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DOCTOR OF PHILOSOPHY

Measuring Different Aspects of Market Efficiency: A Comparative Study Between The United Kingdom and Bangladeshi Stock Markets

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CARDIFF SCHOOL OF MANAGEMENT

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CARDIFF, WALES, THE UNITED KINGDOM

This thesis is dedicated to my parents (Mohammad Jamal and Afifa Akhtary Begum - Asgary)
who have supported me continuously since the beginning of my studies.
It is also dedicated to you (the reader)

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Declaration

I hereby declare that I am the author of this thesis, that the work of which this thesis is a record has been conducted by me, and that it has not previously been accepted for the purpose of a higher degree.

Signed: [redacted] **Dated:** *3rd October 2021*

Mohammad Iqbal

Certificate

We certify that Mohammad Iqbal has worked on this research, and that the conditions of the relevant ordinance and regulations have been fulfilled.

Signed: __[redacted]__ **Dated:** *3rd October 2021*

Dr Juma Oino Isaiah

Signed: _[redacted] **Dated:** *3rd October 2021*

Dr Vijai Shenai

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Abstract

This paper examines the various aspects related to market efficiency between the United Kingdom and Bangladeshi stock markets. The Efficient Market Hypothesis (EMH) states that on-going security prices are able to show all the relevant information about the intrinsic value of those securities either directly or indirectly available at that time. Therefore, it is impossible to employ the prices currently seen in order to forecast future security prices. Estimation of market efficiency is imperative from an investors' position because of its significant role in developing successful investment plans or trading strategies. The majority of earlier studies have examined this area in the context of either developed or other developing economies. However, a comparative study on the market efficiency between one developed economy and one emerging economy has not been commonly observed. The current study attempts to cover this literature gap by conducting a comparative investigation of market efficiency between Bangladesh and the United Kingdom. In this case, the FTSE 100 from the UK Stock Exchange and the DSE Gen Index from the Dhaka Stock Exchange have been considered.

The first section applies, daily, weekly and monthly stock indexes from two different stock markets, these have been used to examine whether they exhibit characteristics that comply with the Random Walk Hypothesis (RWH). A Runs Test, Ljung-Box Q-Test, Lo- Mackinley Variance Ratio Test, as well as a Chow-Denning Multiple Variance Ratio Test have been used in order to examine stock price behaviour between these two stock markets. In exceptional of the run test, all of the above mentioned test results indicated that the daily and weekly data series did not follow random walk for the UK and Bangladeshi stock markets. Conversely, monthly data series results adhered to the random walk properties for both economies. On the other hand, the percentage of the Run test as compared to the entire set of daily, weekly and monthly data series for the UK Stock Markets is greater than that of the Bangladeshi Stock Markets. This comparative evolution implied that the FTSE 100 Index was found to be less-random than the DSE Gen Index.

Secondly, the Soren Johansen's Cointegration analysis was used to estimate the long-run equilibrium between stock prices and the few specific macroeconomic variables (i.e., consumer price indexes, exchange rates, deposit interest rates, broad money supplies, per capita GDP, balance of trade, international crude oil prices, foreign remittance, treasury bill rates) between the UK and Bangladeshi Stock Markets. A significantly large sample data between January

1998 and June 2018 has been employed to carry out this estimation. Johansen's Cointegrating test shows that there is clearly a long run equilibrium relationship in place when cointegrating vectors exist between the specified variables. Therefore, it can be said that the Bangladesh and UK stock prices have a long run equilibrium relationship, in the context of the macroeconomic variables in their economies.

The second section also relates, the short-run disequilibrium adjustment has been examined in the context of the UK and Bangladeshi Stock Markets through the application of the Vector Error Correction Model (VECM). For the UK, the outcome shows that the error correction term holds an extremely small standard error, and this is characteristic of the validity of the results. Once the specified macroeconomic variables were taken into account with the VAR model, it was found that stock price in the UK needs less time than in Bangladesh to reach equilibrium condition. When the two markets were compared, the data showed that the UK stock market can fix disequilibrium issues with greater efficiency than the Bangladeshi Stock Market. As a result, the findings offer rational standards regarding the rapidity of short-run disequilibrium changes between Bangladesh and the UK.

Thirdly, the Toda-Yamamoto Granger Causality Test was used here to examine the dynamic long-run causal relationship that exists between stock prices and specific macroeconomic variables for Bangladesh and the UK within the sample period. The findings showed that when it came to macroeconomic development and progress, Bangladesh and the UK have a lower likelihood and the causal evidence amongst stock prices and macroeconomic variables offer varying results across the two nations. A significant amount of uni-directional causal evidence existed between the stock prices of both economies and the specific macroeconomic variables. However, some exceptional evidence was identified within the UK economy context.

Finally, after examining and evaluating the data analysis of the DSE and LSE in the previous chapters, the scrutinised recommendations have been provided at the end of this thesis to deal with the problems faced in obtaining market efficiency in some cases by the Dhaka Stock Exchange.

The outcomes of the research differed as the Bangladesh stock prices are impacted by numerous macroeconomic variables, which is in contrast with the UK as the latter is affected by macroeconomic variables to a much lesser degree. This disparity affects stock prices accordingly, and this could be because of the differences in the macroeconomic stability in Bangladesh and the UK. Bangladesh is a developing economy with numerous financial, environmental and administrative issues. In addition, there is limited expertise, market inefficiency, political unrest and clashes, which, in addition to natural disasters, impede the steady progress of the economy. Similarly, investors in Bangladesh are not willing to put their money in the stock market, and these decisions are strongly impacted by rumors and noise trading, meaning the stock market is less efficient. Thus, problematic situations in macroeconomic aspects have a deep impact on the stock prices of Bangladesh for a substantial period of time. Conversely, the UK is a developed nation with a more genial business environment, and financial, political as well as institutional growth maintains macroeconomic stability. The UK has a historically robust market, which can counter negative events in a short time, with stable stock markets. Therefore, when these challenging instances occur, stock prices are affected less and for a smaller period of time, so stock prices in the UK are seen to be more insensitive to macroeconomic performance changes. Correspondingly, the UK stock market has solid ties with the US stock market, so when there is any substantial movement in the US stock market, then the UK stock market has an appropriate reaction. Consequently, the UK stock markets are even less related to UK macroeconomic performance than they otherwise would be.

Acronyms

AMH: Adaptive Market Hypothesis

AIM: Alternative Investment Market

ARCH: Autoregressive conditional heteroskedasticity

BBS: Bangladesh Bureau of Statistics

CDS: Central Depository System

CPD: Centre for Policy Dialogue

CREST: Certificateless Registry for Electronic Share Transfer

CRR: Cash Reserve Requirement

DVP: Delivery Versus Payment

EMH: Efficient Market Hypothesis

ECM: Equity and Equity-Linked Issuance

FPO: Foreign Portfolio Investors

GAAP: Generally Accepted Accounting Principles

GARCH: Generalized Autoregressive Conditional Heteroskedasticity

ICB: Investment Corporation of Bangladesh

IPO: Initial Public Offering

IRF: Impulse Response Function

MTF: A Multilateral Trading Facility

NAV: Net Asset Value

NBR: The National Board of Revenue

OCT: Over-the Counter Markets

OFIS: The Order Book for Fixed Income Securities

ONS: Office for National Statistics

IPO: Initial Public Offering

RWH: Random Walk Hypothesis

SAARC: South Asian Association for Regional Cooperation

SAFE: State Administration of Foreign Exchange

SC: Schwarz Criterion

SEAQ: The Stock Exchange Automated Quotation

SEC: Securities and Exchange Commission

SETS: Stock Exchange Electronic Trading Service

VECM: Vector Error Correction

Part I
Overview and General Discussion

Chapter 1-Introduction of the Study

1.1 Introduction

This research aims to measure different aspects of market efficiency between the United Kingdom and Bangladeshi stock markets. Over the past three decades, the financial literature has focused on the efficient market theory and random walk theory. The Random Walk Hypothesis suggests that it is not possible to get excess returns using information gleaned from the observed moment of prices. However, it does not imply that insider trading is not possible. Efficient Market Hypothesis (EMH) is similar as it suggests that current stock prices have been indicative of all available information, and thus it isn't feasible to utilise observed prices to forecast current or forthcoming share prices. This information is vital when considering a country's economic growth (Devarajan and Nabi, 2006). In an efficient market, an investor must make above-average risks if they expect to reap above-average returns (Malkiel, 2003). Similarly, Malkiel (1992) identified a stock market as bring effective if it completely and accurately demonstrated every pertinent data when deriving security prices. For this reason, it is necessary to identify if a market is competent in order to devise the best suited investment tactic. As with the phrase "tall oaks from little acorns grow," Bachelier (1900) produced research on market informational efficiency that continues to influence research today (Corrado and Truong, 2008).

A capital market centres on a robust and well-structured stock market, which makes it a vital aspect of a country's development. The fact that nearly all developed countries are home to strong stock markets is not simply happenstance. Such a market operates as an important intermediary for financial transactions (Rahman and Rahman, 2007).

A stock market will have the ability to fulfil the economic necessities of companies and will be considered high-performing if it operates in an environment that is both hospitable and encouraging to investors and operators (Ahmed and Imam, 2007). Such an enabling environment is necessary to enhance investor confidence and is vital for a stock market to grow and develop within a market economy. The secondary market is able to build market capitalisation by providing diversified instruments and share liquidity. When an investor is confident, they will have a positive influence on any country's Gross Domestic Product (GDP).[1]

In today's world, stock markets undertake a massive volume of transactions every day, thus the efficiency of a market is important. Market efficiency is ultimately responsible for the economic success of several people, and is therefore a large part of the contemporary economic

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[1] For further information regarding these research studies, the reader is advised to read Chapter 2.

lifestyle. Throughout history, humanity has always been interested in predicting what the unknown future holds. The same goes for stock markets, where people try to predict future share prices in order to earn "easy money."

1.2 Context of the Research

The theory of efficient market hypothesis states that share prices fully reflect all relevant available information. It is core for participants dealing with the market to obtain knowledge regarding stock market efficiency. Intense competition is ensured with efficient markets, which means that debts, securities and stocks are fairly valued. Stock Market movement is irregular due to new information, within an efficient market. Hence, abnormal profit cannot be made by marketers outguessing the stock prices.

Operational and information efficiency are the two key fields to understand an efficient stock market. Baumol (1965) and Fama (1970), stated that examining the efficiency of a stock market from an operational viewpoint pursues addressing all facets of functionality, including liquidity, transaction time and cost. Informational efficiency evaluates the response of participants to new information. Ergo, information efficiency suggests that there is a rapid adjustment of the market to new information, which means that information is reflected in market values.

If Bangladesh has informational efficiency or not, is the central question in the perspective of an efficiency market and to what extent. The degree of being considered efficient is reliant on the ability of the market assure investors of fair returns.

For investors, the government and academics of Bangladesh the effectiveness and behaviour of Bangladesh's economy has been an intriguing area for exploration, so much that the government has understood that refining the efficiency is of extreme importance.

The stock market efficiency of UK and Bangladesh were measured in this research and are both incredibly important to the context on various levels – which has been described below.

The majority of laws in Bangladesh have been set by Britain, due to the ruling of Bangladesh since 1757 (i.e., Companies Act 1857, Companies Act 1929, Joint Stock Companies Act 1844 and Companies Act 1913). Moreover, Sales of Goods Act 1930 and Contract Act 1872 were also British laws brought to Bangladesh. Bangladeshi remains in a pit of darkness, despite copying the laws of UK's Stock Market Exchange, which is shown by the fact that Bangladesh has not been able to recuperate from the market crash 10 years ago. In stark contrast, the UK would have been able to adjust within a couple of months. Ergo, the UK had been examined, to be able to deduce why Bangladesh had a failing market efficiency. Comparative investigations between Bangladesh and the UK with the intent to improve Bangladesh's market efficiency had not been carried out prior to this. Although Bangladesh is ancestrally linked to the UK, being governed for 200 years an examination of the links has never been executed. In order to fill this gap, one of the research aims was to compare UK to Bangladesh.

In addition, various reasons exist as to why UK was chosen as the point of interest to compare against Bangladesh. Firstly, a minimal amount of literature has examined Bangladeshi stock markets, since most of the focus is upon other markets within Asia (Click and Plummer, 2005), Latin America (Chen and Yeh, 2002), Central Europe (Gilmore and McManus, 2002) or Africa (Wang et al., 2003). Additionally, a comparison between Bangladesh and UK has not taken place and most studies which deliberated upon the connections between the stock market and macroeconomic factors are no longer relevant; they also usually focus on individual economies and a small range of variables, instead of a comparative study. Gunasekarage et al. (2004), Ahmed (2008), Sohail and Hussain, (2009), and Ahmed and Imam (2007) all examined links within economic factors and market performance for specific nations in south Asia and only used samples from 1995-2001. The researches also provided no evidence of long-term linages amongst either factors for any of the addressed markets (despite the use cointegration analyses and granger causality tests) and relied on domestic samples. These gaps show that this research responds to particular necessities for regionally focused and current investigations, as it utilises local and global economic variables. Furthermore, since previous studies used granger causality and co-integration analysis tests alongside various up-to-date econometrics tools.

The thesis also utilised quantitative research methods, to consider share price data and selected macroeconomic variables, which can be generalised to be suitable for other markets. As the quantitative research is focused on the quantification and analysis of different data, it adopted a deductive approach and incorporated aspects of objectivity, thereby producing a highly scientific model that the research process followed.

The United Kingdom is a significant trade and development partner for Bangladesh and Bangladesh has a fruitful market, obtaining a +6% development within the last 10 years. The relationship of the UK and Bangladesh were built upon a variety of factors. Bangladesh has had important economic successes for multiple years, and the United Kingdom has a part - British High Commissioner to Bangladesh, Robert Chatterton Dickson publicised his opinions on the challenges, relations and prospects (BHC, 2021; Ministry of Foreign Affairs, 2021). The Bangladeshi market regulator is due to discuss understandings with the LSE, which has been a major development, in order to increase the capital market (BSEC, 2021). The Bangladeshi Taka (Bangladesh's national currency) was approved by LSE - bonds to its Main Market (LSE, 2019). The goal to improve the Investment Climate and position on Global Ease of Doing Business Index, was endorsed by the United Kingdom and so was the establishment of Bangladesh Investment Development Authority (BIDA), as the main facilitation agency and investment promotion for the government. It was accepted by both nations to co-operate for the encouragement of investment into both stock markets, and ensure appropriate practices and regulations were kept. Along with tackling issues over contract enforcement and speeding up processes (Foreign Affairs GOV.UK, 2019). Given their previous ties and how much the UK has supported Bangladesh, it is the most viable option that the UK (a developed country) should be used to compare Bangladesh to.

The Bangladeshi Government decided to revitalise the economy during late 1900s, infrastructural development and legal changes were the main measures taken. The Securities and Exchange Commission (SEC) established in 1993, which was one of the most notable changes, alongside an automation of securities transactions in 1998 and the Central Depository System in 2000. Nevertheless, serious crashes were experienced in 1996, 2008 and 2011 - the last of which is still continuing. Therefore, testing the efficiency for Dhaka Stock Exchange is of utmost necessity, so that the implications of the reforms can be examined. Knowledge of market efficiency is imperative in order to decrease the likelihood of crashes for the DSE.

The effects and causes of collapses in the stock market, with links to the politics and national economy of Bangladesh have been attempted at being explained by a couple of researches; but none from a macroeconomic viewpoint. To be able to take a leading role in the development of the capital market, the government and central bank have the need to analyse the stock market functions with the stock market. There is an intricate link amongst stock values and the variables, since they can easily impact the market and economic functions of a nation (Bernanke and Gertler, 1985; Haan and Sterken, 2000; Strulik, 2008). Henceforth, to realise the connection from Bangladesh it is necessary for a thorough study to be carried out. Nonetheless, reviews on the influence on the DSE from macroeconomic variables have not been made, with the exception of Ahmed et al. (2006) – even then he considers select return aspects. Therefore, a gap exists for a study to discover the interrelationship and impact of macroeconomic variables on the stock market prices, which will help the government, DSE and the central bank to achieve a stable stock market. One of the aims, was to make recommendations for improvement of the Bangladeshi stock market, and the previous two paragraphs are the contextual reasons.

Individuals typically have a smaller beginning for diversifying their portfolios with restricted ability to access info, for Bangladeshi Stock Market. (Bialkowski et al., 2008; Giofre, 2013).

They also lack knowledge and have low investment scales, which results in a disadvantage with regards to information; this results in decisions based off variables rather than fundamentals. (Haque, 2011; Odean, 2013). Literature reviews have concluded that home bias is strongly exhibited by the market when market participants have minimal options for diversity. (French and Poterba, 1991; Baxter and Jermann, 1997; Bialkowski et al., 2008). Therefore, stock prices may not be impact by global variables when the market is controlled by individual investors, and they also may not have integration between various equity and even might not obtain concurrent reactions to variations in domestic factors. Yet, empirical evidence is rare from emerging markets and this study will provide documentation on these issues.

Bangladesh's exchanges are an integral role for the economy. Generation of money is helped by both markets, from the idle to productive segment. Transfer of funds creates money values and various Bangladeshis' career goals are in investments. This means that Bangladesh's Stock Exchange is an employment source. Trading security and opening B.O. accounts are extremely simple, which is why people from dissimilar areas relish in the opportunity of investments. However, their knowledge is not sufficient to invest in stocks effectively, appropriate information regarding the exchange and its variations have to be obtained by an investor. In Bangladesh, majority of people attempt to obtain profits overnight, whereas stock markets create a long run investment opportunity. Ergo, a massive amount of cash arrives in the market just purchase an insignificant amount of shares, which is why the DSE have experienced crashes within the market. Therein lies the question of whether the stock market is efficient. To find out the efficiency of the stock exchanges and which stock is in a better situation study is needed. Ergo, it was one of the aims of the study.

Among the most rapid of the growing economies, Bangladesh is one of them. Prior to the pandemic, an 8.2% annual development rate had been registered, according to the World Bank (2020). The economy is more significant than Vietnam, while also increasing at a swifter pace than that of the Southeast Asian nations and hidden gems have a possibility of being unearthed within the companies that are publicly listed (HSBC Economic Report 2021; CNBC, June 2021). According to the World Bank (2020), in order to sustain growth a continuous supply of investments to the markets are necessary. Compared to developing markets like Egypt, Russia, Mexico or the Gulf Cooperation Council (GCC – like Saudi Arabia, UAE & Kuwait), DSE has extra registered and is on par with Brazil, another developing nation. DSE placed in the top 8 within The Bloomberg's (2018) per market cap and Return on Equity (ROE) in 2016. Moreover, it was one of the few economies in which more than 90% of companies had been beneficial. The above showcase the buoyancy and breadth of Bangladesh, but globally there are a plethora of people who are unaware. This is the reason why only 12 portfolios allocated 90%+ of their corpus to Bangladesh (early-2017), while South Africa & Indonesia had 50 each and Turkey & Thailand had close to 200 each. An umpteen amount of researches showed that solely the long-term investors made money. Institutional investments for both foreign and domestic are necessary, as is generating additional buoyancy in investor demand and retail investments. This highlights that albeit DSE has been successful, it also has it fair share of challenges. By focusing on the challenges in this study it will aid to maintain the long-run investor interest, which Bangladesh, being a potential market, deserves. Finally, this research also maintains an examination which can be scaled to compare various other developed and developing nations, by focusing on various variables impacting market efficiency amongst the UK and Bangladesh.

A multitude of research, such as one carried out by Yang et al. (2003), utilised 6.5 years of sample data, taken from Pakistan and India, during their broader examination of market integration amongst a dozen other Asian markets. Further researches were restricted to their native country, Elyasiani and Mansur (1998) investigated data sets from Sri-Lanka and India. In the current research, a comprehensive investigation of the market efficiency for Bangladesh and the UK was aimed to be carried out. The length of time has been ascertained as a significant facet for comprehensive studies. Henceforth, a 20.5-year period has been used so that a wider understanding of long-term connections between markets can be obtained. Furthermore, the macroeconomic variables impact the stock market in different ways in different stock markets, which means that there is a different adjustment effect on the two markets - another reason why the two markets have been chosen.

Ergo, the aim of this thesis is to analyse the various aspects of stock market efficiency and the impact that macroeconomic variables in the Bangladeshi Stock Market, to then compare it with the United Kingdom and make recommendations for the improvement of the Bangladeshi Stock Market. Henceforth, the researcher identified the following objectives for the study of Bangladesh's stock market. Indeed, by studying each of the objectives, this study looks deep into several micro and macro dynamics of the Dhaka Stock Exchange.

To be able to take preventative measure and understand how important market participant's sentiments this thesis has been facilitated to various beneficiaries.

Firstly, academics will be benefited as the empirical contribution can be added to the existent literature of the relationship between stock market performance, investor confidence and macroeconomic variables for Bangladesh.

Secondly, Bangladeshi firm managers will be able to better understand external factors and their impacts on performance, so that they can make well informed decisions accordingly.

Thirdly, policy makers will also be able to reap the benefits as it offers a greater understanding of how economic development and other economic variables are linked to market. This may lead to policy makers improving rules, in order to establish enhanced conditions for the market and predict the course of economic development. Additionally, other market regulators may be able to construct policies to be certain that trade is smooth for market participants within Bangladesh.

Finally, the research shall provide investors with data on how sensitivity levels vary across industries, risk types and firm scales, so that investments can be made accordingly.

1.3 Research Questions

The current research is a comparative study which aims to measure and estimate market efficiency. EMH suggests that it isn't feasible to get excess returns using information available in the markets (Fama, 1969). Moreover, this research began at a high level by using different tools and updated macroeconomic models to scrutinise how values of UK and the Bangladeshi shares behave. Likewise, the random walk hypothesis also suggests that the current prices are based on available information which is why it isn't feasible to use the observed prices to predict current or forthcoming share values (Fama, 1965; Malkeil, 1992). Ergo, it is vital to identify the stock market efficiency in the UK and Bangladesh.

Due to the very crucial in-depth reasons, above, the researcher analysed whether both shares obeyed EMH or whether EMH was non-existent in these markets, as well as how and why this occurs. Furthermore, it was important to examine the question: Does the market efficiency only show in a certain time period (i.e. just monthly or just weekly, etc.), or does it show up over a range of time periods (e.g. in monthly and weekly or daily, etc)? It is hinted that for a developed economy, it is very likely that the randomness is evident in the share prices, as there isn't any information manipulation, insider trading affects or leakage of secret/confidential information. On the other hand, the study suggests that in terms of the Bangladeshi stock market, there were some syndicates that existed and they manipulated the market systems, taking the profits out of the market, however, the rest of the investors suffered severely (CPD, 2010). Additionally, negligence, political instability, skilled manpower shortage and environmental disasters also affected the Bangladeshi stock market.

The researcher studied the two stock market indexes with the most significant macroeconomic variables for both economies and attempted to investigate and establish the way in which they are linked to the capital markets - the researcher was striving to ascertain if an equilibrium relation between the stock markets and common variables exists. This is not relatable to every stock market globally or to the ways in which they are impacted, nor do they have long-run equilibrium relationships with all variables. There are several empirical studies that found no equilibrium long-term link between stock and designated real economic variables in a few particular countries (Olayungbo, 2019; Al Sharkas and Adel, 2000). However, this research study attempts to identify whether long-term connections exist between chosen real economic stimuli and share prices within the UK and Bangladesh. The researcher also tried to examine how long-term association affected stock by using specified macro indicators in both markets, positive and negative, as well examining how the relationship is established in the long-run. Therefore, this research examined the real economic conditions of both economies and explained the factors behind these outcomes with arguments and logic.

After an in-depth analysis was completed using the observed results, the researcher tried to inspect if there exists some disequilibrium relationship, as well as examining the speed of correction in the UK and Bangladeshi shares with a set of real economic factors. The researcher also explored how the UK and Bangladeshi stock markets correct their capital markets so swiftly and examined what caused this speed of correction.

Furthermore, several findings have shown that not only had macroeconomic variables impacted the stock prices but that the stock prices had also influenced the macroeconomic variables (Hunjra et al., 2014). At this point, the researcher began exploring whether the stock prices of both economies had influence the nominated macroeconomic variables or vice versa. The researcher also examined whether there was a causal affiliation within the UK and Bangladeshi share markets with a common set of macroeconomic variables (Kalyanaraman and Al-Tuwajri, 2014), and if so, it was important to identify whether these relationships are unidirectional or bidirectional, as well as the cause of these relationships. Thus, the researcher did not stop to discover the causal relationship but delved further into studying the reasons behind the unidirectional or bidirectional relationships that befell both markets. Various tools and models were utilised and the results were calculated for the purpose of studying the extent to which the operation of the London Stock Exchange can provide lessons for the Bangladeshi Stock Market to improve Bangladeshi stock market efficiency. Upon taking in the above, the researcher set the following objectives which are explained prior to the end of this chapter.

1.4 Outline of the Research Problem

Variation in macroeconomic factors and difference in shares are linked in the long-run (Olayungbo, 2019; Rudra, Mak and Atanu, 2015), the share market is also influenced by social and financial variables (Hussain et al., 2015). Using US economic data, Chen et al. (1986) and Fama (1981, 1990) verified the strength of these correlations. Fama's study (1981) discovered that macroeconomic factors and typical share prices are closely linked. Moreover, Jahfer and Inoue (2017) discovered that there exists a strong relationship between real economic factors (Treasury Bill Rate, Money Supply, Foreign Exchange Rate, International Oil Prices and inflation) (Siddiki, 2000) and share values for several emerging and emerged countries (Tomáš and Daniel, 2017; Jareno and Negrut, 2016). Under the multifactor model, a variable that impacts a consumption-investment decision or that influences future investment prospects are factors priced in equilibrium. These factors are seen as being of greater risk in an economy that is prone to risk-aversion (Merton, 1973).

At the same time, it is necessary to examine the causal link between macroeconomic variables and share price. It is proven by an empiric study that macroeconomic variables influence index and that, in many cases, index influences macroeconomic variables. So, the market efficiency can be measured by establishing this causal relationship (Ditimi, et al. 2018; Kalyanaraman and Al-Tuwajri, 2014). In many cases, no relationship can appear between the index and macroeconomic variables. Sometimes, a bidirectional relationship can also be found, where the index and macroeconomic variables can cause each other (Paul Ndubuisi, 2017).

There is also a bivariate link between real economic variables and share indices. Several empirical investigations have revealed that a unilateral causality in the long-term from equity prices to macroeconomic factors is present e.g., CPI, interest rates and inflation (Giri and Joshi, 2017; Tripathi and Kumar, 2016; Baillie, Chung, and Tieslau, 1996). On the other hand, a bidirectional causal relationship of stock prices is found with CPI, exchange rate, and oil price (Umer, 2016; Barakat et al., 2016).

It can be scrutinised whether a long- term equilibrium link is present amongst shares and macro stimuli (Lee and Brahmasrene, 2018). If there is an equilibrium long-run connection, the market's efficiency can be shown to justify it with how many months it takes for the short-term disequilibrium to be converted into a long-term equilibrium relationship (Bruce, 1997; Vejzagic and Zarafar, 2013)[2].

Despite the existing studies, there remains an absence of empirical research concerning a comparison between the United Kingdom (developed economy) and Bangladeshi stock markets (developing economy), with regards to the effect of real economic stimuli (Ali, 2011). The proposed research addresses a comparison study by measuring different aspects (equilibrium long-term connection, long-term dynamic causal link, as well as short-run disequilibrium adjustment, within specified real economic factors) of market efficiency in UK and Bangladeshi share markets.

1.5 The Research Aim

The Bangladesh stock market was set up in colonial times during UK rule. Both the United Kingdom and Bangladeshi stock markets have evolved substantially over the last seventy years. The aim of this thesis is to investigate the different aspects of stock market efficiency and the impact of macroeconomic variables in the Bangladeshi Stock Market and compare it with the United Kingdom and then to make recommendations for improvement in the Bangladeshi Stock Market.

1.6 The Research Objectives

The research objectives are-

1. To make a critical appraisal of the literature on stock-market efficiency, and the impact of macroeconomic variables on the stock-market.
2. To assess the state of market efficiency in Bangladesh using a range of tests and compare it with the United Kingdom.
3. To examine the short-run disequilibrium adjustment and the long-run impact of macroeconomic variables on the Bangladeshi Stock Market and compare it with the United Kingdom.
4. To investigate the long-run dynamic causal relationship between stock prices and selected macroeconomic variables in the UK and Bangladeshi Stock Markets.
5. To integrate the analysis and findings and generate recommendations for overall improvements in the Bangladeshi Stock Market.

[2] Sometimes, international developments can impact the effectiveness of stock price. In such a scenario, the market efficiency can be tested by measuring the pre and post indirect stock price (Saini et al., 2006).

1.7 Contribution and Motivation of the Research

Firstly, there are several reasons that the UK, an industrialised nation, and Bangladesh, a developing country, are of interest to this research. First, there has been very little literature devoted to examining stock markets in Bangladesh; the majority focus on other Asian markets (Click and Plummer, 2005), Central Europe (Gilmore and McManus, 2002), Africa (Wang et al., 2003), or Latin America (Chen and Yeh, 2002)[3]. Moreover, in any period, there has been no research concerning a comparison between Bangladesh and the United Kingdom. In addition, most past studies that have discussed the correlation amongst macroeconomic factors and stock yields are no longer applicable to the present day, and tend to look at individual countries and a small number of factors rather than a comparison study across a broad range of inputs. Gunasekarage et al. (2004), Ahmed (2008), Sohail and Hussain, (2009), and Ahmed and Imam (2007) all examined the link between stock market performance and economic variables for individual South-Asian nations, compromising of Bangladesh, Pakistan, India and Sri Lanka. These studies also looked at the relationships as they stood from 1995 to 2001. The studies indicated no proof of a long-range link between the two factors in either of the addressed markets, despite being conducted using granger causality tests and co-integration analysis. None of the studies took factors of international influence into account, instead, they only relied on domestic information. Such a gap implies that this literature, which addresses both global and local macroeconomic aspects, responds to a specific need for a current and regionally-focused investigation.

Secondly, Britain ruled Bangladesh since 1757, hence the majority of the governmental laws were created by Britain, for instance: Joint Stock Companies Act 1844 endorsed by the UK Parliament, Companies Act 1857, Companies Act 1913 and Companies Act 1929, all the rules are xerox copies of Bangladesh's current laws. Furthermore, Bangladesh's contract laws are based upon the Contract Act 1872 and the Sale of Goods Act 1930 which were British laws. LSE has a history of operations which dates back further than three hundred years, which makes it among the longest running and strongest stock exchanges on the planet. Albeit adapting with the rules and regulations of the UK Stock Market Exchange, Bangladesh is still in a pit of darkness, with regards to stock exchanges. It has been 10 years since the last market crash and Bangladesh still has not been able to recover. However, the UK, if it was in the same situation, would be able to recover within a few months. Henceforth, the researcher investigated the UK, so as to ascertain the reason for which Bangladesh was failing to establish market efficiency. They, for the main part, have been overlooked. Not a single study has been carried out to

[3] However, two studies did look at linkages between Southeast Asian stocks utilising information from 1995-2001 (Narayan and Smyth, 2004) and from 1997-2003 (Lamba, 2005).

undertake a comparative investigation between the UK (as an emerged country) and Bangladesh to increase market efficiency. Bangladesh has ancestral bonds with the UK, as Bangladesh was governed by them for two-hundred years; in spite of that, a relationship analysis of the shares market has never been performed.

Thirdly, previous research, including that carried out by Yang et al. (2003), only took 6.5 years of data from India and Pakistan into account during their wider analysis of market integration among 12 separate Asian markets. Other studies were limited in their country scope: Elyasiani and Mansur (1998) solely examined data drawn from Sri Lanka and India. In the present study, the author aimed to carry out a comprehensive examination of the EMH as it exists in Bangladesh and the United Kingdom. It has been established that length of time is an important aspect of comprehensive research[4]. Therefore, this thesis has considered a 20-year period in order to have an understanding of the long-run relationships between markets. Additionally, the author addressed long-run equilibrium, disequilibrium adjustment, as well as long-standing causal dynamic links that may exist within specific equities and real economic factors for the United Kingdom and Bangladesh. The author also aimed to examine whether or not the "Random Walk Hypothesis" had been present in either country's shares. This further emphasises the need for a current piece of research that addresses these topics.

Fourth, by addressing different factors influencing market efficiency between Bangladesh and the United Kingdom, this research supports an investigation that could be scaled out to compare other developing and developed country linkages and stock markets.

Finally, the outcome of this thesis will assist foreign investors, domestic shareholders, governments and academics – all of whom have a vested interest in comprehending the market behaviour in these countries in the recent past. All of these groups would be involved in the pricing efficiency of the share market of these regions. In particular, investors will be curious regarding potential trading strategies drawn from the historic and geographic information collected in this thesis. On the other hand, governments and policy-makers would be more interested in the need to reinforce regulations and data streams to facilitate price detection processes in the two countries. Thus, the information presented in this thesis will be useful to a variety of audiences.

1.8 The Rationale of the Research

The stock markets are an essential aspect for any nation's financial status. Throughout the world, a large and robust stock market is a gauge of financial well-being and a predictor of the

[4] In particular it is vital to research links which are present over the long-run (Hakkio and Rush, 1991).

nation's performance that is useful to both international and domestic investors. Several studies back up the fact that there is a significant relationship between share growth and financial development. An equity market can be defined by its level of informational efficiency, in particular whether securities prices accurately reflect all data, which respond to stimuli in an impartial manner (Fama'70). If macroeconomic activity truly impacts stock pricing, then share values have to directly imitate accessible data with regards to economic variables in order to be considered efficient[5]. This thesis addresses the existence, or lack thereof, of any long- or short-run relationships and disequilibrium adjustments between the two selected stock markets and their related macroeconomic variables. The research also investigates whether each of those countries' stock markets demonstrate behaviour that conforms to RWH. This research's examination of DSE & LSE, as well as the chosen macroeconomic variables, will guide stakeholder groups in making successful managerial, operational and sustainable growth decisions. Regulators can use this information to inform their policies and decisions regarding trading and investment, building such decisions on predictable stock market behaviours. Stockholders may utilise the data to inform the returns they create from the stock market. Finally, efficient trading in both markets is a matter of national interest to both Bangladesh and the United Kingdom.

1.9 Structure of the Research

The framework for the current research is explained below. Chapter 2 offers contextual data regarding EMH (Efficient Market Hypothesis) and specifically explains the historical and hypothetical context for numerous types of EMH. Chapter 2 additionally explains the irregularities within the stock market, interval actions of stock market costs, and model categorisation. Ultimately, Chapter 2 illustrates the advent of behavioural finance with an altered market theory. Chapter 3 presents contextual data with regards to the progression of developing and appearing stock markets. Appropriately, this includes an examination of LSE (London Stock Market) and DSE (Dhaka Stock Market) to consider and supply a background for the following essay. Chapter 3 explains the United Kingdom and Bangladesh's micro-organisation and stock market such as the growth, organisation, operation, legislative restrictions, prerequisites for share classes, and stock market indexes. Ultimately, the section explains and examines previous stock market crises and the associated elements that added to these crises. The section concludes by illustrating the techniques for addressing the issues caused by stock market crises.

[5] When a stock market is inefficient, stock market participants can manipulate the stock market to gain greater than average returns.

Chapter 4 presents a textual examination that specifically considers numerous primary subjects within the field of EMH. In particular, this section commences through providing an overview of numerous examinations within the subject with regards to three general arguments. The section explores practical examinations that have investigated 3 kinds of EMH: weak-, semi- and strong- form. This examination was conducted by employing numerous statistical and econometric methods. The following component of this section provides a short summary of the texts that have considered the Random Walk Hypothesis and stock price responses. The following section of the textual examination explores practical examinations, which have explored long-term balanced correlations and stock price reactions.

This examination encompasses both developing and established stock exchanges, in addition to the effect of various theories. Ultimately, this section concludes by examining the practical examinations which have considered long-term causal correlations and stock price reactions. The second half of this chapter explains the correlations between numerous macroeconomic factors and differing share prices within developing and established stock markets. The primary objective of the textual examination is to specifically explore examinations that have considered and produced results on the United Kingdom and Bangladesh stock markets. Clearly, substantial examinations have been conducted on this subject matter. However, this examination specifically considers previous examinations that explored the particular area and utilised similar techniques.

Chapter 5 explains the techniques employed with this thesis' examination. Chapter 5 additionally presents Burrell and Morgan's (1979) presumptions on social science examinations, which included 4 paradigms: “interpretative”, “functionalist”, “radical humanist”, and “radical structuralist”. This essay's examination suggests that this examination qualifies within the functionalist paradigm. The motivations for employing a functionalist paradigm are also explained. Next, the examination techniques used within this examination are presented including a discussion of their suitability for the functionalist paradigm.

The outcomes of the Random Walk Hypothesis and stock price reactions are explained within Chapter 6. This chapter additionally conducts a comparative analysis of both markets. The run test is employed because a common distribution is not essential. Stock indexes on both markets are gathered at regular intervals (daily, weekly, and monthly) for 23 intervals. To conclude, the Ljung-Box, Q-Test, Lo-Mackinlay and Chow-Denning Tests are utilised for the United Kingdom and Bangladesh markets to explore and assess if stock prices within these markets demonstrate the Random Walk Hypothesis.

The initial practical evaluation within this examination is described in Chapter 7(A) with an examination of the long-term equilibrium relationship between macros and stock. Chapter 7 contains three sub-sections. Sub-section one explores the co-integration examination of the United Kingdom and Bangladesh. It begins by explaining the information and introductory information evaluation before a unit root examination is undertaken to determine the stability and occurrence of a unit-root within the 4 equity results as presented within the indexes. Monthly information on the Bangladesh and United Kingdom markets is employed between the interval of January 1998 and June 2018. The concluding sub-section conducts a comparative evaluation between information on Bangladesh and the United Kingdom.

Additionally, the results obtained through evaluations on predictions of immediate unbalanced alterations are explained in Chapter 6(B). Furthermore, this chapter begins by illustrating the employment of VECM information within both markets. It concludes with a comparative evaluation of the two markets.

Moreover, the results on long-term predictions of dynamic causal correlations on macro stimuli and share prices are explained in Chapter 8. The Toda Yamamoto Granger causality examination is employed to gather information on both markets. To conclude, these outcomes are investigated and contrasted.

Bangladesh Stock Markets have to reinforce the present state and deliver more confidence to the investors which will improve the competitiveness and the liquidity of the market. The present schemes of trade and settlements have to be reformed for better performance. DSE has been experiencing problems between demand and supply matters. When analysis was required about the problems and their reasons, the status of the different aspects of share effectiveness and the development process for Bangladeshi shares had to be examined. To achieve this end and the points that need to be addressed immediately, the scrutinised recommendations have already been established in Chapter 9 to deal with the problems faced by the Dhaka Stock Exchange.

Chapter 10 serves as the conclusion chapter of this thesis by explaining the primary outcomes and how this examination adds to the current comprehension of various elements of market efficiency within both markets. The impacts of these results with regards to the examination enquiry are thoroughly considered. The chapter finishes by providing recommendations for additional examinations on this subject.

1.10 Conclusion

The present research aimed to measure the different aspects of market efficiency between the United Kingdom and Bangladeshi stock markets. It investigated various parts of market efficiency by using several econometric tools for both stock markets. As no remarkable comparative study was conducted on share effectiveness between the UK and Bangladeshi stock markets especially pertaining to the equilibrium long-term connection, short-term disequilibrium rate, long-run dynamic causal link between the share values and specified real economic factors in both the UK and Bangladeshi Share Markets, as well evaluating whether share prices in both markets exhibit RWH, there was an emergent need to conduct this research, particularly to deal with the unsettled matters of the above objectives. This research has also investigated the clear variation between evolving and evolved economies, which will help when identifying how and why the distance of the position for developing shares deviates from evolved shares. However, the current analysis must also adequately be able to achieve the research objectives raised for both markets.

This research also ascends to be the benchmark of the observed studies on the different aspects of market efficiency in both developing and emerging markets as a comparative study. Moreover, this thesis will draw attention to the regulatory bodies, policy-making bodies, security analysts, and portfolio investors of the emerging markets. This research will evidently provide a clear recommendation to the parties associated in both stock markets and specifically to the regulatory bodies and foreign investors. Finally, the study can be valuable for the justification of market efficiency as efficient trading is a matter of nationwide interest to both the United Kingdom and Bangladeshi stock markets.

Chapter 2- The Evaluation of Efficient Market Hypothesis

Introduction

With regards to an info set, the term 'efficient market' has been defined as a market where the prices fully reflect all the available information (Fama, 1970). According to this definition, the appearance of available information should be unpredictable, and so should the change of stock price in response to new information. This typically results in failure of generating any kind of abnormal profits, and in the event that the price remains unaffected, the relevant information will be revealed to every participant in the market (Malkiel, 1992). This explanatory account does not intend to comprehend the chapter, however, as per the researcher, it is very much capable of enabling the readers, through its extensive adequacy, to develop an integral image incorporating the latest principal observations along with the future scope of research in this field. As proclaimed by the EMH, financial markets are competent. This section provides a sequential overview of all the distinguished research related to EMH, starting from the 16th century.

2.1 Historical Context

As noted by Cardano, the protuberant Italian mathematician of the 16th century, in his book "The Book of Games of Chance" (originally "Liber de Ludo Aleae"), the basic belief is that in every type of betting there are equivalent situations. This means that the challengers, the onlookers, the money, the dice box, the situation as well as the die itself should have equal conditions. In case one neglects this equality, the gambling becomes partial to one or another.

In 1880, Rayleigh, a physicist of British origin became aware of the concept of a random walk through his work on sound vibrations (Rayleigh, 1880)[6]. Meanwhile, in 1900, Bachelier, a mathematician of French origin, in his PhD dissertation (Théorie de la Speculation), mentioned the figures and arithmetic of "Brownian motion", half a decade prior to when Einstein came up with the same[7]. Bachelier also inferred, 6 and a half decades before the concept of "efficient markets" and martingale model was explained by Samuelson (1965), that zero is the mathematical expectation of the speculator. The expression, "Random Walk", was introduced in Nature in the letters page, in 1905, by Pearson, a Fellow of the Royal Society. Einstein worked out the equations of Brownian motion in 1905, as he was not aware of the work of Bachelier. In 1906, Brownian motion was defined by Smoluchowski, a polish scientist (Smoluchowski, 1906). The book by Barriol, written on financial transactions, also shows influences from Bachelier's work (Barriol, 1908). De Montessus wrote his publication ("Upon chance") in 1908, which contained a whole chapter on finance that was based on the work

[6] The notion of efficient markets found clear mentioning as early as 1889, it was published as part of "The Stock Markets of London, Paris and New York" (Gibson, 1889).

[7] Venn had a clear conception of both Brownian motion as well as a random walk (Venn, 1888).

of Bachelier. Langevin successfully deduced the "Brownian motion's" randomness equation (Langevin, 1908). The spectrum analysis of equity performed by Granger and Morgenstern (1963) showed the outcome that short-term series movement obeys simple RW, while long-term series don't conform to random walk.

In 1964, Alexander completed his next work, answering the critics of his 1961 publication, and citing that a RW isn't respected by S&P industrials. Cootner edited a book called "The Random Character of Stock Market Prices", which was a compilation of works by Moore, Kendell, Working, Cowles, Osborne, Bachelier, Moore, Cootner himself, and Granger, along with Alexander, Fama, Morgenstern, Steiger, Larson and others. "The Random Walk Hypothesis of Stock Market Behaviour" by Godfrey, Granger and Morgenstern was also published in 1964. The stock prices were tested for non-randomness by Steiger in 1964, and he came to the conclusion that the prices of stocks do not trail a random walk model [8].

In an empirical research study on share prices, Fama (1965b) initially defined the phrase as "efficient market" and concluded that stock values obey a RWH[9]. The title of his work "Proof that properly anticipated prices fluctuate randomly" precisely summarises his findings. He was the one who highlighted the notion of a martingale rather than RW. Fama (1965a) also described how the random walk theory makes it critical for technical as well as fundamental analysts to predict the market.

Fama and Blume (1966) arrived at the conclusion that serial correlation is expected to be as powerful as the filter rules of Alexander for calculating the direction and the extent of dependence between stock prices (Alexander, 1961, 1964). The phrase "efficient market hypothesis" had been initially invented by Roberts (1967), who also differentiated with the strong and weak form evaluations, which Fama used in his classic taxonomy in 1970.

The first of the three reviewed papers of Fama, entitled "Efficient Capital Markets: A review of theory and empirical work", was issued in 1970. In the paper, "efficient market" was described as a share that imitates data. The 'joint hypothesis problem' was also first considered by Fama. In 1970, the book, "Predictability of Stock Market Prices", was published by Granger and Morgenstern.

When the earnings of firms are announced in public, the returns of uniform excess are divulged through a survey paper written by Ball (1978). In the famous opinion of Jensen (1978),

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[8] Within the same year, 1964, Sharpe published his work on CAPM, which won him the Nobel.
[9] It was Samuelson (1965) who came up with the first official argument for "efficient markets" from the point of economics.

Efficient Market Hypothesis has the highest supporting concrete empirical proof among the other propositions. Therefore, his definition for EMH states that in accordance with the dataset of θt, the effectiveness of market depends on considering the impossibility of profiting economically based on the information set θt. With the help of rational agents, a theoretical model was developed by Robert E. Lucas for showing the irrelevance of risk aversion for a martingale property[10].

A market cannot be perfectly efficient in terms of information (Grossman and Stiglitz, 1980). Due to the expensive nature of cost, the availability of information cannot be reflected perfectly by prices. Even if it is supposed to be done, no compensation would remain for the investors who analysed and obtained by spending many resources. Therefore, leaving some incentives at the time of collecting information (security analysis) should be made mandatory by a sensible market equilibrium model[11].

Moreover, market movement is not sufficiently explained by the news (Cutler et al., 1989). Markets of stock markets are substantiated by a certain independent nature and a consistency between the efficiency, in terms of information of markets of international stocks, and result is found by Eun and Shim (1989). The specific features of the efficiency of stock markets are encompassed by Ball (1989). Guimaraes, Kingsman and Taylor revised "A Reappraisal of the Efficiency of Financial Markets" in 1989, where the sources originate from and how EMH gets challenged by it are detailed by Leroy in a survey paper titled 'Efficient capital markets and martingales' (1989). His clarification indicates that the transitional nature between martingale and market efficiency, as relates to intuitive ideas, stands far away from being straight.

The overreaction in stocks was noticed by Chopra, Lakonishok and Ritter, (1992). Foreign exchange markets and excess return generated by equity give rise to predictable components (Bekaert and Hodrick, 1992). Bernstein (1992), accounted for the shaping ideas from history in modern finance with ornamenting anecdotes. Additionally, the 'Efficient market hypothesis' (1992) is an essay which is contributed to by the "New Palgrave Dictionary of Money and Finance" by Malkiel.

Two major articles related to EMH were included in the two volumes that were edited by Lo in 1997. As lectured by Chan et al. (1998), weak form was exemplified within world equities. Additionally, the way in which economic efficiency is connected to equity efficiency was the

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[10] Considering the infinity of initial information regarding alternative state numbers, Radner (1979) through an asset trading theoretical model, brought out the generic existence of the equilibrium of rational expectations which provides each trader with information.

[11] Market efficiency is rejected by stock markets and excess volatility is also reflected through them (LeRoy and Porter, 1981).

subject of investigation in the study of Dow and Gorton (1997), and a historical account of market efficiency was briefly discussed by Dimson and Mussavian (1998). As per the conclusion of Fama (1998), in his last of three literature reviews, on the basis of anomalies, the long-term return helps market efficiency to recover the challenge.

"A Non-Random Walk Down Wall Street" (1999) was published by Lo and MacKinlay. Haugen (1999) argued for the inefficient market in the second edition of the book authored by him, where he posited the paradigm of efficient market at the edge of probable lists of situations. According to Bernstein (1999), marginal costs were exceeded by the marginal benefits that the investors gained with the trust on information as EMH was criticized by him[12].

The presuppositions on perfect arbitrage and investor rationality were doubted by Shleifer (2000) in *"Inefficient Markets: An Introduction to Behavioural Finance". A survey on finance,* as well as a paper on EMH, was published by Lo (2000) and Beechey et al. (2000), respectively. EMH was challenged by demonstrating an inability of giving a historical explanation on the basis of voluntary dividends or company earnings.

The perception of an advanced approach of anticipation was applied on EMH by Timmermann and Granger (2004). As per the observation of Malkiel (2005), the index benchmarks are not outperformed by the professional investment managers and the reflection of available information was generated by overall market prices and they also serve as evidence. Some consequences and reasons, pertaining to the random behaviour of price, were investigated by Blakey (2006) while the New York Stock Exchange was detected with rising efficiency (Tóth and Kertesz, 2006).

Wilson and Marashdeh (2007) observed instances of both inconsistency and consistency in the demonstration of the co-integration of shares in EMH over the short and long-term, respectively. The inadequacy of shares in the short-term can lead to the effectiveness of long-term shares with the elimination of arbitrage opportunities.

It is accurately shaped by the requirement of being complete in definition, implicitly hinting at the impossibility of markets being efficient along with the covert implication of the sparse truthfulness of EMH. In addition, economics can be presented as a social science which is an asymptotically true hypothesis questioning EMH and this is regarded as the most powerful hypothesis of social science.

[12] Markets that were marginally efficient had been presented by Zhang (1999).

2.2 Theoretical Background

It is not possible to cover efficient markets in their entirety in a single discussion, thus this chapter will not propagate that. This chapter aims at providing a key-hole view of each main theoretical work required to assess the efficiency of markets. First, it is necessary to fathom the Efficient Market Hypothesis prior to getting involved in detailing market efficiency. Notably, from the viewpoint of a precursor, the Efficient Market Hypothesis has already been considered as a de facto base of financial markets in the world of academia. Technically, the term 'hypothesis' gets stuck in the walls of principle or philosophy which brings forth only the ground of argument or a conclusive premise such as a supposition[13].

The consequences of the implications of efficient markets as a depending factor in wealth creation is the appropriate diffusion of capital of investment via stock market. As per Keane (1985), market efficiency directs new information to adjust with price magnitude. According to the conception, deficiency of any of these factors will lead to market participants with good prior knowledge profiting as a consequence of market failure in adopting the new information properly.

The coinage of 'Efficient Market Hypothesis' was made by Roberts (1967), who also distinguished a weak-form test from a strong-form one; Fama (1970) also further used it as the classic taxonomy[15]. The contemporary evidence and the theory of market efficiency of that time were examined by him, and he established an efficient market to be a market where prices carry out the complete reflection of available information justifying the market to be efficient (Fama, 1970, p.383). The return model assumed by Fama (1970) was:

$$P_t = E_t\,[M_{t+1}(P_{t+1} + D_{t+1})] \qquad (2.1)$$

Where;

P_t : The stock price at a time t,

P_{t+1}: The stock price at the next period,

E_t : The predictable value provided information at a time t,

M_{t+1}: The stochastic discount factor,

D_{t+1} : The dividend the stock recompenses following the period.

[13] Thus, with a willingness of keeping an open mind from our side, equity markets can be provisionally explained by the Efficient Market Hypothesis and further inspection may get a good ignition later on, leading to approval or disapproval of the supposition.

Significantly, investors assume a certainty regarding the usage of best models in order to predict future returns[14]. This begins to signify the definition of markets due to the time efficiency in local consideration of the accessible data set (Timmermann and Granger 2004).

Therefore, with a complete reflection of concurrent information available through the current prices of assets, efficiency is proved in financial markets. The graphs below outline what market efficiency implies:

Figure 2.1: Implications of Efficient Market

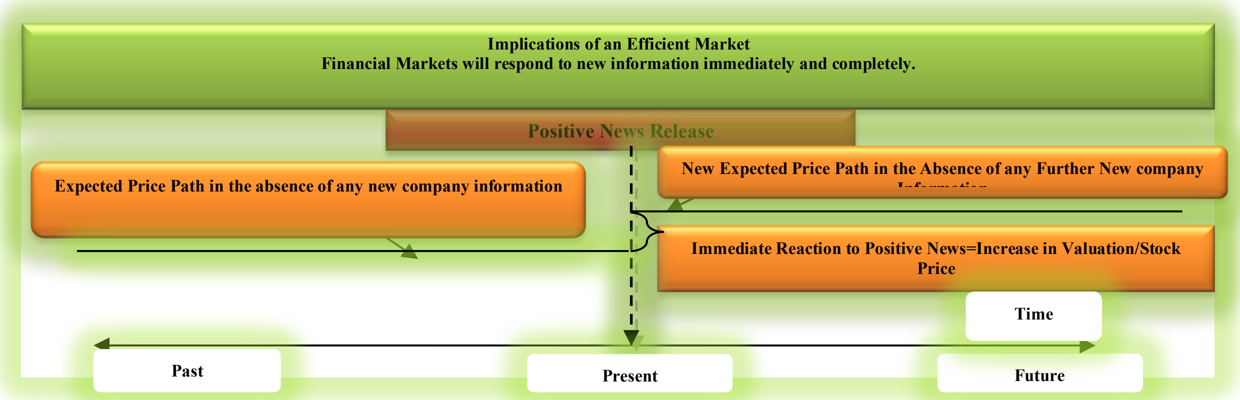


Figure 2.2: Implications of Efficient Market (Under-react)

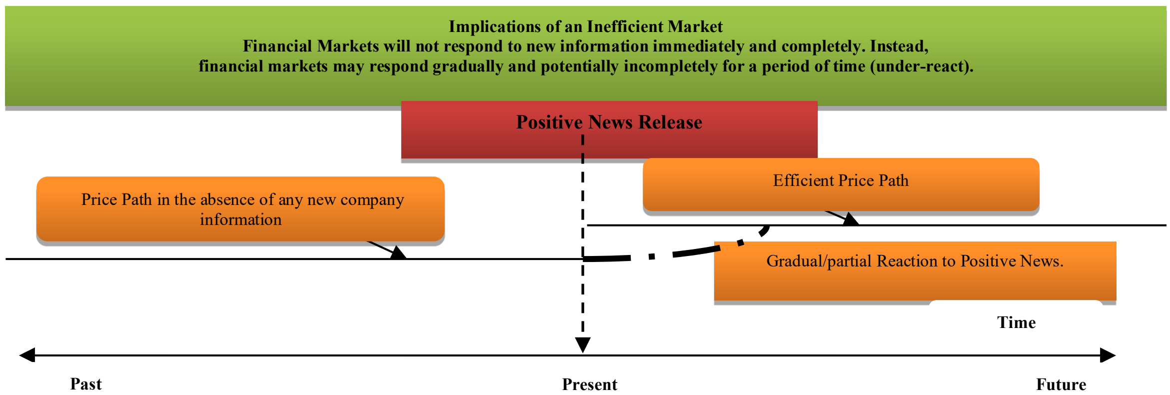
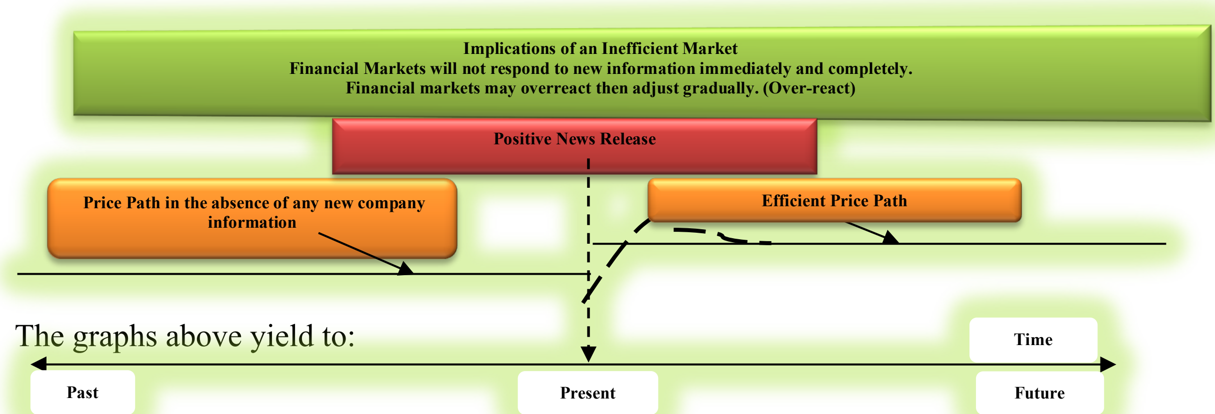


Figure 2.3: Implications of Efficient Market (Over-react)



The graphs above yield to:

[14] However, with the loosening of that assumption and the best forecasting model is not known to the investors, then the operator of mathematical expectation cannot be used in a very attractive way in the context of market efficiency

a) When any security is purchased or sold following the most current market price, then it is called a zero NPV transaction.

b) There is no systematic over-valuation or under-valuation of assets as the immediate reflection is gotten through information.

c) Securities that are sold by the firms must deserve receiving a justified price. The contemporary worth of a time of cash flow, which are expected, called fair value, combined with proper risk adjustment.

d) In case of efficient finance markets, purchasing assets cannot have any highest degree of good opportunity, and upcoming values cannot be determined by apparent patterns of previous values.

Assuming Market Efficiency: The assumptions below develop the theoretical base of the EMH (Shleifer, 2000):

1. **Rationality of investors:** Rationality is expected in EMH. It signifies that logical securities are regarded highly by them, and with the advent of new information, their faith is believed.
2. **Arbitrage**: Rationality cannot be seen in some investors, up to a certain limit these are dismissed by the rational investors with the application of arbitrage which is ineffective on prices.
3. **Collective rationality:** The market nullifies the common mistakes by investors. Rationality may not be characterised in some investors, but due to their random trade, prices do not get affected as they are dismissed by each other.
4. **Trades and costless information:** Each investor can avail information as it is ready to get and free in the market and no transactional costs are involved.

The impossibility of earning more than competitive returns by the investors retrieving the available information is fortified by these conditions. Nevertheless, there may not be an immediate consequence of inefficiency as abnormality returns are not being traced. It is ironic of efficient markets that the complete assumption of being the market efficient by the investors would make the market inefficient because non-profitability would not urge the investors to make trades or stock analysis (Grossman and Stiglitz, 1980)[15].

[15]Therefore, market participants determine market efficiency as they regard the market to be inefficient and the trading stocks as being viable for making considerable profits (Shleifer, 2000).

Valid EMH will present the stock market prices and justifiably estimate the underlying capacity of stocks, however, later on, this was contradicted by Shiller (1984). It no way inculcates the absence of price-related errors or anything wrong in them, but rather the true value is very much concerned with the price-related errors about random disturbance. Price may fluctuate from time-to-time, but a trend cannot be developed by this. In case of an unbarred EMH, returns adjusted by risk would be earned above average by the manipulation of norms of profitable investment. The development of market in the future may be badly affected by such pernicious conditions. Thus, the transformation of an investor from being naive to sophisticated and finally to being well-informed is indicated through the inefficiencies of markets[16]. The reason is that the number of individuals who maximise profits is large as they move into active competition and anticipating market values, relating individual securities and having free availability of all the useful information by themselves (Latif et al,. 2011). The graphs below illustrate the on-going discussion:

Efficiency of a market will instantly project the impact due to new events and the inefficiency of a market will make prolonged adjustments of prices as per the new information. The stock prices will, in the consideration of the foreseeable, happen well ahead of the occurrence of the incident and the inefficiency of market may allow them to immediately cope with the event (Chuvakhin, 2009).

2.3 The Current State of Efficient Market Hypothesis

The central important concept for economy is efficiency. Initially, the implication of ‘efficiency’ was to define a market with relevant information impounding the price of financial assets. Occasionally, operational efficiency is referred to by economists using this term, especially pointing at the employment of the resources for ameliorating the market operations. The previous definition relates to this review mostly, such as the informational efficiency found in financial markets (Elroy and Massoud, 1998).

A major reason for this state of EMH is that it, in itself, cannot be well defined and refuted in terms of empirical evidence[17]. The specification of an additional structure for making it operational is necessary as seen in investor structure and the preferences of investors. However, numerous auxiliary hypotheses are evaluated through the testing of EMH and very little can be known about the inconsistent part of such a rejected joint hypothesis. The inferences include

[16] The changes in prices should not be forecasted in a market with efficiency of information providing a complete reflection of information and expectations of each participant in the market. Random announcement of news justifies the random fluctuation of prices (Samuelson, 1965).

[17] Despite EMH being surrounded by advanced databases, statistical analysis and theoretical models, the principal outcome aims at creating solutions derived by the proponents of debate from each side (Blume and Durlauf, 2007, p.12)

the volatility of stock prices causing inefficient markets and risk aversion and smoothening of dividend instilling consistency in the data. Furthermore, the internally distinguishing design of fresh statistical tests will undoubtedly necessitate auxiliary hypotheses, which themselves are questionable[18].

Various new milestones of literature have been more realistically assumed for developing financial theories, such as psychological interpretations of chance-taking approaches (Thaler, 1993; Lo, 1999; Kahneman and Tversky, 1979), financial market models based on agents (Chan et al., 1998; Arthur et al., 1997), evolutionary game theory (Friedman, 1991) and explicitly applying the conditions of evolutionary psychology in finance and economics (Lo and Repin, 2002; Lo, 1999; 2002, '04, '05). Newly interpreted accounts of EMH directly attract all those emerging sub-areas differentiated in style and method substantially. Particularly, the manner in which human psychology influences the procedure of financial decisions for explicating primary diversion from rationality is focused on financial-market-related psychological models. The study of evolutionary game theory adheres to the nature of population in highly idealised competitive strategies in steady-state equilibrium and evolution. The complexity of learning behaviour with financial market dynamics, in terms of information structures, strategies and realistic markets, is to be captured by models based on agents[19].

As per the indication of several studies, with the evolving strategy population, the tendency is for markets to be shaped as efficient, but the perfect efficiency delineated in classical EMH stands further apart. Multifarious trading strategies cause fluctuation of prices timed with internal dynamics. The reflection of prices is not always necessary to be in 'true values'. Supposing the market in terms of machines having the responsibility of directing prices effectively may show machines to be substantially inefficient. The price patterns may have the tendency of disappearing because they are exploited by the agents with profitable strategies, but this type of occurrence is very rare in a prolonged period, when the appearance of new patterns and the accumulation of substantial profits may be possible.

2.4 Various Forms of Market Efficiency

An effective stock market has been additionally described by Sharpe et al. (1999) as something where all the security's value is equivalent to its investiture (e.g., "fair" or "intrinsic") price at all times. Fama (1970) suggests an exact description for an efficient market and evaluates it as

[18] Thus, according to the practical viewpoint of Grossman and Stiglitz (1980), the idealised EMH cannot be economically realised but it is considered as a benchmark for the measurement of relative efficiency (Blume and Durlauf, 2007, p.13).

[19] Rational expectations and behavioural findings are reconciled when evolutionary psychology is applied and is seeming to have inconsistency in rationality.

the site where available information is ‘fully reflected'. Regarding the phrase 'fully reflected', he speaks of an extra distinction of market effectiveness in 3 subcategories: namely strong, semi-strong and weak form market efficiency (This classification originates from Roberts (1967)[20]). The three types of stock efficiency are stated below:

2.4.1 Weak-Form Market Efficiency

The assertion of the effectiveness of weak-form efficiency entails that the projection of all information via stock prices which past accounts of prices, short interest or training volume and data of market trading are able to derive. On the other hand, the market data from the past have been already contemplated through weak-form efficiency (Bodie et al., 2007). More importantly, the examination of price information from the past, solely, will not acquire higher profit for individuals.

Thus, the analysis of technical trends holds no significance by itself as movements of price from the past are used in identifying the points leading to individual stock markets or stock paths in the future (Jones, 1993). The futility of technical or trend analysis is implied in the interpretation of the hypothesis. Public availability and absence of virtual costless are found through obtaining the price data of past stocks. Those signs might have been exploited by the investors provided the chances of reliability of those signs conveying future performance.

The implication of weak-form efficiency confirms the complete reflection of all past information through the asset price in actuality. It also carries the implication of asset price moving forward in a random rhythm, signifying that the consequent changes in price do not correlate with each other averagely. Thus, weak-form efficiency asserts much consistency in the observations from the research work focusing on the hypothesis of random walk, which means prices are free to be changed from time to time (Dixon and Holmes, 1992)

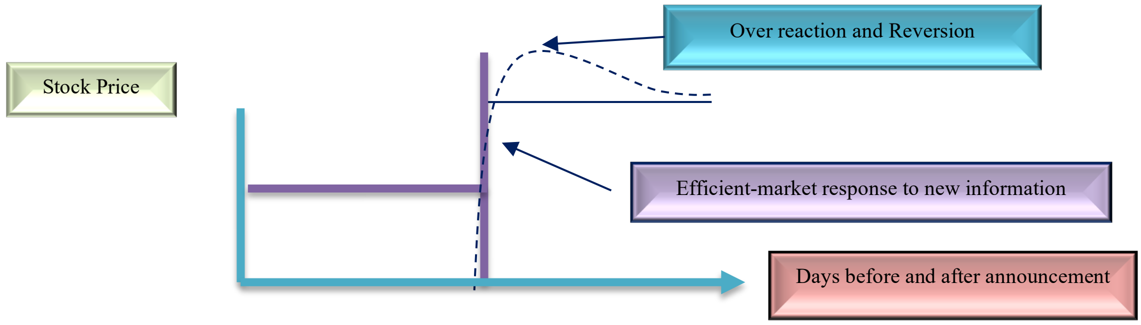
2.4.2 Semi-Strong Form Market Efficiency

An assertion of the effectiveness in semi-strong-form efficiency is that the public availability of the information on the future of firm conditions means that the stock price and fundamental analysis is unable to tag a stock as either overvalued or undervalued and that the stocks ought to respond to the new useful data immediately and without being influenced. Thus, generally accessible information about return and price, serving the development of trading rules, would not earn excess return for the investor. Such information consists of basic data regarding the

[20] Fama (1970) recognised that Roberts (1959) initially presented stages of market effectiveness and differentiated three approaches to the EMH which individually utilise different information to decide equity price (Kondak, 1997, p.36).

product line of the firm, the composition of the balance sheet, predictions of earnings, management quality, patents held and practices of accounts, apart from past prices.

Figure 2.4: The Delineation of Semi-strong Form



(Source: Gregoriou, 2011, p7)

It is obvious that "technical analysis" won't work with the semi-strong procedure for effective markets, because if a stock remains effective within the semi-strong method, it is consequently effective for weak-procedure as well, because the previous values are openly accessible (Bodie et al., 2007)[21].

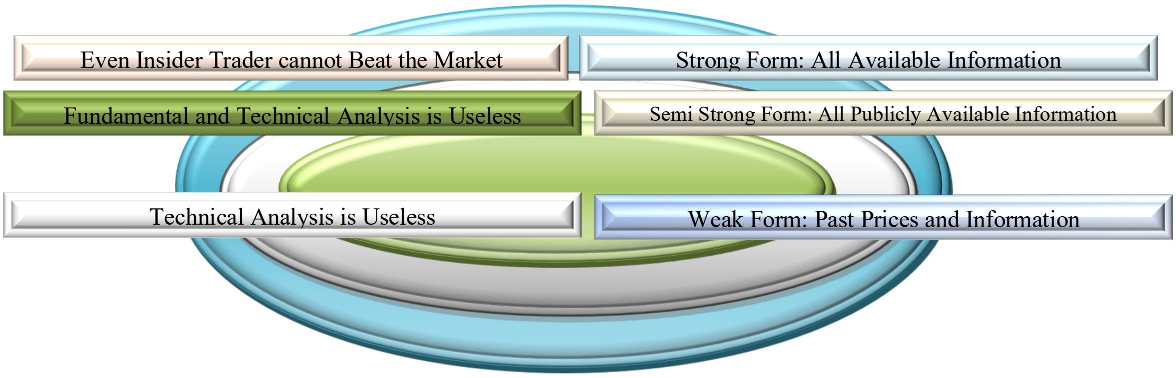
2.4.3 Strong-Form Market Efficiency

Strong-form efficiency goes beyond the semi-strong form to state that equities imitate all data related to the company, inclusive of data accessible merely to firm internals. By no means can a stakeholder earn extra dividends with some data, whether it is privately or publicly accessible info. Strong method competence denotes that data is wholly imitated in real asset value. It suggests that business insiders can't gain extra revenue or win against the market with internal evidence (Brealey et al.,1999)[22].

Strong approach productivity indicates that shares will have changed prior to having a chance to exchange with the information. This procedure is virtually infeasible to analyse as internal data is basically not possible to measure. Semi-strong proficiency denotes weak-form efficiency while strong-form competence infers as semi-strong and weak efficiency.

[21] The semi- strong procedure backs the idea that no knowledge lag in the delivery of open data is present (Dixon and Holmes, 1992).
[22] e.g., internal data is useless. For instance, assume we identify that our company has just completed a significant industrial finding.

Figure 2.5: Exhibits the 3 Nested Information Sets and the Type of Market Efficiency



Source: Cumulative of market efficiency and the information associated with each level. (Latif, et al., 2011, p-2).

2.5 Time Series Behaviour of Stock Market Prices

Over many years, researchers have preferred to endeavour seasonal time series and modelling trends. At the beginning of the 1920s, researchers majorly focused on seasonal adjustment and the decomposition model as seasonal time series was experimented on with decomposing. A method in order to anticipate the seasonal time series and trend was developed on the basis of weighted exponential smoothening. Estimation of the components has been generated through several ways such as approaches that are both non-parametric and parametric. The behavioural dynamics in the arrivals of visitors are allowed for being interpreted by such decomposition considering the estimation of components.

Available information in its entirety is reflected completely by the current security price in a market of efficiency; the possession of available information by the investors does not gain more than the normal returns in these conditions. There have been many studies in finance aimed at understanding security behaviour prices and market efficiency.

Determination of returns and stock prices in the form of the result from supply and demand among rational traders within competitive markets is implied by efficient markets. Security prices are adjusted to irrespective of any relevant information very quickly by the traders[23]. Various concepts have been constructed in the due course of the creation of EMH, in particular, “RWM”, the “Martingale & Sub-martingale” Model and the Fair Game Model (Yalçın, 2010, p.27-28).

[23] Therefore, profits above market cannot be yielded by the traders in a systematic way after accounting for the transactions and risk by acquiring new information (Jensen, 1978).

2.5.1 The Fair Game Model

Generally, having the property below ensures a stochastic process x_t conditioned by an information set φ_t to be a justified affair:

$E(x_{t+1}|\varphi_t) = 0$---(2.4)

An EMH model has been developed by Fama (1970) in stock market cases, which has its origin from the property of Fair Game to acquire expected returns; the equation is as follows:

$x_{j,t+1} = p_{j,t+1} - E\left(p_{j,t+1}\middle|\varphi_t\right)$--(2.5)

With

$E(x_{t+1}|\varphi_t) = E[p_{j,t+1} - \left(p_{j,t+1}\middle|\varphi_t\right)] = 0$---(2.6)

Here, according to the consideration of time $t + 1$, the excess security value j is $j, t + 1$. At time $t + 1$ the actual security price j is observed as $p_{j,t+1}$. The predictable value security, *j,* upon *t* has turned out the expected value of $E\left(p_{j,t+1}\middle|\varphi_t\right)$. This is conditioned by the information set φ_t or equivalent.

The implication of this model is the surplus security market value, *j,* timed at $t + 1$ ($x_{j,t+1}$). It differentiates expected price and actual price conditioned by an information set φ_t.

Fair-game inculcates the value of extra stock dividend as null. To put it differently, the sequences of excess market value $\{x_{j,t+1}\}$ of the equations 2.6 exemplify fair game with regards to the information sequence $\{\varphi_t\}$ (Victor, 2010).

2.5.2 Martingale and Sub-Martingale Model

Martingale Model

It is the oldest theoretically significant model in asset pricing, and was developed through Samuelson (1965) and Bachelier (1900). The postulation of this hypothesis focuses on the inability of anticipation by the dynamics of asset prices. As per the supposition of any asset returns, it has to be random, a process that is identically disturbed and independent[24].

It has been supposed that the price of assets is represented by $p_{i,t}$, timed at t, along with the available information set, φ_t, at data, t, and all asset prices from history are contained in φ_t (φ_t= { $p_{i,t}$, $p_{i,t+1}$, $p_{i,t+2}$.....}). Considering the history of the asset price, the denotation of the

[24] There will be no explanatory power holding statistical importance in predicting future prices regarding assets but being worthless (Urquhart, 2013a).

martingale hypothesis finds expected equality in prices between today and tomorrow. It means that supposing $p_{i,t}$ in terms of a stochastic variable makes $p_{i,t}$ a martingale with the fulfilment of the condition below:

$E[p_{i,t+1}|\varphi_t] = p_t$---(2.9)

Only the known things timed at t are contained in φ_t, which is a very important characteristic and all past and present asset prices are also contained in it. Thus:

$E[p_{i,t+1} - p_t|\varphi_t] = 0$---(2.10)

Bachelier developed this and named it as fair game, with the consideration that the history of the price of asset price zero is defined as the price of projected return. The information set (φ_t) must be accessible to the investors and there should be a trust factor in having the asset in terms of being fair in game; each lead and lag is not correlated with the dynamics of non-overlapping price [25].

Thus, all prices from history have been imitated within the present values of efficient market, and profiting as per the future expectations of prices is not possible by following the history of price. Efficiency of market relies on unpredictable and random changes in prices. Nevertheless, return and risk are traded off with each other in finance and in no way are risk considerations involved in the martingale hypothesis. Asset risk, termed the asset equilibrium return, is determined by CAPM and as such financial models, and derives the trade-off between expected returns and risk (Urquhart, 2013a). Nevertheless, expected return is restricted by the martingale hypothesis and risk is also not accounted for by it. Thus, it implies that rational determination of asset prices cannot be sufficed by a martingale property.

Noticeably, modern concepts on asset price regard the assumption of martingale as a potential tool (Campbell et al., 1997). In theory, after adjustment of asset returns properly in accordance with risk martingale property pauses indeed. This can be exemplified in the implication of a risk of asset that an investor should be offered with some positive return level. Therefore, the expectation over the change in asset price is positive but the returns in reality still cannot be predicted. A random walk model regarding asset price is pointed by it with which it can be checked whether risk is adjusted to returns properly or not, then adjusted returns are held by the martingale property (Urquhart, 2013a, p.12-13).

Sub-martingale model

[25] Those linear forecasts are not empowered with making predictions in price dynamics for the future based on previous values

The “Sub-martingale-model” is a “Fair -Game” model, but with an extremely tiny modification for anticipated yield being applied. The estimated revenue is contemplated to be positive, not null, in line with the Fair-Game (Victor, 2010, p.120). The modification suggests that security prices are likely to surge after a while - Simply put, yields on assets are expected to be positive because of the obvious peril of capital investment. The Sub-martingale model can arithmetically be transcribed as follows:

$$E(\frac{r_{j,t+1}}{\varphi_t}) \geq p_{j,t} \text{--}(2.11)$$

$$E\left(\frac{r_{j,t+1}}{\varphi_t}\right) = \frac{E\left(\frac{r_{j,t+1}}{\varphi_t}\right)}{p_{j,t}} \geq 0 \text{--}(2.12)$$

This model says that the probable profit order $\{r_{j,t+1}\}$ obeys a sub-martingale, provisional of the data structure $\{\varphi_t\}$, which is worthless when predicting equities, but the likely revenue, as estimated from the info φ_t, is bigger than or equivalent to null (Fama, 1970). The significant use for submartingale is a non-trade law centred solely upon dataset φ_t which may give larger likely yields compared to a plan to constantly hold and purchase bonds throughout the upcoming stage in query.

2.5.3 Random Walk Model

The random walk hypothesis implies the impossibility of getting additional returns through utilising information gleaned from the observed moment of prices. In accordance with Fama (1970), EMH is similar in that it suggests that current stock values have been indicative for available data, and thus it is impossible to utilise observed values to forecast current or upcoming shares. As per a stock market concern, share intrinsic value is consistently measured by the cash flows discounted value which will accumulate to the shareholders. If any stock markets are efficient, then current share prices must be indicative of every piece of accessible data that is pertinent for appraisals for any upcoming performances of a company[26]. Consequently, the share price of a market has to be equivalent to the inherent price.

Any kind of fresh data, that is projected to alter the future profitability of a company must be instantaneously echoed in the stock price since interruption in the dissemination of data to value would effect illogicality, because a few subcategories of info which are available in stock prices could be subjugated to predict imminent profitability. When the information arrives

[26] Hence, in an effective stock market, value deviations have to be a reply solely to fresh material (Victor, 2010, p.120- 121).

randomly, the stock price must change arbitrarily. The equation of the Random walk model can be specified as follows:

$P_{t+1} = P_t + \varepsilon_{t+1}$--(2.13)

Where;

P_{t+1}: Value of security at period $t + 1$

P_t: Value of security at period t

ε_{t+1}: Random error along with finite variance and zero average.

The calculation (2.13) specifies that the value of security at period $t + 1$ is equivalent to the security value at period t and (plus) a certain price which is contingent on the updated data (random) reaching periods t and $t + 1$. Putting it differently, the change of stock price, ε_{t+1}=P_{t+1} -P_t is autonomous of changes in price in the past.

It was argued by Fama (1970) that anticipated return or fair game's extension version is the random walk model. Unambiguously, fair game objectively states that the setting of stock equilibrium is possible to be specified with regards to estimated dividends, whereas the random walk model provides the facts of the random procedure making yields. Consequently, Fama determined that pragmatic analyses of the price behaviour of random walk are further prevailing and give more strength to the efficient market hypothesis compared to analyses of fair game. The efficient market hypothesis may further be precisely described with reference to the accessible information (φ_t) to the stock investors.

2.6 Stock Market Anomalies

A literal definition of an anomaly is a rare or odd incidence. The term anomaly denotes technological and technical situations. George and Elton defined it as an abnormality or deviance from natural order or an unprecedented condition[27]. Lots of perceived stock activities aren't cleared up by opinions on EMH. In business theory, share variations which have been inconstant alongside EMH have been named 'anomalies'. "An anomaly is a deviation from the presently accepted paradigms that is widespread to be ignored, too systematic to be dismissed as random error, and too fundamental to be accommodated by relaxing the normative system" (Tversky and Kahneman, 1986, p.252).

While applying the standard finance theory, stock irregularities signify a state in which: a behaviour of (a collection of) equities diverges from the expectations of EMH. Such occurrences, that are unexplainable using EMH, are named 'stock market anomalies'. Simply

[27] Anomaly is a word which is universal in description and covers any fundamental analysis, unforeseen and new surprise or marvel with regards to a model/hypothesis/theory (George and Elton, 2001).

put, irregularities are divisible into three simple types: (a) “Fundamental anomalies” (b) “Technical anomalies” (c) “Calendar or seasonal anomalies”.

(1) Fundamental Anomalies

Low Price: Book, price irregularities, small-cap effect, Small P/S or P/E (Price to sales and earnings) and high return yield are included in fundamental anomalies (Karz, 2010).

Table 2.1: Fundamental Anomalies

Fundamental Anomaly	Description	Author
Value anomaly	Due to false predictions of investors, value anomalies occur. They underestimate the future earnings and returns of value companies and overestimate the future returns and earnings of growth companies.	(Graham, 1962)
Low Price to Book	Stocks with a low price to book ratio generate more return than stocks having a high book to market ratio.	Fama (1991)
High Dividend Yield	Stocks with high dividend yields surpass the market and generate more return. The stock generates more return if the yield is high.	Fama and French (1988)
Low Price to Earnings (P/E)	Stocks with a low price to earnings ratio are likely to generate more returns and exceed the market. However, stocks that have high price to earnings ratios tend to drift from the index.	Goodman and Peavy (1983)
Neglected Stocks	Neglected stocks generate more returns over a period of time, while prior best performers underperform the index.	DeBondt and Thaler (1985)

Source: Latif et al. (2011, p.4)

(2) Technical Abnormalities

Numerous assessing methods are involved in technical analysis, by which future stock prices are forecasted depending on the past relevant information and prices. When weak-form efficiency is held, the reflection of past information is already carried out by prices and technical analysis becomes useless. The market cannot be overshadowed by the investors with achieving abnormal returns based on technical analysis and historical information - Some deviations regarding anomalies are stated below:

Table 2.2: Technical Abnormalities

Technical Anomaly	Description	Article
Moving Averages	It is a technique where averages of short period and long period generate stock signals of selling and purchasing. Its strategy inculcates stocks to buy when the average of long period is overlapped by short period and stocks to sell when the average of short period is overlapped by long period.	(Brock et al., 1992)
Trading Range Break	The level of support and resistance is the ground of this technique. When the prices reach the level of resistance, a buying signal is developed, which is called local maximum. Due to the investors’ desire of selling reaching a peak, the previous level is broken out by this resistance level due to the selling pressure, and it yields to a buying signal. The creation of a selling signal is caused by reaching prices at the support level, known as the minimum level of price. Therefore, the recommendation of technical analysis advice is purchasing at rise of price over the last peak and selling at dip of price below the last trough. But, the implementation of this strategy is very difficult.	(Brock et al., 1992)

Source: Latif et al. (2011, p-5)

(3) Seasonal Abnormalities Calendar

Certain time periods have a relation with calendar anomalies, meaning the daily, monthly and yearly behaviours for share values. The calendar abnormalities contain month-end outcomes, weekend-effects, turn-of-the-year-effects, and so on (Karz, 2010).

Table 2.3: Seasonal Abnormalities Calendar

Calendar Anomalies	Description	Study Conducted and Article
Weekend Effect	On Monday, the stock prices tend to drop. This reveals that the closing price of last Friday was higher than the closing price of Monday.	Smirlock and Starks (1986)
Turn-of-the-Month Effect	The last business day of the ongoing month and the first three days of the following month tend to give increased stock prices.	Agrawal and Tandon (1994)
Turn-of-the-Year Effect	The first half of January and the last week of December tend to give increased stock prices and a higher trading volume in the stock exchange.	Agrawal and Tandon (1994)
January Effect	Generating increased return of stock in comparison to the market and other classes of assets in the first two is a phenomenon to stocks of small-companies.	Keims (1983)

Source: Latif et al. (2011, p-3)

2.6.1 Value, Size and Other Regularities

The occasional studies have raised contradictions, but they were not regarded as significant until the 1980s. The implementation of ratios of earnings and price to predict stock returns was documented by Basu (1977). In a period from 1956 to 1971, a survey was conducted over 1400 firms, where low price to earning securities were noticed to outclass the counterparts of high price to earnings with a yearly increase of 7%. However, the CAPM benchmark can be challenged by the interpretation of his outcome with what he intended to imply[28].

The announcement of post-earnings is already evidenced in relation to the drifting towards earning surprise (Ball and Brown, 1968). Ball (1978) published the first paper compiling all the literature related to earning anomalies together after a decade. He put forward a summary of twenty studies in an appendix on dividends and earnings, and drew the conclusion in favour of the anomalous behaviour caused by collective evidence.

Banz (1981) published his work encompassing long-run return rates from investments in small firms after the low P/E stocks study by Basu [29]. He recorded the effect of small firms and the study pioneered many other research scopes regarding this phenomenon (Schwert, 1983); many nations have also had this corroboration (Dimson and Marsh, 1989).

[28] According to Basu (1977), market efficiency is indicated by his results as he opined that the pricing of security trading averagely, at various different earnings, seemed to be inappropriate in confronting each other and investors are enabled with opportunities of gaining abnormal returns.

[29] The monthly analysis of NYSE shares from 1931-1975 was done by Banz. Fifty of the largest stocks got overshadowed by the performance of fifty of the smallest ones with a monthly 1% point in a risk- adjusted provision (Banz, 1981).

Additionally, the hypothesis of efficient market is challenged by numerous confusing observations of returns of regularities related to size and earnings. According to studies of Loughran and Ritter (1995) and Ritter (1991), the way in which new issues perform negatively in the long-run is yet to be satisfactorily explained by a phenomenon. Ritter surveyed, over a sample size of 1526 primary offerings to the public, between 1975 and 1984 and asserted that in the course of three years, a substantial underperformance might have been evolved if these shares were invested with primary investment at the beginning of the trade day, that loss would have been conditioned by a varied range of benchmarks such as a procedure of elaborative matching by which the industry and market capitalisation of all securities was controlled.

Additionally, along with the discussion over regularities, a literature review is also included consisting of various effects such as hour-of-the-day (French, 1980 and Harris, 1986), the effect of certain days on the week (Ariel, 1987), the effect of some weeks on the month (Keim, 1983) and the effect of some months on the year (Rozeff and Kinney, 1976). There may be a consistency between specific returns of small stocks in January s and either seasonal asset pricing or market efficiencies.

Dealing with the anomalies

The normality of a study can be hindered by the powerful anomalies which must be eliminated or may be overlooked if it is short-termed (Ball, 1978)[30]. In the perception of Kuhn (1977), the finance is benefitted by the anomalies and despite their futility in resulting in something new, they prepare the ground of emerging new theories by shattering the existing infrastructure.

Kuhn (1970) suggested another significant point that is replacing the paradigm. Scientifically, the availability of a paradigm is necessary to replace the present paradigm, otherwise rejecting the existing paradigm without any option for replacement would be utterly unscientific. The existence of numerous anomalies can be found but they can only be considered if they are proven to have potential in replacing EMH or CAPM (Lakatos, 1970). Thus, the existence of evidence in favour of behavioural finance is necessary as a better option than EMH or CAPM and until this is found, the efficient market hypothesis cannot get rid of anomalies regardless of the number of detected anomalies.

2.6.2 Test of Fundamental Valuation

The response of security prices to new information is efficient as per many event studies and strong test formations. Its possibility will be retained with the undervalued or overvalued persistence of assets during a long-term period. The difficulty lies in deciding the conformity

[30] The disciplinary foundation, which explains the anomalies, is now necessary to be modified (Kleidon, 1986).

by prices for fundamental values or the appropriateness of the response by prices to the information. However, the evolution of literature has been directed in this way despite difficult testing to decide over the correctness of security price level.

In examination of varied prices of the stock market by Shiller (1981), dividend payments related to upcoming variations are unable to justify the enormous price fluctuations. He opined that for the last few decades, the measurement of the volatility of stock prices has been much hiked up, as much as 5 to 13 times more, so that real dividends related to new information for the future could not be attributed by them and the dramatic collapse of the model of efficient markets dogged the scope of fixing the collapses related to problems of price index, data errors and modified tax laws[31]. The validity of this dividend process model and the market efficiency are jointly tested by this procedure. Substantial controversy is aroused by this literature, as raised by Kleidon (1986), and a bounds test varied by second generation is evolved as demonstrated by Gilles and LeRoy (1991).

Moving on from arguments centred on survivor type, following which modifications are made in the model of Mehra and Prescott (1985) for encompassing lowly probable catastrophic events (Rietz, 1988). However, there are other models available which focus on generalised assumptions over consumers' preferences along with a re-working on empirical analysis. Research interest continues to pique by the premium puzzle of equity risk[32].

2.6.3 Test of Overreaction and Under-Reaction

Lastly, there are some tests to be conducted regarding return predictability. These are subsumed in two categories. Firstly, for the periods of a week or a month, security returns are positively auto-correlated by evidence from various studies simultaneously contradicting the previous literature of random walk. Secondly, negative serial correlation is indicated in the case of returns from longer horizons over the course of many years. However, big arbitrage opportunities are claimed to be analysing the autocorrelation over returns from a short time, the presence of abnormal returns is not clear after acknowledging the involvement of commissions, trading spreads and other costs in order to achieve this particular momentum strategy in short term.

Market efficiency could be violated in more serious ways with the constitutions of longer-term mispricing, and research work, with a minimum of two practitioners, regarding the dependencies

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[31] The same restrictions over anomalies, as noted in his previous research of bond markets, are found in this extended study on equity markets (Shiller, 1979).

[32] "The Equity Premium: A Puzzle" by Mehra and Prescott (1985) may be considered with similar applications.

of time series in returns is largely impactful (DeBondt and Thaler, 1985). Returns from longer time periods have been studied by them to identify the under-performed stocks during the periods of three or five years as well as averaging the maximum returns adjusted by the market in that very period in addition to the contrary situations.

This reversal pattern of return is explained by them as the markets' overreaction where divergence from the basic value of stock prices is noticed. Jegadeesh and Titman (1993) argued for a consistency between positive feedback trading and price behaviour in an observation of a similar phenomenon.

In a collaborative discussion by Poterba and Summers (1988), Fama and French (1988), an association was elucidated regarding stock returns from short-horizon positive serial correlation and negative correlation in longer breaks. Indicating market efficiency in their findings, Poterba and Summers (1988) asserted that the demands of investors in noise trading were conditioned with factors apart from the expected returns and the transitory components were plausibly explained over stock prices[33].

2.7 Deficiency of Efficient Market Hypothesis and Advent of Behavioural Finance

The EMH contended that the stocks in a dynamic market, including several knowledgeable and smart financiers, would be suitably rated and will expose necessary statistics. All the data that had the capacity to envisage stock efficiency is displayed in the stock price these days. Owing to the wide accessibility of public data, financiers find it almost impracticable to overcome the market thoroughly[34]. RWH and fair game helped in producing EMH. Weak, semi-strong and strong form efficiency were the types that the EMH organised effective capital markets (Fama 1965b, 1970).

EMH is classified among the most significant theories in numerous conventional business concepts. The effective market was explained as a market that supports a larger number of profits enhancing people who dynamically contend against the other in their effort to foresee future market standards of separate securities (Latif et al., 2011), while all the significant information is readily available to the financiers, according to Fama (1970). The intensity of the effectiveness of shares decides how haphazard the price is, while extremely efficient markets explain the incredibly haphazard price actions, completely random.

[33] It is controversial to be positive over the existence of those patterns of long reversion meant for mean reversion as Poterba and Summers (1988) along with DeBondt and Thaler (1985) observed the robustness of the patterns to fall short in the result of sub-period with time.

[34] There's no way for each participant investing in share exchange to understand all the significant data and to examine its purpose (Nwaolisa and Kasie, 2012, P.76).

This is because the market representatives attempt to use the accessible data to their benefit, and by rapidly consuming them, they hastily combine them in prices, which is how they terminate the ever-increasing chances of negotiation. If this procedure is performed immediately (which is only possible where the market does not maintain transaction costs), then the prices will always reveal all the accessible data. Hence the data cannot help in gaining additional revenues as the revenues have been integrated beforehand.

The efficiency market hypothesis is concerned with:

- The concept that the stock prices demonstrate the actual worth of the stocks,
- The lack of arbitrage openings inside a financial system that is influenced by reasonable revenue generating representatives, and
- The notion that the market prices always completely reveal the readily accessible data (Fama, 1970).

It is a common knowledge that since the end of the 1950's, EMH became an embraced model and has managed to become a significant part of financial and economic procedures[35]. As the financiers make efforts to enhance the revenues, and owing to the vagueness the reason evades its features in the market. This helps the concept of unreasonableness amidst the financiers to upsurge. In this particular area, numerous research studies have invoked the impact of illogical aspects, which make the resolutions of the financier seem unpredictable. Interactive business is concerned with the exploration of the intellectual choices made by the contributors and clarifying the irregularities witnessed and perceived in the market (Chaffai and Medhioub, 2014).

Critical Analysis of EMH – Behavioural Approach

Behaviour finance is a field which studies the investor's behaviour and is acquired from the psychological ideologies associated with the decision-making; clarifying the reason behind the individuals' purchasing or selling of stocks, is known as Behavioural Finance[36]. Fromlet (2001) suggested the explanation that, "behavioural finance merges the personal behaviour and market facts and consumes the information collected from the mental and financial concept". Shefrin (2001) claims that behavioural finance involves "the influence of sensibility on the financial

[35] According to Jensen (1978), this theory in the financial area, is classed as a "RW concept" and does under the title of "rational expectations concept" within the economic area.
[36] It is concerned with the behavioural intellect that contemplates the ability of the person to make decisions, and the financial market.

decisions and financial markets", while Thaler (1993) offers that "it is just unprejudiced finance"[37].

Ritter (2002) maintained that behavioural finance is dependent on two elements including '*Cognitive Psychology*' (the way the individuals contemplate) and "*limits to Arbitrage"* (arbitrage efficiency within diverse situations). "*Cognitive Psychology"* deals with the numerous components and concepts concerning the attitude of the individuals which signifies the regular mistakes that the individuals make when deliberating and making decisions about the stock choice. In this section, we will also consider the *Behavioural Theories* such as the "Prospect Theory" and the "Expected Utility Theory" (Shiller, 2001), together with the irregularities of EMH, namely "Overconfidence", "Mental Compartments" and "Over and Under Reaction" (Ritter, 2002).

The mixture of the extremely significant principle of the informational efficiency theory regarding financial markets is as follows:

Financiers are completely reasonable. They dislike hazards and only deal with the actions that show a probability of good revenue, with only meagre risk[38]. The markets can surely become more competent if the financiers maintain a sensible approach and their attitudes are linked, providing that these financiers are on the lookout for arbitrary openings.

Here, it is worth mentioning that the basics of the concept of efficient markets are not authentic. The idea that financiers are completely reasonable and are expert at treating the data in the correct way is downright impractical, and wisdom here is a hard trait to explain because the attitude of an individual is usually impulsive. The financier's wisdom surfaces when the conventional economic science still depends on the mechanical model, where the morals, absurdity, absence of knowledge and perception are not respected by the economic process. It can also be asserted that the data can be a challenge to understand, comprehending the dealings is expensive, the technology and organisations are continuously evolving, and so are the ways through which the data is collected and handled.

The conventional EMH model associated with the behaviour of the financiers has helped in acknowledging numerous faults like over-confidence (superlative faith) (Gervais and Odean, 2001). DeBondt and Thaler (1985) exposed that when they order assets according to their rents

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[37] Furthermore, Sewell (2005) asserts that behavioural finance comprises of examining the effect of sensibility on the attitude demonstrated by the financial experts towards the market.

[38] On the other hand, EMH does not maintain that all the contributors of the market are sensible.

in the previous 3 - 5 years, the assets which had a high yield in the last duration are bound to have a low revenue in the recent duration. These abnormalities are ascribed as the responses to the data. When making assumptions, the financiers depend highly on the last activities and operations of the organisations and pay little attention to the detail that this functioning can be reversed by loss aversion (which signified the ability of the individuals to evade loss and attain profits), herding and regret (the theory of the late Bell, 1982). Opponents of the EMH offer that financiers are usually unreasonable[39]. Hypothetical economic conditions are an abnormality, as the market only seems to be propelled by purchasers functioning on illogical excitement - the ones who hardly consider the fundamental worth.

Behavioural Finance - An Original Approach to Capital Markets

Current economics have recorded extraordinary development through the previous decades. Behavioural economics is a recent technique to confront stock markets, and their significant part for economic verdict procedure. Giving judgement with respect to behavioural economics is described as the method of selecting a specific investment substitute out of many. It is an action that occurs after the appropriate assessment of all the substitutes (Mathews, 2005). The reasons behind the development of behavioural finance are mentioned below:

- Admission to data and accessibility of statistics

The EMH states that capitalising markets are "data effective". Everyone has the right of entry to all the easily accessible data, which is why the investment information cannot be misused. On the other hand, the particular hypothetical paradigm has produced significant discussion regarding two ideas; accessibility and availability. Hypothetically, all the individuals have a right to the complete financing data. Comparatively, economic behaviour maintains that under specified conditions, equities are unproductive based on data (Ritter, 2003).

Accessibility to data is another failing of EMH. Normally, where an investment procedure is concerned, the statistics are accessible to just a few units of financiers or sometimes is presented to the investors ahead of being accessible to the overall populace. Consequently, the people who had the right to use this kind of data gain complete benefit from it. The procedure through which the readily accessible data is conversed should also be emphasised[40]. Considering this fact, the part played by unbiased financial papers or market experts is extremely important.

[39] In reality, people behave in a non-linear manner (Saadi et al., 2006; Lim, 2007; Lim and Brooks, 2009; Johnson et al., 2003).

[40] Basically, uniform data concerning the constantly altering investing settings is normally identified as an investing encounter that occurs between victors and failures, profits and losses (Birău, 2012).

Extraordinarily, stock evaluations have normally been a part of a high-priced marketing project for a specific organisation of financiers. In such setting, Behavioural Finance asserts that stock markets (accessibility and availability) are “informationally incompetent”.

1. Essential Scrutiny (Fundamental Analysis)

The procedures were applied to examine securities and make certain that the investment verdicts were distributed into two types: essential and practical investigation. When applying the investment procedures to gain the maximum revenue and authorised association with a business, the financiers should examine its essential constituents. The financiers usually outline an illustration of the business to add to their collections when evaluating financial information, and normally produce an association based on trust along with it (Birău, 2012). The EMH is disregarded and traded by the standard of "semi-strong structure effectiveness”[41].

2. Practical Study (Technical Analysis)

The theory of Efficient Market opposes the importance placed on predicting the course of the prices, which is done through technical examination by analysing the previous information offered by the market, and proposes that procedures concerning the investment should be related to the current data and prices. Basically, the past course that was maintained and the growth of a business or investment practice are indicated by their influence on the decisions made concerning the investment (Birău, 2012). The charts and previous market statistics should not be emphasised by the study or with the aim of gaining more revenue, but they also should not be regarded as recollections. However, the idea that “history always has a way of repeating itself and the nation maintains in a loop”, has become fervently stressed by individuals, especially the financiers.

3. Consistency of Financing (Uniformity of Investment)

The EMH requests that all the people who deal with the investment and stock market should be considered the same, as the monochrome units of financiers maintaining mutual financing qualities, approaches, techniques and opportunities. The financing attitude is not conclusively influenced by experience, gender, family or friends. Constituents like character, diverse financing principles, private information and distinctive investment stances, all play an essential role in interpreting the effective market model (Birău, 2012, p.59).

[41] The supporters of the EMH have normally produced critical arguments by engaging in questionable and unsupported disputes, which have caused the EMH to be considered as contradictory, and the concerns claim that it should be disproved.

4. Reasonable conduct (Rational Behaviour)

Efficient Market supporters suggest that the sensible people are the ones who capitalise in stock markets. As was stated earlier, they are concerned with anticipated beneficial results and gaining revenue through sensible probabilities.

Here, the particular insinuation illustrates the financiers as the well-maintained engines. The financiers, who follow the sensibility standard of financing, are contrasted against the parading stock market military troops. This reasoning is tempting, for its admired opinion concerning the stock market "irrationality"[42]. In investment procedures, sensibleness is a target, which is not attained by the investors all the time, and which on its own, produces a reasonable gain. But the financiers should never be observed as robots capitalising in war stocks.

5. Financing and sentiment (Investment and Emotion)

Financiers develop their views and manners according to their sentimental attachment. They are inspired or disheartened from their financing procedures by the happy or sad emotions, positive or negative approaches, and excess or lack of a response. The sentimental density of the individuals comprises of numerous key emotions like terror, fright, nervousness, jealousy, elation, insatiability, gratification, determination or pride. It is very much probable that all these sentiments meddle with the decisions concerned with the investment in evident amounts (Birău, 2011a). Along with prejudices, sentiments are essential in prompting sensible investing approaches.

6. Capitalising bubbles or the bubble of effective market concept (Investing bubbles or the bubble of efficient market hypothesis)

Considering that stocks are competent and that the financiers work reasonably, then the main concern is the reason that an influx of Investment entertains a normal facade and lengthier period in the stock market. The two main examples that validate the disputes and support the supremacy of Behavioural Finance over the Efficient Market Theory include the dot-com bubble, which includes the stock influx of website firms who relished in prosperous stocks just by including '.com', pin addition to the failure of the housing market (Birău, 2012). Contemplation against reasons that supported the EMH is that the contribution of realistic investors in arbitrage procedures is not competent while the variation in the stock prices is measured and damaging.

7. A simple concept (A naive hypothesis)

[42] However, it is clearly incomplete and imperfect (Roberts, 1959).

As mentioned earlier, Behavioural Finance is a corrective structure comprising of history, sociology, psychology and anthropology[43].

Regardless of being an extremely simple model, EMH was considerably favoured by financiers for a long time, since it is idealistic and accentuates the constructive consequences of decision-making linked with the investment. The possible outcomes from the viewpoint of the financiers are somewhat critical[47]. However, the decisions concerning investment are significantly assisted by numerous deliberations that are covered in BF from other principles and are beneficial in augmenting its position and determining its supremacy over conventional financial models.

Behavioural finance is a comparatively undeveloped and favourable subject of modern finance which has catalogued a great deal of success through recent years. It signifies a transformation in monetary notion. The mixture of pecuniary concept compared to other common sciences behavioural finance. This is a considerably undeveloped and capable area of contemporary finance, which has succeeded in listing notable development through the recent period.

Behavioural finance focuses on the emotional frame of investment decision-making procedure, which challenges the Efficient Markets Hypothesis (Birău, 2012, p.49)[44].

Along with the thoughts mentioned above, it should also be stated that inside the setting of Behavioural Finance, the possibilities of ruling and capitalising are immensely influenced by the prejudiced reasoning of the individuals. These prejudices cause individuals to make rational mistakes.

Lastly, Behavioural Finance appeared as an ideal which improved and rebuked the deteriorating finance concepts. It also briefly succeeded in inspiring the educational and technical consideration and was documented as a substitute against conceptual settings, in addition to succeeding in acting as the leading paradigm for capitalising.

2.8 The Adaptive Market Hypothesis (AMH)

EMH has become a very popular research topic over the last 40 years, and it stands as the famously debated hypothesis of business schools, which has had a sway on modern finance theoretically as well as in practical terms. A market is considered effective when prices imitate

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[43] Thus, compared to EMH which is deliberated as a simple and inexperienced technique, its conceptual viewpoints are much more complex.

[44] It is a fact that it is impossible to distinguish the character of the financer from the decisions he makes regarding the financing (Birău, 2012, p.49).

the accessible data to the fullest extent (Fama, 1970a). Under these circumstances, new information causes a rapid change to security prices, and all information is used constantly in order to establish equilibrium once again. In addition, gathering information is an expensive process, without any additional returns under an efficient market. Fundamental or technical analysis is unable to perform better than the straightforward approach of buying and maintaining diversified securities. Thus, EMH excludes active portfolio management (Fama, 1970b).

Even though there is considerable EMH research for developed, as well as developing, markets, there is no definite agreement as to what an efficient market is, and so discussions continue. Recently, even with the increasing amount of proof showing that stocks don't adhere to RW and are instead at least somewhat predictable, there are no other robust theories to rival EMH (Hiremath and Kumari, 2014). Behavioural finance has become involved in a different outlook for capital markets, and plays a critical part in making financial decisions. Behavioural psychology practices regarding stock market trading are key alternatives to EMH. Lo put forward the adaptive market hypothesis, which aims to reunite financial hypotheses through EMH and behavioural alternatives, using an evolutionary basis involving competition, adaptation, and natural selection, for financial activities (Oprean, 2012, p.163). Lo also posited the notion that valuable insights are able to be found through biology, and an evolutional substitute for stock effectiveness is encouraged. Additionally, Lo suggested a fresh example, where EMH is able to work together with behavioural finance harmoniously, in what is known as the Adaptive Market Hypothesis (AMH)[45].

Lo (2004) states that a large amount of behaviour prejudices existing in economics are echoed by evolutionary learning models and making alterations in line with the dynamic market environment[46]. Lo (2005) also mentions that the principles behind AMH are that people act in line with their self-interests; they make mistakes, but also learn and change accordingly, that competition encourages change and innovative thinking, that natural selection establishes current market ecology[47], and that evolution establishes market dynamics.

[45] This stands as an evolutionary concept that was built on in the future by Farmer (2002), Lo (2002), as well as Farmer and Lo (1999) until Lo eventually formalised it in 2004.
[46] The effect of these evolutionary factors for economic market and firm players establishes the effectiveness of them, with subsequent results for investments, organisations and sectors.
[47] AMH shows that complicated market dynamics including panics, crashes, bubbles and trends are prominent in natural market environments.

Despite the fact that AMH is a new concept, it has garnered interest from a variety of researchers, especially in modern academic literature. Neely et al. (2009) looked into the AMH, but from the perspective of yields on trade laws that fell, as well as the speed at which it occurs. It is specifically described that when returns drop at a gradual enough pace, then AMH is displayed. On the other hand, Lo (2005) believes that under an adaptive market, strategies can start to lose effectiveness for certain periods, before returning to their previous state of profitability, once conditions are more in line with these properties (Lo, 2005, p.25). As a result, trading rules drop off and then return to the previous profits once the environment is more conducive. Despite the fact that Neely et al. (2009) display that specific trading rules lose effectiveness, there is no proof of Lo's (2005) adaptive market.

Lim et al. (2006) looked into the progressive effectiveness of emerging and emerged nations and their equities, with the help of the combined bi-correlation test statistic. Through the rolling sample practice, it was shown that the level of market efficiency changes cyclically. Todea et al. (2009) examined the way in which effective moving average strategy behaves with regards to time periods, through linear and non-linear tests between 1997 and 2008. It was shown that the returns are not the same during the whole time, instead they have sub-times of linear and non-linear correlation within the wider timeframe. As a result, it was concluded that the level of market efficiency changes in cycles, as described by the Adaptive Market Hypothesis. Ito and Sugiyama (2009) investigated the time-variant serial correlation for S&P500 monthly yields, it was proven that the amount of market effectiveness present changes with time, with peak inefficiency seen in late-1980, and peak efficiency manifesting around 2000[48].

In addition, Alvarez et al. (2012) offer findings supporting the AMH, showing that the US market had greater efficiency between 1973 and 2003[49]. Also, Urquhart and Hudson (2013) provided evidence of diverse outcomes for Japan, the UK and the US, summarising that Adaptive Market Hypothesis offers a mostly accurate explanation of these markets. Hiremath and Kumari (2014) showed India's share alternates effective times with more inefficient periods. On the other hand, outcomes from non-linear tests clearly show that there are non-linear yields during the time series, under tapering magnitude of non-linear dependence at the most recent time frame, in line with the AMH.

[48] Furthermore, Smith (2011) showed that Estonian, Maltese, and Ukrainian shares had the least efficiency, meanwhile Polish, Hungarian, UK and Turkish stocks had the most efficiency. The 18 equities offer proof that there is a time variant characteristic to yield expectedness, and this is in line with AMH.

[49] Moreover, research by Charles et al. (2012) showed that AMH is true for foreign exchange rates in developing countries, where it is seen that periods of return predictability occur based on market conditions.

Conclusion

The researches from the 80s and 90s heavily criticised EMH, but at the same time market efficiency was supported by the majority of the researches assessed. With regards to a set of information, the efficiency of market relies on having considered the complete reflection of price on that particular set of information (Fama, 1970). The disparaged of EMH overshadows in firm assertion however, its spiritual truthfulness cannot be denied. Apart from that, the most supreme hypothesis is usually sought by science and the value of criticism is limited to the advent of an improved hypothesis replacing the flawed one for instance, AMH plus Behavioural Finance. Against the common conviction of the supporters of EMH, who believe that sentiments do not take part in the realistic policy-making procedures, behavioural finance accentuates the connection of sentimental responses with the stock proceedings, which then suggests that sentiments represent a main pillar for a hypothetical setting of EMH. Instead, AMH demonstrates that complicated market dynamics, including crashes, bubbles, panics, and trends, are prominent within natural market environments. Nonetheless, these new definitions for BF and AMH are still developing and need deeper research in order to affirm their practical applicability and/ or operational importance, as Samuelson stated. Even at this early time, the evolutionary basis can allow for numerous issues to be resolved for efficient markets and behavioural exceptions.

Chapter 3-An Overview of the London Stock Market (LSE) and Dhaka Stock Market (DSE)

3.1 Microstructure of Bangladeshi Stock Market

For any economy, whether it is developed or developing, its share market is deemed to exist as the greatest significant economic institution. It provides the assistance to various companies by helping them raise the required amount of funds from investors who are spread across their country and in other countries. It was commented by Hafer and Hein in the year 2007 that without the presence of stocks and advancement of the finance market, the evolution of business and the growth of the economy would be unimaginable. Nowadays, with the changing trends, investment in the stock market has become significantly more popular among people residing in Bangladesh when compared to investing in the other investment sectors. From the stockholders' perspective, purchasing stocks offers them more liquidity than other modes of investments as it gives them the ability to sell or buy ownership at any time without facing any kind of hassle.

In the year 2008-2009, the performance of the Bangladeshi stock market had been boosted immensely, particularly from 2004, and it had even managed to outperform all other markets in the world stock market. The year 2008-09 is known worldwide as a time of economic and global financial crisis, however, there was not much effect on the economy of Bangladesh. Its stock market did not face any major change at a higher level. Furthermore, in 2011, *The Center for Policy Dialogue (CPD)* shared that the year 2008-2009 was a very unsettling one and it was during this time that Bangladesh's economy profited a lot from the decreased prices of importable goods and removed the pressure that was surrounding the exportation of services and merchandise (Ahmed, 1992).

The successive behaviour of the country's equity occurred in the past years prior to the fall, pulling heaps of potential stakeholders towards equities to capitalise all of their tiny savings[50]. This is a major reason why a good number of fresh stockholders kept all of their small savings within the shares during the current time period. Investing their little savings in the stock market proved to be a better approach to these fresh and new investors, compared to working a job. Additionally, a few beneficial owner (BO) account holders also acted as intermediaries for their friends and relatives for investing their savings in shares.

3.1.1 Advancement of the Stock Market in Bangladesh

The advancement of shares for Bangladesh picked up long back when Pakistan had got its independence in 1947, and there existed only two capital markets in the area of then-Pakistan. But due to the migration of a huge number of non-Muslims to India from Bangladesh, both of

[50] Before the stock market had experienced such a crash, it had become a way to gather easy and quick money by investors who were new in the market.

these functional stock markets stopped after 1947. The same year, Pakistan did not have a single stock exchange. However, there arose needs to have one such institution setup in the country, which thus gave birth to KSE in 1948. Then, another stock exchange was set up in 1954 on April 28th with the alias of "East Pakistan Stock Exchange Association Limited" in then East Pakistan. On June 23, 1962, this exchange altered its designation to "East Pakistan Stock Exchange Ltd." and then to the Dacca Stock Exchange (DSE) on May 13th, 1964, which remains the name it is known by at present.

In 1976, DSE resumed its operations because of the practical approach that was followed by the Bangladeshi Government. Some of the economic measures undertaken during this approach were restoration of the Investment Corporation, increasing the limit of private investment in both the public and private area, in addition to a divestment of a good number of medium and small industries. The aim of these programs was to create a positive environment which would lead to a competent capital market, and DSE undertook the responsibility of channelling the various investment opportunities in the best suitable direction. Presently, DSE has approximately 578 listed securities along with a complete capitalisation of 4,228,945.40 Million Taka, 8 debentures (DSE, 2019a)], which comprises of 37 mutual funds securities DSE (2019c); 8 are joint venture companies and 13 are multinational companies (DSE, 2019e), 221 treasury bonds 3 corporate bonds, listed company 311 (CEIC, 2019)

Table 3.1: Performance of DSE at a Glance

Particulars	2012	2013	2014	2015	2016	2017
Listed Securities	515	529	546	559	560	569
DSE Broad Index (DSEX)						
Opening Index		4,055.91	4,266.55	4,864.96	4,629.64	5,036.05
Closing Index		4,266.55	4,864.96	4,629.64	5,036.05	6,244.52
% of change		5.19	14.03	(4.84)	8.78	**24.00**
Highest Index		4,439.60	5,334.04	4,969.73	5,036.05	6,336.88
Lowest Index		3,438.90	4,286.15	3,959.74	4,171.41	5,083.89
DSE 30 Index (DS30)						
Opening Index		1,460.30	1,466.25	1,803.06	1,750.59	1,810.91
Closing Index		1,466.25	1,803.06	1,750.59	1,810.91	2,283.23
% of change		0.41	22.97	(2.91)	3.45	**26.08**
Highest Index		1,654.22	2,002.09	1,904.76	1,810.91	2,290.35
Lowest Index		1,282.42	1,478.38	1,505.70	1,599.24	1,821.89
DSEX Shariah Index (DSES)						
Opening Index			941.28	1,150.22	1,107.12	1,191.87
Closing Index			1,150.22	1,107.12	1,191.87	1,390.67
% of change			22.20	(3.75)	7.66	16.68
Highest Index			1,248.78	1,207.92	1,191.87	1,394.26
Lowest Index			941.28	973.45	1,020.02	1,200.53
Market Capitalisation Tk. In Million						
Opening Market Cap.	2,616,730.54	2,403,555.62	2,647,790.83	3,259,246.76	3,159,757.75	3,412,441.49
Closing Market Cap.	2,403,555.62	2,647,790.83	3,259,246.76	3,159,757.75	3,412,441.49	4,228,945.40
Highest Market Cap	2,790,617.90	2,731,641.83	3,477,653.78	3,409,970.40	3,412,612.17	4,262,654.71
Lowest Market Cap	2,039,135.98	2,160,241.18	2,657,288.21	2,934,738.95	2,985,349.70	3,440,603.19
Turnover						
Total Turnover in Tk. (Million)	1,001,084.90	952,742.08	1,188,521.54	1,031,398.64	1,191,571.27	2,169,597.12
% of Change	(35.87)	(4.83)	24.75	(13.22)	15.53	82.08
Total Trading Days	238	238	238	244	241	248
Daily Average Turnover	4,206	4,003	4,994	4,227	4,944	8,748
Highest Turnover	12,884.27	12,946.16	12,885.54	10,023.39	14,781.84	21,807.94
Lowest Turnover	1,157.03	1,015.72	1,368.93	1,666.14	2,095.49	3,178.94
Volume						
Total Turnover in Volume (Million)	21,689	22,989	25,996	26,106	34,912	65,605
% of Change	27.83	5.99	13.08	0.42	33.73	87.91
Daily Average Turnover in Volume	91	97	109	107	145	265
Highest Turnover in Volume	301.38	240.93	275.12	265.05	498.04	703.43
Lowest Turnover in Volume	27.49	29.05	34.11	40.07	66.62	87.25
Market Cap. To GDP Ratio	26.27	25.51	24.13	20.88	19.73	21.6217.28
Market P/E	12.07	15.07	17.77	15.23	14.29	

Sources: DSE (2019a)

Table 3.2: The advancement of the Stock Market in Bangladesh

Year	Concise narration of the Development of the Stock Market in Bangladesh
April 28, 1954	The year when the Dhaka Stock Exchange (DSE) was initially established under the name of "East Pakistan Stock Exchange Association".
1956	Initial trading had begun at Narayangonj.
1958	The office had moved to the Narayangonj Chamber Building in Dhaka
1959	Relocated to 9F Motijheel C/A in its own building
July 23, 1962	Changed the name to East Pakistan Stock Exchange Limited.
May 13, 1964	Altered the name to Dacca Stock Exchange (DSE).
December 16, 1971	Stopped the trading activities done in DSE according to the new state policy.
August 16, 1976	Once again started trade activities with 9 companies in DSE
September 16, 1986	Started the calculation of DSE all-share price index Began the computation of all share price index of DSE
November 1, 1993	Computation of the share price index began as per the IFC designed formula in the DSE
2nd June and 10th August, 1998	The wide area network (WAN), local area network (LAN) in DSE and the wide area network (WAN) in CSE were established as a part of the screen-based state-of-the-art automated trading system.
January, 2001	Beginning of the DSE-20 index calculation within DSE
November 27, 2001	Initiating the DSE General index calculation within DSE
December 23, 2003	The commercial operations of the Central Depository Bangladesh Limited (CDBL) begins with the voucher from SEC of business commencement certificate
January 24, and 26, 2004	The DSE forms the Central Depository System (CDS) for the electronic settlement of share trading
October 18, 2008	CSE turns into a member of the OIC Member States' Stock Exchange Forum
June 12, 2012	Dhaka Stock Exchange and NASDAQ OMX sign MoU
July 15, 2014	Agreement among UPGDCL, CSE and DSE and the Agreement of Flex Trade Systems and NASDAQ OMX with DSE
March 23, 2015	Circuit Breaker Amendment in Trade
May 10, 2016	Deposited Money to Government Labour Welfare Fund by DSE
June 6, 2017	DSE has achieved full membership of the WFE
September 3, 2018	DSE received money from Chinese consortium for selling its 25% Share
September 4, 2018,	25% Share of DSE has been transferred to Chinese consortium, DSE's Strategic Partner
April 30, 2019	Inauguration of DSE SME Platform

Source: Stock Market Behavior in Bangladesh, Bureau of Business Research, University of Dhaka and different published, Ahmed (1992) and DSE, (2019b).

After the setup of the first one, the second stock exchange was set up in Chittagong in December 1995. Subsequently, the Bangladesh government formulated its own set of policies for privatisation and liberalisation, and a securities and exchange commission (SEC) was established in the country to monitor the proper functioning of both stock markets in Bangladesh[51]. To make things better, the current situation of the stock markets needs to be analysed and the hindrances to its development have to be addressed.

[51] Although the administration is trying to improve the progress of the stock markets, no considerable change has yet been noticed.

3.1.2 Structure of Bangladeshi Stock Market

Primary Market: It is through the primary market that the new share insurance of a company, Initial Public Offerings, are borne. Once the companies have received the consent from share controllers, they may distribute fresh securities.

Secondary Market: Securities which have been issued earlier, or the existing ones that are being dealt by the secondary market. Both these types of shares may be purchased or traded by this equity. Many figures of trade that are in the stock exchange arise out of aftermarket. Based on diverse exchange attributes, the stocks are separated accordingly.

- Public market: Trading here is done as per their normal charge that is recognised as lot share.
- Spot Market: The instruments are traded as per their normal value according to the corporate actions and each trade is supposed to be resolved within 24 hours.
- Block Market: By applying the method of pick-and-fill, the instruments are traded here in bulk volume.

Odd lot Market: Exchanges here were completed for a stock amount that is lesser than the share value. Here, again, trading of odd lots is done via the pick-and-fills in the market. Majorly those odd lots are traded, which are developed from the rights and bonus issues (DSE, 2019g).

3.1.3 Importance of Stock Market in the Economy

Long-term credits and share wealth solely belong to the capital markets. According to most developing countries, capital market is perceived as the foundation for growth in the near future by means of mobilising the extra stock to the discrepancy group. The effectual financial market shall act like a substitute for various further bases of finance because financial basis engages the least cost. This is the only viable solution for a nation such as Bangladesh, wherein investments are scarce, and the financial market may undoubtedly become an attractive economic basis. Equities act as a link between two aspects viz. preferred stocks and reserves through the economic units and further business entities, while common households make up in combined, construct the excess reserve entities (Ahmed, 2000a). This gives the best suited option for substituting security openings with the excess reserve entities by effectively putting in motion their savings and channelling them via securities into entirely feasible and beneficial financial venues[52].

[52] The stock market assists all investors, big or small and regardless of their methods and means of partaking in the increased wealth with the diligent help of competitive enterprises (Ahmed, 2000a).

Additionally, the stock market helps in providing a market system that further enables the convenient purchase and sale of all the listed securities, which in turn helps in ensuring cash flow (transfer of shares), and this is the sole base for the combined share enterprise method. The subsistence of equities in reality creates it so that there is probability to concurrently look after company aspirations for cash-flow stockholders and increased capital (Cauchie et al., 2004). This functioning of the stock market is somewhat of a boon for the economy, especially in difficult scenarios whenever the funding division of a nation goes through a task to optimise the advance-deposit proportion to maintainable levels, thus enabling the nation's economy to unfold new chance prospects. With the excessive disclosure of the existing economic scheme, shares may support an exceedingly substantial part, if there wasn't any stock disaster. With the two huge stock pops in 1996 and in 2010, as well as the subsequent events for Bangladesh that followed, it would be arduous for the main market to elevate a meaningful fund volume. Therefore, the critical financial pertinence of shares could be comprehended by forsaking openings. The Bangladeshi economy, with the intent of becoming a middle-income country, is bound to raise huge levels of investment, which can't be fulfilled with the current stature of the funding network[53].

While the financial market aids to alleviate investments and reserves that are crucial for financial growth, the share playground renders variousness throughout a number of possessions, which aid in minimising the danger for stockholders, ergo moderating financial cost, which by default triggers financial investment[54]. If a stock market behaves improper due to deficiency of information, investors end up facing difficulty whilst deciding on economical investments as data regarding business behaviour is snail-paced or deficient. Arising scepticism may cause investors to forego their investment from the stocks unless the doubt or suspicion is discouraging to capitalise reserves in the long-run.

Furthermore, the stockholders are not able to reap the appropriate benefits for indulging in high-risk investments in stocks, and if over-instability shakes up the stockholder's assurance, they won't put their investments at stake in stock which will eventually decrease in economic growth. The continuous readability of stock markets offers a great chance to study the ever-changing mechanism of stock earnings, such as in Bangladesh.

[53] The security market may render a pivotal part to fulfil such drastic investing requests unless the aftermarket retains its calm (Ahmed, 1990).

[54] With that being said, unsteadiness and stock effectiveness are two pertinent types that have to eventually decide what role the equities play for financial growth (CPD, 2011).

3.1.4 Development of Dhaka Stock Exchange (DSE)

There may be various reasons for the failure of capital markets in developing economies to support effective industrialisation and this can happen because of ineffective savings mobilisation and improper allocation of investments and maturity transformation, along with the presence of a running unofficial credit market, the reduction in the separation of owner-management relations, the disadvantages of informational irregularity, and the complexity of maturity transformation (Ahmed, 1998). Comprehending the stock market's functioning and evolution may be achieved by studying its relative support in resource mobilisation. With the beginning of DSE in 1976, the structure of DSE has evolved alongside the number of listed securities, which increases gradually. Therefore, with this increasing importance, it is worthwhile to examine DSE beside the aim of ascertaining its future and the trends associated therewith (Ahmed, 1990).

By opening its own capital market, since 1994, with the intent to increase the participation of foreign capital, the Bangladeshi Government has further eased out the process of conversion of its own currency into foreign currency. Investors have the permit to formulate their portfolio like domestic investors, and government-owned corporations have been undergoing the process of privatisation for the last 10 years. Ahmed (2000a) studied a few statistics and associated variables to emulate the phenomenal growth of the DSE. Basically, the government has been instrumental in orchestrating the development of stock alongside the help of various policies and programs.

All securities exchanged on the stock exchange are subjected to everyday value limits, which by default is helpful in discouraging speculative investors. The stock exchange manages all the limits regarding daily price movements and transactions by large shareholders, the Bangladeshi SEC also interposes the function through regulating DSE functioning (DSE, 2019f). This practice can cause low returns and thus delay the effect of new information on stock [55]. With the ongoing size of the market, as well as the regular accusations regarding manipulations in the market and the huge debacles of 1996 and 2010, the trust ability of the system as a whole has been under the scanner (Ali, 2012). To overcome all of this, the system has to merge the benefits of technology- efficiency, accuracy and speed - with those of human interaction, visibility and information exchangeability on the trading floor so that better market conditions with less price volatility can be ensured.

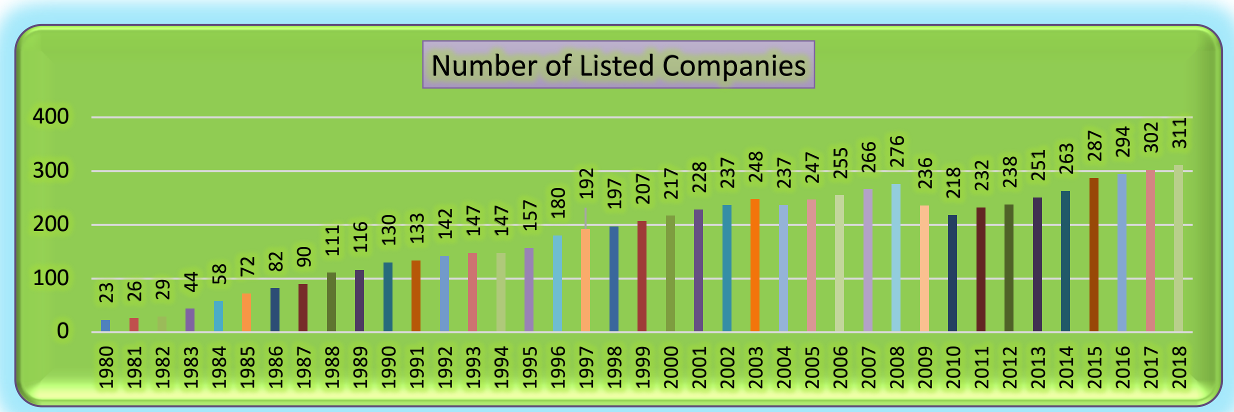
[55]However, the trading system has been entirely computerised and a Central Depository System (CDS) is already in place (Ahmed, 1990).

Figure 3.1: Number of Listed Securities (DSE)

Source: DSE Website

Activity within the market and its corresponding development can be dexterously analysed by visualising various market-oriented performance indicators. Figure: 3.1 depicts all the listed securities at DSE between 1980 and 2018. The upward inclined curve with positive slope transparently shows an improving trajectory of the listed securities over time. But the growth rate of all the listed securities is quite low within the years 1980 to 1982[56] (DSE, 2019h).

Figure 3.2: Number of Listed Companies



Source: DSE Website

Figure: 3.2 shows a bar diagram of all the listed companies between 1980 and 2016 in DSE. It is evidently conclusive from the magnitude of the bar that a gradual increase is present in the number of specified firms from 1980-2003. However, in 2004, the number of listed companies descended in a minor proportion (CPD, 2011). Nonetheless, this figure increases thereafter between 2006 and 2008, while in 2009 and 2010, the figure decreases again. In short, DSE has

[56] However, this low rate has a rising curve from 1984 and onwards. It has also been ascertained that a significant rise in the quantity of included securities took place between 2006 and 2010.

been, on average, experiencing a rising tendency with regards to the number of specified firms from 2011 up to 2018 (DSE, 2019h).

Figure: 3.3 Total Market Capitalisation in (Million Tk)

Source: DSE Website

Figure: 3.3 displays the total market capitalisation in million Taka from 1980 to 2016. The graph depicting the capital of DSE moves gradually upwards up until 2009, and reaches TK 3508005.80 in 2010. However, the capital decreased 2011, then from 2011 and onwards is a steady increase in the capital which shows an upward trend for DSE activities between 2013 and 2018 (DSE, 2019h).

3.1.5 Functions and Legal Control of DSE

DSE has important roles, such as:

- ✓ Company-Listing (According to Listing-Regulations).
- ✓ Providing automated listed trading Securities based on screen.
- ✓ Trade Settlement (As per Settlement of Transaction Regulation)
- ✓ Share gifting or approving the transfer or transaction of equity external of the exchange scheme approved by the authorities (According to Listing-Regulations 42).
- ✓ Control and management of shares.
- ✓ Market Observation
- ✓ Publishing monthly-appraisals
- ✓ Keeping an eye on the actions of listed firms (According to Listing-Regulation)
- ✓ Setting up of Grievance Cell of investors (According to Grievance laws, 1997
- ✓ Establishing Secured Deposit of Investors (According to "Investor protection fund Regulations," 1999).
- ✓ Online announcement of value sensitivity about the listed companies and other information.

(DSE, 2019i)

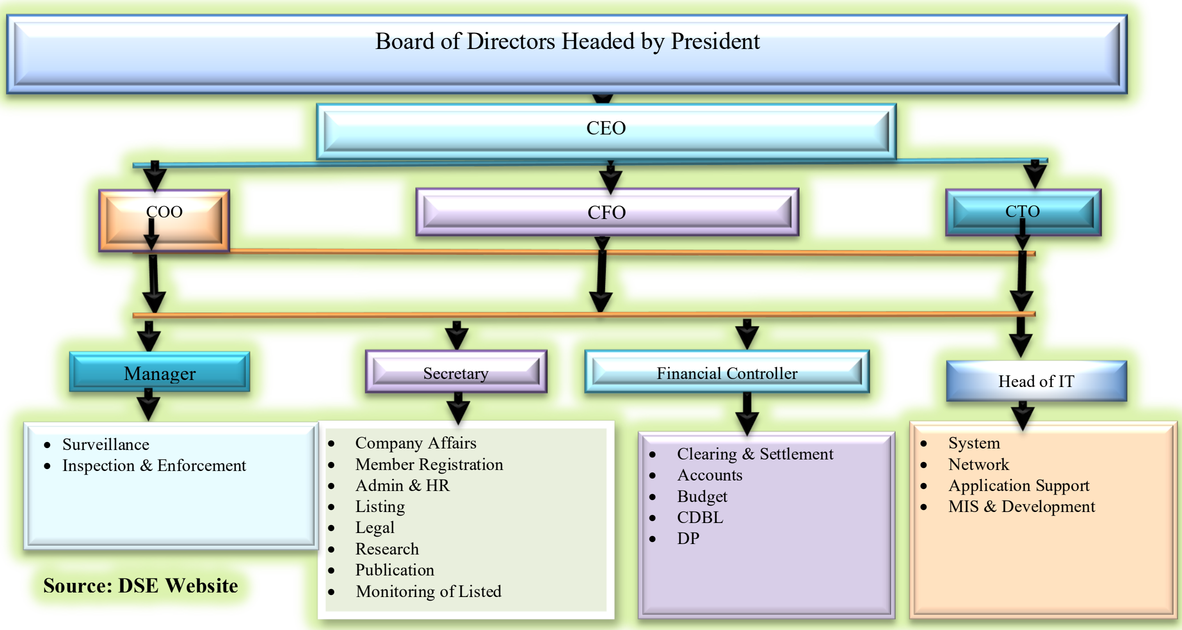
Legal Control

Registered as a "Public Limited Company", the activities of DSE have been governed by the Association Articles laws & regulations, as well as policies including the "Securities & Exchange Ordinance, 1969", "Companies Act, 1994" and the "Securities & Exchange Commission Act, 1993" (DSE, 2019f & 2019i)

3.1.6 Management Structure of DSE

The DSE management is absolutely separate from the council as per Article 105B. A management team that is comprised of highly qualified and trained professionals looks after the everyday operations; at the head of the exchange management team is the Chief Executive Officer, after the president[57]. The other members of the Board are the IT Director, Financial Controller & Secretary. The DSE management structure is presented in the organogram below (DSE, 2019j,k,l,m,n,o,p,q):

Flow Chart 3.1: Organogram of the DSE Management Structure



Source: DSE Website

3.1.7 Criteria of the Share Category in DSE

The companies have been classified into five types of categories according to the distribution of dividend and arranging of the general meeting annually (AGM). The securities that they issue are also divided into five categories (DSE, 2019r). The five categories of different companies that issue securities are briefly described below:

[57] There are policies set out by the Directorial Board, and the administrative team runs independently following those guidelines.

(i) **“A” Category Companies:** The companies that fall under this category are those which hold board conferences annually (AGM), in addition to making announcements on their returns value which is 10% per annum (Mutual funds, debentures and bonds that are traded under this head) and the other companies which have at least 10% EPS and have been newly enlisted.

(ii) **“B” Category Companies**: The companies that fall under this category hold general meetings annually (AGM) but have not declared a 10% dividend rate in a calendar year, this also includes other listed companies that are new and with less than 10% EPS.

(iii)**“G” Category Companies**: Green field companies that have been newly listed come under this heading.

(iv)“N” Category Companies: The recently registered firms that are not new businesses are included within this group and their settlement procedure is the same as that of the “B” category companies.

(v) “Z” Category Companies: The companies that come under this category are those that fail to maintain an AGM, those that haven’t declared dividends, are inoperative for a continuous six-month period, as well as those that have negative revenue, even after adjusting the losses, exceeding the paid-up capital.

(DSE, 2019r)

3.1.8 Clearing and Settlement Process of DSE:

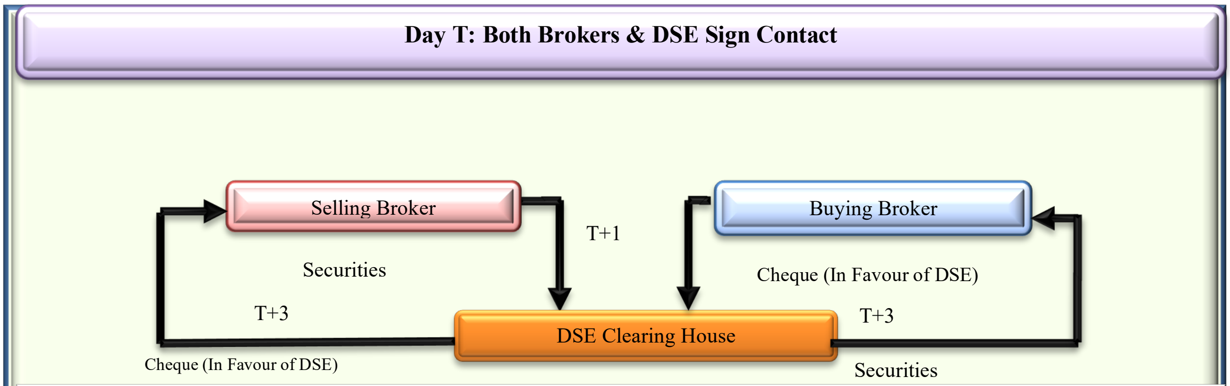
The management of trade is provided with the clearing and settlement module which informs everything right from the entry point to the trade database of Pool Settlement until it is settled, delivered and finally deleted from the Pool Settlement. There are 3 main corporate procedures: Clearing: This part is responsible for reporting about trade, affirmation, making bills and assigning instructions about settlement (DSE, 2019f).

Settlement: This part takes care of the processes that involve monitoring instruments’ delivery to the buyer, whether all payments of money have been cleared to the seller before they are removed from the trade settlement pool (DSE, 2019s).

A full image of the system of settlement for the four-hundred and twenty-seven devices are divided into five sections and four markets, as stated below:

A Group: Here the total count of instruments is 338 (150 + 8D + 22M + 158TB), where TB (Treasury Bonds), M (Mutual Funds) and D (Debentures) – exchange in Public, in block and in an “Odd-lot Market” with the aim to make deals so that they can achieve the exchange clearance competence by the investment bank of DSE on a T + 1, T + 3 base. Both "A" in addition to "DA" are pointed out in the columns of BASES for non-dematerialisation and dematerialisation devices, accordingly, for the interchange program of TESA (DSE, 2019r).

Figure 3.4: The Valid Cycle for A, B, G and N Category Instruments Traded in Public, Block and Odd-lot Market



Source: DSE Website

B Group: Here, the total count of instruments is forty-four (trade public, in block, as well as in an "Odd-lot Market”, alongside the intension to exchange achieving the “trade settlement” competence for the investment bank of DSE for the T + 1, T + 3 base). Both "B" and "DB" have been clear in the BASES columns for Non-dematerialisation and dematerialisation devices consecutively in the exchange program of TESA.

G Group: Here, the total count of tools is 0 (exchange in public, “in block” and in an “Odd-lot Market” along with the intension to exchange for achieving the “trade settlement” competence from the investment bank of DSE on a T + 1, T + 3 base). Both "G" and "DG" have been clear in the column of BASES for non-dematerialisation and dematerialisation devices, correspondingly, in the exchange program of TESA.

N Group: Here, the total count of devices is 11 (exchange in public, in block as well as in an “Odd-lot Market”, along with the intension to exchange to achieve the “trade settlement” competence from the investment bank of DSE on a T + 1, T + 3 base). Both "N" and "DN" are clear in the columns of BASES for respective non-dematerialisation and dematerialisation devices in the exchange program of TESA.

Z Group: Here, the total count of instruments is 34 (exchange in public, in block and in an "Odd-lot Market" alongside the intention to exchange for achieving the "trade settlement" competence via the investment bank of DSE on a T + 1, T + 9 base). Both "Z" and "DZ" have been clear in the columns of BASES both for non-dematerialisation and dematerialisation devices in the exchange program of TESA (DSE, 2019r).

Figure 3.5: The Valid Cycle Only for Z Group Instruments Traded in Public, Block and an Odd-lot market

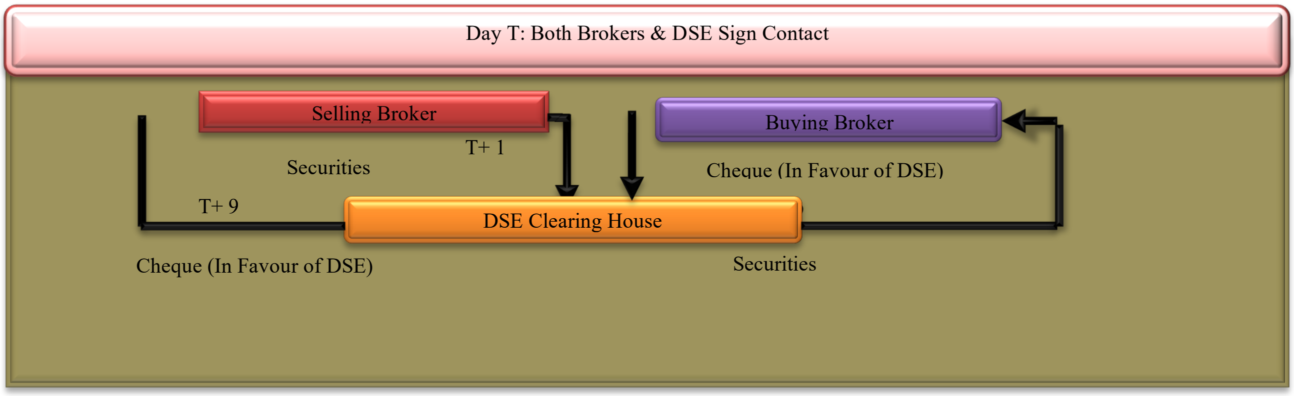


Figure 3.6: The Valid Cycle for all Groups' Instruments Traded in a Spot Market

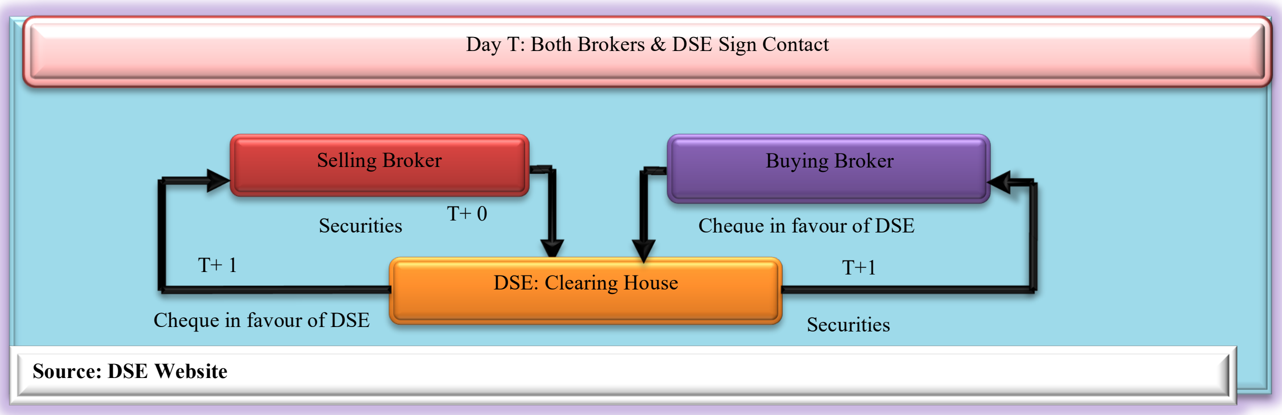
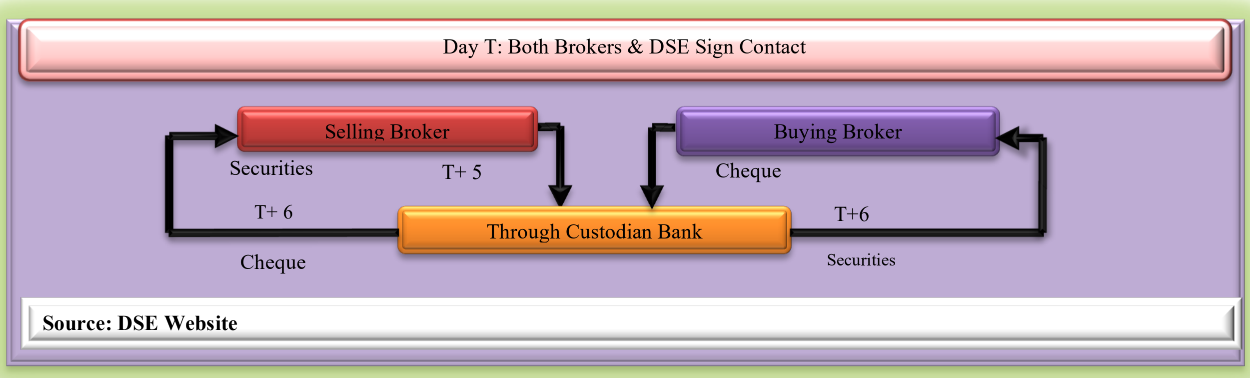


Figure 3:7: The Valid Cycle for All Group's Instruments Used in Foreign Trades



Demat Shares: All the shares that can be sold have to be transferred towards the investment bank of the agents who sell from the specific BO account in the age of settlement. The currency fee remains the same as above. (DSE, 2019r)

3.1.9 Dhaka Stock Exchange Indices

The behaviours of a state's shares are measured in relation to the stock index. The economic development of a country depends largely upon the positive behaviour of the equities. This helps to increase capital by the industrialists and entrepreneurs, as well as the government's fiscal policy and the socio- economic development of a nation. In general, there are three indices in the Dhaka Stock Market (DSE) (DSE, 2019) - A short description of each of these indices is provided below:

DSE All-Share Price Index (DSI): DSI is the common name for "DSE All-Share Indexes". It was introduced on 1st November, 1993. 350 is the base value of this index and the index has been formed and estimated with reference to all the categories of shares.

DSE General Index (DGEN): On 27th November, 1993, the DSE General index or DSE Gen was introduced with the base index being 817.62. This is a benchmark price barometer. The Z-category firms aren't within the index and a calculation is made upon price movements for the individual stocks. The nature of the index is value-weighted[62] (DSE, 2019).

DSE 20 Index (DSE20): On January 1st, 2001, the DSE 20 index was introduced which had 1000 as the base index. The aim of this index was to bring to light the activities of 20 blue chip companies belonging to different industries and those that are known for paying a high rate of dividends belonging to the "A" category companies[63]. The main criteria that have been considered in forming this separate index were:

- The minimum market capitalisation must be worth Tk. 200 million.
- A minimum of 20% of the shares should be in the hands of the public.
- A minimum of 10% dividend has to be paid for the previous 6 months.
- The rating of trading days has to be 95% in the last 6 months. (DSE, 2019)

3.2 Debacles in Bangladesh Stock Market

Bangladesh's financial market has experienced 2 huge disasters taking place from 1996-2010, leaving a few negative impacts on the country's total capital market. A brief debacle scenario that Bangladesh stock market had experienced in 1996 and 2010 is discussed below:

3.2.1 Collapse during 1996

During 1996, some domestic and international introductory offers were instrumental in alluring global notice, leading to a worldwide meeting in 1994. The meeting was succeeded by a few local and worldwide stock undermining procedures and selected hedge fund executives jumped in to invest in the domestic financial market. It was unequipped at both the operational and legal levels to counter such drastic surge in demand both locally and internationally. Eventually, within a brief period of time (Jul - Oct 1996) the stock value level surged to an all new high (of the period) with the index surging to 3627 from 894 (Shah, 2007). The market price-to-earnings proportions of the specified shares extended up to 66.5 within a quadrimestre. The exchange procedure of the Dhaka Stock Exchange couldn't manage the surplus need arising out of the myriads of stockholders that packed Motijheel. With all this chaos in place, a road-based control market preceded throughout the lawful exchange that was earlier managed through the stock market system. Inexperienced fresher investors with an intention of earning a swift income were purchasing without comprehending the legitimacy, legality and material of the investment[58]. Hence, due to all the chaos and mismanagement, the market realised its first major crash in l996 which affected around fifty thousand investors.

3.2.2 Factors Contributing to the Stock Market Crash in 1996

Various factors contributed towards DSE's crash in 1996. Several studies have been carried out to determine the factors responsible for the huge debacle. A short summary of the commonly identified factors is given below:

Foreign portfolio investors (FPIs), some guarantors and dealers of some specified businesses were the main culprits supporting stock influence in 10/1996. This resulted in increasing the "DSE All-Share Price Index" drastically from 1000 point to 3600 points in a period of half-a-year. A number of resident and overseas shareholders possessing internal data ended up with enormous profits while myriads of general investors ended up paying heavily.

Improper functioning of market regulators was the main reason for 1996's pop as concluded by Afroz (2006). Stock exchanges failed to react accordingly by not taking measures regarding the dramatic value incline for the recorded shares from 06/1996 – 11/1996. As a result, a fictitious bubble was formed because of the illogical requirement for shares by fresh stakeholders, whereas the amount of securities was quite small in comparison. The reason for this histrionic in-pouring of investors was largely due to the political stability in the country at that particular time, which brought up a lot of self- trust within the investors.

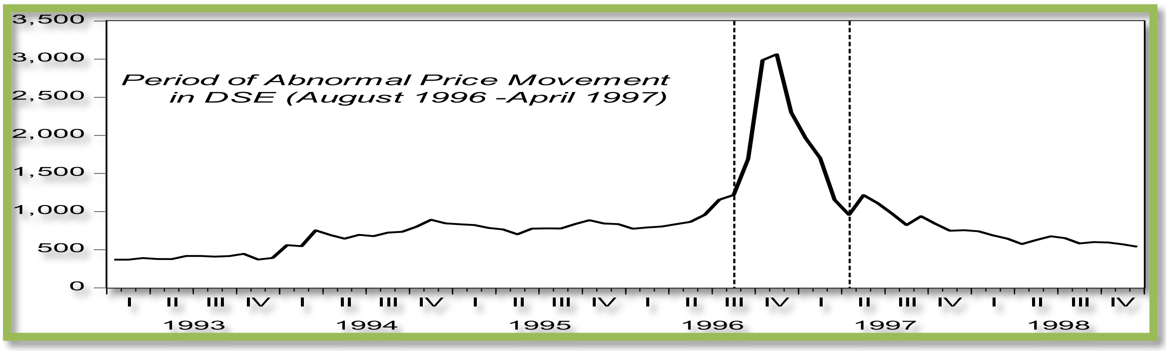
The Delivery VS Payment (DVP) scheme of exchange used a DVP mechanism which was manipulated in more ways than one. It was later concluded that there were many fake DVP

[58] Fraudulent market investors (inclusive of a few publishers) were busy making profits from the sale of invalid or false shares to the masses who were more than willing to make a fast buck using shares (Afroz, 2006).

deals in almost every case. A huge number of fake deals were carried out to fool the market and depict a rising trend of the share price of particular scripts. However, circumstantial evidence guesses the existence of made-up and unsettled DVP deals[59].

Thus, this complete process of manipulating the DVP mechanism was not only instrumental in increasing the share prices beyond proportion, but also helped the member-brokers in their plan to make money without investment.

Figure 3.8: Stock Market Crash of Dhaka Stock Exchange (DSE) in 1996



Source: DSE Website

3.2.3 Debacle during 2010

If we take a brief look at all the stock market crashes, it can be easily perceived that the "Bull Run" prior to a market pop is quite usual. It was the same with the crash of the People's Republic of Bangladesh in 2010-11. The crucial variables that pointed to the Bull Run have been previously mentioned.

<u>Root of Bubbles</u>

Owing to the disturbed governmental structure of Bangladesh, a crisis period had been established and armed forces assumed control of Bangladesh in 2007. At this time, there was a dip within the real areas of investment & FDI, though the REMIT influx was amplified. Stockholders found an attractive substitute to reinvest their reserves i.e., share market (Khaled, 2011).

In accordance with CPD (2011), the amount of BO Account owners on 20/12/2010 increased to 3.21M from 1.25M in December 2009. These freshers had insufficient knowledge of the stock market, but still ended up investing all their reserves in shares. In total, 238 brokering firms opened 590 outlets at 32[60].

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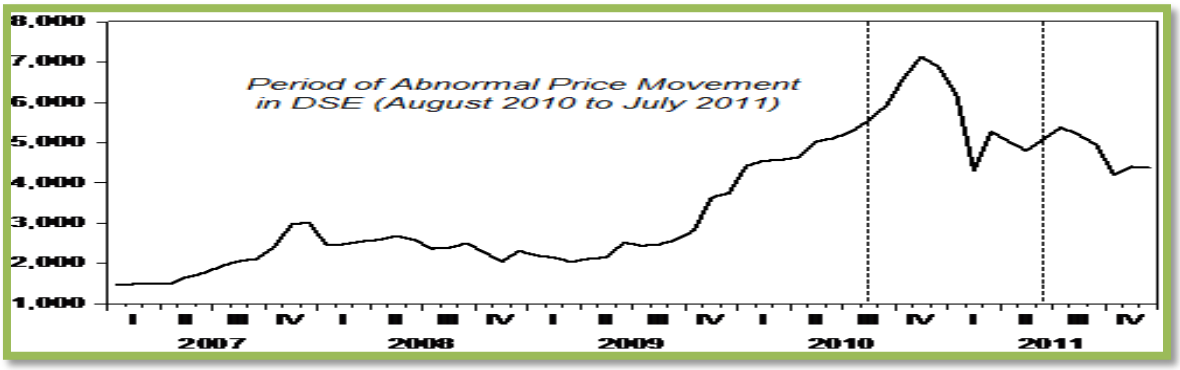
[59] The conventional practice of T+4 of DSE had not been roped in for DVP deals. It is judged that the above-mentioned practice was deliberately not followed to aid fraudulent means in favour of the DVP dealers.
[60] According to CPD (2011) website exchange procedure, beginning outlets of brokering firms throughout the nation, public access to share data, organising a nationwide "Share Mela (fair)" are variable for an increase of people who want to invest.

Figure 3.9: Stock Market Crash of Dhaka Stock Exchange (DSE) in 2010



Source: DSE Website

Banks and other financial institutions of Bangladesh were very much liquidated due to scarcity of business opportunities during 2009 and 2010. With an aim to reduce the price to bear the overflow of liquidity, economic firms, along with officials and some outsiders, got credit then invested in equities thereby resulting in a great inflow of cash. It was witnessed that mundane contracts in shares ranged from 20 to 30B BDT in 2010 and the number doubled compared to 2009 (Raisa, 2011). Policies implemented by the Bank of Bangladesh to raise the nation through surplus investments and trades finally failed which resulted in bursting the[61].

Moreover, the Security and Exchange Commissions (SEC) was ill-equipped to look after the market conditions and this resulted in a dramatic increase in the equities of "Z Group" corporations and minor businesses. Additionally, SEC policies were not effectual while initiating consistent change in directives viz. it altered the "margin loan ratio" by nineteen (Raisa, 2011).

3.2.4 Factors Contributing to the Stock Market Crash in 2010

Bangladeshi officials formulated a group of 4 participants headed by the chairperson, Mr. Khaled, to ascertain the individuals and institutions that indulged in the stock market scam in 2010. The committee deposited a report stating the grounds for the crash and suggestions with a few empirical research studies on 7/04/2011. The description targeted a hoard of exploiters which included individual brokers, investors, issuers, issue managers, auditors, key officials and some additional investors. As per the research summary of the enquiry group during 2011, the following are the causes of the share crash :

- **Responsibility of Share Regulators and Personnel:** An ineffective functioning of the Stock Exchange Commission in order to regulate the issuing of incorrect directives, working for the manipulators, accepting fraudulent proposals and capital market; these all

[61] Thereafter, the government refilled the bubble by allowing the conversion of illegal money from systems and tax relief (Rahman and Moazzem 2011).

collectively led to exaggerated stock conditions, thus damaging the appearance of the Stock Exchange Commission. The names of a few fraudulent workers for the equity controllers were also mentioned in the report, which was then engaged in stock influence. There were a few overlying jobs within the Stock Exchange Commission and Exchange, i.e., Dhaka Stock Exchange organization had the same surveillance departments but with no or minimal coordination. The report proclaims that the SEC had less people under employment, such as: researchers to regulate and supervise the market, financial analysts as well as qualified accountants.[68] Rahman and Moazzem (2011) recognised, in their research study, that DSE was heading towards extra fluctuation while controllers were not able to place a curb. Therefore, it was recommended to build up the workforce then engage qualified experts in the "Stock Exchange Commission".

- **Demutualisation of Exchanges:** There are chosen as well as designated affiliates of DSE. Hence, the selected supporters carry out the administrative work, and investors of financial markets operate as organisers. At the same time, regulators carry out immoral actions because of a tiff in interest. The inquiry stated that dissimilar investors of shares and people aid and claim for trade demutualisation. Demutualisation implies the separation of regulatory capabilities from the regulator's capabilities, authorising regulators and making verdicts deprived of influence from market investors (Afroz, 2006).

- **Financial Institutions in the Share Market:** During 2009-10, economic establishments, along with banks, capitalised a lot of reserves into equities. This led to a dramatic escalation in prices of shares, up to 10/2010. When BB bounded exceeding a 10% security of savings, with an elevated "SLR & CRR" proportion, this produced a cash disaster and the stock suffered a major downfall.

- **Serial and artificial trading:** A few manipulators made up a fictitious active trading environment amongst each other via huge transactions and accelerated share prices. Also, continuous trade plus stock deception by various orders to sell/buy via various stockbroker firms and profiles overloaded the equities (Shah, 2007).
- **Issue of Right and Preference shares:** Right issue is distributed at a discounted value to current investors. The "Stock Exchange Commission" took too long (4.5 months) to make up decisions regarding the right issue proposal. During this period, companies informed the market regarding the right share issue. This should have led to a decree in the share price, but instead increased it.

Capitalising in preference stock is normally reliable to reap a secure fraction of return.

Preference shares can also be converted and are known as *Convertible Preference Shares*. The preference shares and convertible preference shares were issued haphazardly for inappropriate time periods, and the probe committee revealed that SEC failed to possess adequate guidelines for issuing these kinds of specific shares (Shah, 2007).

- **Suspicious transactions of top players:** The probe report indicated that a few official and personal stockholders were significant vendors and purchasers throughout the exceptional decline and incline of the index at varying times. Trades associated with these stockholders were doubtful and were majorly influenced by stock, causing them to be responsible for unexpected fluctuation.
- **Block placement:** There were many dishonest block exchanges of "mutual Funds", and a few investors received phenomenal amounts of order.

- **Direct listings:** With the orders of the "Stock Exchange Commission", some firms gained access to direct listings in the stock exchange[62]. The probe report stated that suggestive values of these businesses were found to be 9 times extra of NAV and by 58 for EPS, and the SEC or exchanges never tried to ascertain the cause of the unexpected price (Afroz, 2006).

- Mr. Khondhkar Ibrahim Khaled, chairman of the investigation committee, recognized and stated all the above-mentioned factors that predominantly contributed to the stock market debacle in 2010. These factors beckon for explicit examining and suitable policy measures of the controlling authority of the stock market to prevent another disaster of such scale and magnitude (Sahu and Dhiman, 2012).

3.3 Microstructure of the London Stock Market

Market microstructure is frequently referred to as the 'investigation of trading processes associated with financial securities.' For the National Bureau of Economic Research, market microstructure is an academic discipline that is dedicated to the hypothetical, investigative, and pragmatic exploration of security markets and their economic features. It focuses on the significance of data, as it pertains to price discovery functions. It is also concerned with concepts relating to the quantification, security, and control of alternative trading methods and market frameworks. According to esteemed academic Maureen O'Hara, it is 'an examination of the methods and results produced by exchanging assets, according to a selection of clearly established guidelines and fiscal policies' (Ellis et al., 2000). Crucially, the link shared by market microstructure and related aspects of finance is not yet fully understood (Krishnamurti

[62] These companies arrive in the market with inflated share prices.

and Vishwanath 2009, p.14) and our knowledge of it could be much improved. This is the objective for financial academics, scholars, and researchers.

3.3.1 Evolution of the Stock Market in the UK

LSE has been one of the most famous financial markets in the world. At present, its accumulated market capitalisation stretches into the trillions of US dollars (Krishnamurti and Vishwanath, 2009, p.14). Unsurprisingly, businesses, scholars, and stakeholders are fascinated with how it works and why it functions so efficiently. The LSE has a record of operations that can be dated back to more than three centuries ago. This makes it one of the longest running stock exchanges on the planet. It actually began its remarkable run rather quietly, in the form of small, mostly private meetings held in the 17th century coffee houses of London[63]. It rapidly developed to become the most significant financial association in the country and, later on, in the world.

LSE is among the earth's eldest securities markets and can be traced back beyond 3 centuries. Beginning its existence in coffee, LSE swiftly developed to convert into the capital's most significant pecuniary organisation. Throughout the following centuries, LSE reliably directed the path to develop a robust, disciplined equity market and is currently at the centre of the international economic community (LSGE, 2018a).

The London Stock Exchange has a long history that has helped to build the reputation they possess today. Here are some of the milestones in the history of the London Stock Exchange

[63] The history of capital markets in the city can be traced back even further than this. In 1593, the first joint stock enterprise (named 'Muscovy') was created. It involved a total of 240 stakeholders, who each signed up for a single share of around £25 in value. The venture was associated with the funding of an expedition to open up a route to Asia (Vishwanath and Krishnamurti, 2009).

Table 3.3: Brief Description of the Development of the London Stock Market in England

Year	Brief Description of the Development of London Stock Market in England
1698	In this year, John Castaing starts to distribute details about commodity and stock prices in a document called 'The Course of the Exchange and Other Things.' It is the first known indication of controlled trading in marketable securities within the capital city. He makes his document available to the patrons at Jonathan's Coffee House. This is the beginning of big things for what will later become the London Stock Exchange.
1698	A number of stock dealers are thrown out of the Royal Exchange after they behave inappropriately. They then start to take their work into the local coffee shops, including the one where Castaing had recently distributed his document on commodity prices.
1720	A sense of anticipation and expectation, referred to as the 'South Sea Bubble', finally ruptures and breaks.
1748	Tragedy strikes after a fire breaks out and devastates the businesses located on Change Alley, including Jonathan's Coffee House. They are later reconstructed and restored.
1761	While at Jonathan's Coffee House, around 150 jobbers and stockbrokers decide to establish an organisation. The main objective is to purchase and exchange shares.
1773	These ambitious individuals later go on to construct their own headquarters. The new property features a dealing space on the bottom floor and, of course, an area for drinking coffee at the top. It is located in Sweeting's Alley. For a while, it is affectionately referred to as the 'new Jonathan's,' but it is later given a proper title, the Stock Exchange.
1801	The organisation is revamped and has a formal opening, on March 3rd, 1801. It now operates via an official membership system. This marks the emergence of the first controlled exchange in the capital city. It is the birth of the London Stock Exchange as we now know it, though it was still very different to the LSE of today.
1802	The new Exchange is relocated to another property, which is located in Chapel Court.
1812	The very first official and verified set of exchange guidelines is established.
1836	Liverpool and Manchester become the home of the first regional exchange in the country.
1845	Around this time, another wave of anticipation and financial expectation spreads across England. It is nicknamed 'Railway Fever.'
1854	The Stock Exchange is entirely revamped and reconstructed.
1876	The Stock Exchange establishes its newest Deed of Settlement.
1914	Due to the breakout of war, the Exchange is completely shut down. This lasts from late July 1914 until the start of 1915. The Stock Exchange Battalion of Royal Fusiliers is also created to help with the war effort. A total of 1,600 men sign up to fight, but 400 of these soldiers would not come home to their families.
1923	The rather apt aphorism 'Dictum Meum Pactum' is awarded to the Exchange, after it is given a personal coat of arms. The words can be translated as 'My Word is My Bond.'
1939	The beginning of WWII causes more upheaval for the Exchange. It is shut down for a period of six days and opens again on September 7th. In 1945, it would be partially shut down again after a V2 rocket hits the building. Remarkably, some trading still occurred on the bottom floor even while the city was in the midst of panic and chaos.
1972	The brand new 26 floor office block, built to expand and enhance the Exchange, is declared open by the Queen. It adds around 23,000sq ft of extra space.
1973	The eleven Irish and British regional branches are merged with the main capital exchange (the LSE). And, in 1973, the Exchange also decides to accept its first female member.
1986	The market experiences intensive deregulation. This period is often referred to as the 'Big Bang' of the London Stock Exchange. • External enterprises are now permitted to own member firms. • Every firm is given the two-fold opportunity to act as dealer and broker. • Minimum measurements for commission are removed. • Standalone members no longer have voting privileges. • Trading is no longer carried out on a one-to-one basis on the market floor. It is conducted via the use of computer technologies and over the phone (traders operate in isolated dealing environments). The new system is fast, efficient, and productive. It lays the groundwork for the contemporary stock exchange of today. • The 1985 Companies Act allows the Exchange to be listed as a private limited enterprise.
1991	Finally, the institution gets its most recognisable title and becomes the London Stock Exchange. The regulatory Council of the London Stock Exchange is shut down and a carefully selected Board of Directors is created as a viable and practical substitute. It incorporates individuals from the client, user, and executive sectors of the Exchange.
1995	AIM is established and begins to operate. It is a global market for developing and emerging enterprises.
1997	In 1997, the CREST settlement system is established. The Stock Exchange Electronic Trading Service (also known as SETS) is created too. The aim is to make trading faster and more productive.
2000	In 2000, the Financial Services Authority takes over the responsibility as the primary UK Listing Authority with HM Treasury. Following this, stakeholders have their say in what happens next. They decide to make the London Stock Exchange a public limited enterprise.
2001	Plans are made to commemorate two centuries of the Stock Exchange. During July, they list on their own Primary Market.
2003	LSC purchase Proquote Ltd, which is a contemporary generation provider of real time market trading methods and information. EDX London is also established. It is an emerging global equity derivatives enterprise and it is affiliated with the OM Group.
2004	LSC relocate to an improved base located at Paternoster Square. This new hub is in close proximity to the grand and majestic St Paul's Cathedral.
2007	In 2007, Borsa Italiana is united with the LSE (LSEG, 2015a). This creates the 'London Stock Exchange Group.'
LSE (2019g)	

Table 3.4: Historical Development of the London Stock Exchange Group in England (In Chronological Order)

The London Stock Exchange is one of the world's oldest stock exchanges and can trace its history back more than 300 years. The London Stock Exchange Group was created in October 2007 when the London Stock Exchange merged with the Milan Stock Exchange, Borsa Italiana.

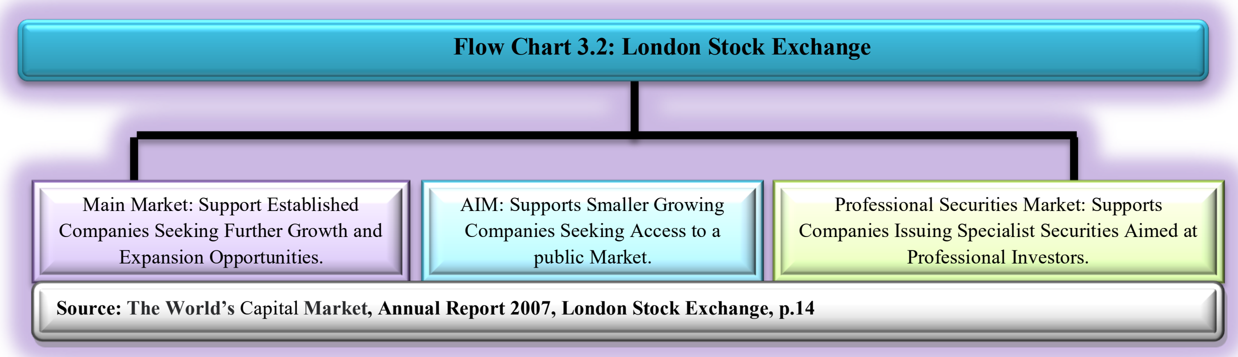
Year	*London Stock Exchange Group Timeline*
October 2007	Merging Borsa Italiana and the London Stock Exchange, created Europe's most expanded stock exchange.
December 2008	Made a great premeditated partnership with Oslo Børs, the London Stock Exchange Group comprises the facilities of its derivatives markets, fixed income and exchange services.
March 2009	Obtained the world class premier technology resolutions supplier named Millennium IT which assists the global stock market industry.
December 2009	The new platform of mainstream stake gained by the London Stock Exchange Group in Turquoise and the Pan-European stock enterprise is unveiled through banks of global investment.
November 2010	By inaugurating charity establishment, the London Stock Exchange Group takes steps in helping the communities in which it functions.
January 2011	The Monte Titoli, which is the solitary Eurozone Central Securities Depository, is approved by the European Central Bank so that it can fulfil the purpose of application of Target2-Securities.
January 2011	A new tactical partnership is contracted with the stock exchange of Mongolia.
December 2011	LSEG plc gains fifty percent of FTSE International Limited, which gives the London Stock Exchange Group a full proprietorship and total control of its strategy.
21 February 2012	An agreement is signed with the giant online company Google and gives investors opportunities to get access to real-time updated trade price data on Borsa Italiana and the London Stock Exchange.
March 2012	LSEG agrees to acquire a majority stake in LCH.Clearnet Group Limited. Agreement is made to acquire a maximum stake by the LSEG in LCH Clearnet Group Limited.
April 2012	Announcement of £529,400 raised in the first day of Charity Trading by the London Stock Exchange Group
February 2013	The UK and Italian established technology corporation named Gatelab, LSEG gained a 67% stake.
April 2013	Announcement of a conclusive treaty as a joint venture called FTSE TMX Global Debt Capital Markets by the FTSE Group and TMX Group to syndicate their Index of fixed income.
May 2013	LSEG bought LCH Clearnet's maximum stake
December 2014	The acquisition of a maximum stake of Frank Russell Company is completed by the London Stock Exchange Group.

LSEG (2019h)

3.3.2 Structure of the London Stock Market

LSE and its diverse markets have placed Great Britain at the heart of the financial environment. It helps global enterprises to make contact with what is, essentially, one of the most comprehensive accumulations of international capital on the planet. These markets work with thousands of businesses in a hundred different nations. They are just as likely to interact with emerging ventures as they are with multinational enterprises.

To decide which market is best suited to your business, you'll need to think carefully about its scale, scope, forecasts for the future, and financial requirements.



<u>Main Market</u>

The Main Market is the leading stock, particularly for the bigger enterprises with lots of trading experience. It is an EU Regulated Market, and works with many of the biggest and most recognisable enterprises on the planet. The Main Market is founded upon the principles of fairness and equal opportunity and it carries highly regarded standards of management and corporate control[64]. There are three key sectors within the Main Market, these are designed to suit a broad variety of securities and enterprises.

Premium: This sector is featured on the Official List from the FCA. It works with many of the biggest enterprises in the world. As such, it operates using the strictest principles of management and control.

Standard: This sector accepts debt securities and shares. It is governed by the EU minimum guidelines. It is also featured on the Official List.

High Growth Segment: This sector was specially created to cater to equity securities with rapid growth and revenue generating enterprises which hope, eventually, to become

[64] This has made it a shining example for the enterprises that it works with; one that many of them are motivated to emulate and follow.

Premium Listed institutions. It is still a relatively young part of the Main Market (LSE 2007 and LSEG, 2019e).

AIM

While it may be a market created for younger and developing enterprises, AIM continues to be the single most successful development market on the planet. It works with a huge variety of businesses; from the newest venture funded capital start-ups to highly regarded, older enterprises, and there is a plethora of reasons why so many businesses consider AIM to be the most nurturing and supportive environment for their future growth.

Professional Securities Market

The Professional Securities Market enables issuers to take advantage of a more practical and adaptable attitude to regulatory obligations. It is an exchange controlled market that was created to deal with listed depositary revenues and the type of loans most often associated with career investors.

Specialist Fund Market

The Specialist Fund Market is designed specifically for the issuers of specialist funds. It gives these issuers the chance to benefit from the support of an advanced and international investor framework. The main aim is to provide a particular type of investment leader with the pragmatism and variability needed to work with fixed assets.

For this reason, the Specialist Funds Market is valuable for many different kinds of investment leaders. It is a particularly good choice for those trying to monitor private equity or large-scale hedge funds (LSE 2019e). It is also useful when it comes to the management of specific types of developing and specialist property and market funds.

3.3.3 Importance of the Stock Market in the UK Economy

Due to its contribution as a source of emerging private capital, shares have long been linked to the health of the nation. Yet, economic health might actually be the driving force behind stock market development. These two contrary ideas form the basis of a hotly debated question (Mun et al., 2008, p. 86) - Should equities be utilised as a measure of upcoming economic health, or should it be the other way around?

According to Paudel (2005), the liquidity of stock markets is the very reason why they allow companies to earn essential capital at a rapid rate. This process supports the distribution of capital, development, and investment. Therefore, local stock markets certainly do share an important connection with economic health. A number of studies (Neusser and Kugler, 1998;

Benchivenga et al., 1996) have suggested that the more sophisticated shares can offer cash which reduces the price of international liquidity needed for growth. Consequently, as equity markets advance, there are greater local savings and this supports the health of the economy. However, the work of Adajaski and Biekpe (2005) discovered that this positive correlation is only substantial for nations with 'upper middle-class income economies.'

Additionally, Chandra (2002) stated that it has been shown by various researchers that approximately 30 - 35% of variations in share price may indeed be credited to certain factors that affect the whole economy.

There are a number of probable clarifications as to why share prices could be used to forecast economic health. The two most important are the so-called 'wealth impact', proposed by Wesleyan and Comincioli (1996), and the conventional valuation framework for stock prices. The 'wealth impact' theory states that fluctuations within stock prices directly contribute to shifts within the national economy, as has been seen before in Great Britain[65].

It makes sense to think that shifts within equities would have powerful impacts on the wider economic health, as well as the lives of ordinary consumers (Machlup, 1940, p. 92). Ultimately, increases within the securities market don't amount to much, for very long, unless consumers have the capacity and the incentive to spend more money. According to 2011 statistics, the London Stock Market carries a stock funding of 3.266T USD.

Generally, the connection between shares and user spending is much less explicit in Britain than it is in economies like that of the USA. Consumer purchases account for a huge proportion of British GDP. Yet, British shares are mostly owned by institutional investors (for example, retirement reserves, life protection firms and wealth management businesses). This actually widens the gap between regular consumers and activities within the stock market. The link still exists, but households experience its effects less directly, particularly when it comes to their annual combined incomes. Nevertheless, people with trusts or private pensions are still influenced; the impact is just less obvious. Furthermore, the basic trend development rate is an important contributor to quarterly GDP increases for the British economy (PWC, 2015a). Yet, shifts within unemployment figures don't necessarily offer such an obvious and unambiguous correlation.

[65] The stock markets in Great Britain have, historically, been more of an indicator of international health than the local economy (PWC, 2019a). They can even be used, to some extent, to make predictions about the US economy.

To reiterate, the British economy is certainly linked to activities within the stock market. Substantial economic booms or downturns are definitely going to have an effect (Westerhof, 2011; Blanchard and Milesi-Ferretti, 2009). Then again, the actions of the stock market also have an impact, to some degree, on investment and consumption expenditures.

3.3.4 Development of the London Stock Exchange (LSE)

LSE dates back to the 1600s, when it was first introduced (in its most basic form) at a London coffee shop. In the decades after this, it saw a tremendous amount of development and, eventually, it grew into the most important financial institution in the country. In 1801, the London Stock Exchange Group was formed, which is considered to be an international leader and its record and history are highly regarded. The LSE has built up a strong, carefully controlled stock market system that has the power to remain right at the heart of the global economy. Some of its remarkable development is illustrated below:

Figure 3.10: Earnings/Loss Per Share (Pence)

Source: Annual Reports LSEG 1999 to 2018

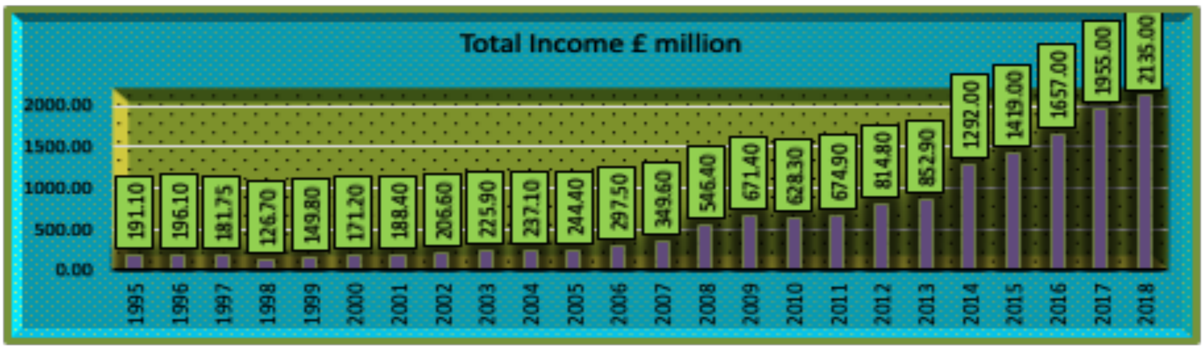
LSEG employs non-GAAP behaviour standards for the main economic pointers, since the “Committee” feels that these can more accurately portray the underlying business operation and outcomes. Adjusted operating-profit, total-income, revenue prior to tax and “basic earnings per share” do not involve repayment of bought intangibles, unrealisable losses/profits on investments and non-recurring objects. Figure 3.10 shows that the Group was able to show earnings/loss per share, which excludes amortisation of purchased unrealisable losses/profits on investments, non-recurring objects and wealth, of 114.1 pennies 2000, which is a 2% increase, including a one-time item increase of 2.4 pence through the £8.4 million release of provisions linked to Lehman’s debtors, exiting a leasehold property and the 2.2 pence increase £6.9M trade of additional wealth (2012: 193.6 pennies inclusive 63 pence linked to the one-off previous years' tax adjustment)[66]. However, (2009: negative 126.1 pence) (LSE Annual Reports, 1999 to 2018).

Figure 3.11: Operating Profit/Loss (£Million)

Source: Annual Reports LSEG from 1995 to 2018

Figure 3.11 shows that the operating profit through on-going operations increased by £0.3 million to £85.4 million in 2006, and profit before tax rose to £48.5 million, which is an increase of £74.9 million from the previous year. Operating profit, prior to exceptional items and amortisation of purchased intangibles, was seen to rise by 56%, to £265.2 million in 2008[67]. During the 11-month period a section of the Group, delivered an income of £263.0M and a "net treasury income" of £62.2 million, against "operating expenses" of £240.6M, bringing an "operating profit" of approximately £358.5 million. On the other hand, a financial downturn was evident in the 2009 fiscal year, but the operating profit gradually increased from 2010 to 2018 (LSE Annual Reports, 1995 to 2018).

Figure 3.12: Total Income (£Million)



Source: Annual Reports of LSEG from 1995 to 2018

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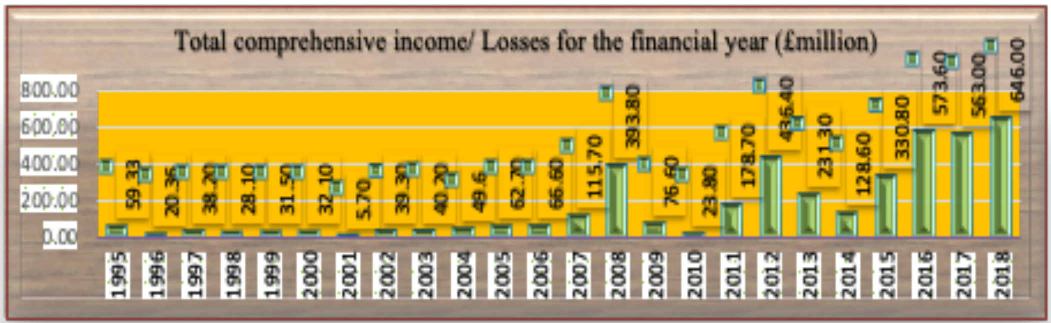
66 Earning/loss per share, prior to acquisition impairment and amortisation, and exceptional items, fell by 19%, to 60.1 pence.

67 Operating profit in 2007: £174.2 million, while operating profit increased by 1%, to £353.1 million (2013: £348.4 million).

Figure 3.12: shows that the overall income of £671.40 million (1995: £191.10 million) was an increase from 2009 levels, as a result of greater cost of sales, as well as staff costs after FTSE business growth. However, the overall income fell to £628.30 million, and this figure rose steadily between 2011 to 2016 with £1667.10 million (2011: £674.90 million), mostly because of a rise in cost of sales from ESP revenue growth, where operating profits fell (LSE Annual Reports, 1995 to 2018).

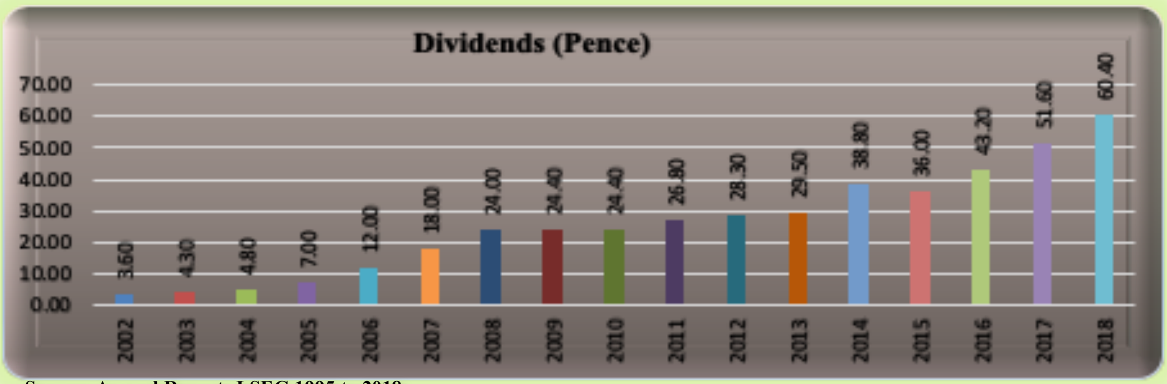
Figure 3.13: Total Comprehensive Income/Losses for the Financial Year (£Million)



Source: Annual Reports LSEG 1995 to 2018

Figure 3.13: shows that the Group re-examines specific aspects that are sensitive changes in the total comprehensive income in 2002 at the level of £39.30 (2001: £5.70 million). Whereas, the Group changed its pattern at the level of £393.80 million in 2008. However, there is a sharp decrease found in 2010 at £23.80 million due to the flash crash. Seemingly, after 2011- 2018, the Group was found to have their comprehensive income gradually reaching the stable points at £646.00 million (LSE Annual Reports, 1995 to 2018).

Figure 3.14: Dividends declared by the London Stock Exchange Group



Source: Annual Reports LSEG 1995 to 2018

Figure 3.14 demonstrates that the yearly dividend increased by 3.60 pence to 24.00 pence in 2008, which was slightly increased in 2011, at 26.80 pence. Furthermore, yields of 24.80 pence and 24.80 pence were reported from the previous two years, 2009 and 2010, respectively. In 2017, The LSE declared that it had partnered with APIR Systems, and that they had been acting as an enrolment agent in Southeast Asia and Australia to help the distribution and conservation of Legal Entity Identifiers (LEI), which encouraged the investors vastly, this resulted in a dividend of 51.60 pence. Mr David Schwimmer, a former Goldman Sachs banker, was appointed in April 2018 with his own new guidance as a chief policymaker of the London Stock Exchange Group. His new strategies have given the LSEG a new look in attracting worldwide investment. As a result, the dividend reached its highest slot of 60.40 pence (LSEG Annual Report, 2002 to 2018).

Many different types of international enterprises and a wide variety of stakeholders can work with the capital markets in Europe by interacting with the LSE markets. These markets incorporate Borsa Italiana, MTS (the primary fixed income market for Europe), Turquoise (for pan-European equities), the LSE, and a number of additional international derivatives, equity, and bond markets.

One of the most important and rapidly developing aspects of LSEG functions is hazard control and after-trade monitoring. The LSEG operates Monte Titoli (a major settlement enterprise in Europe) and CC&G (a CCP with its main office in Italy). Plus, it is currently contributing to the early phases of T2S, as well as being one of the primary owners of LCH Clearnet (a lucrative multiple asset global CCP).

With regards to real time information goods, the LSEG supplies Proquote, Sedol, Unavista, and RNS. It also provides more than 0.2M global bond asset, substitute and equity type indexes that are linked to the FTSE - the FTSE being its most internationally lucrative index supplier (LSEG, 2019c).

The LSEG are currently in the midst of establishing some very fast trading resources and capital market schemes. In fact, according to statistics released in 2014, the MillenniumIT after-trade management and trading tools used by the LSEG are already invaluable for both its interior markets and for an additional thirty exchanges and enterprises (LSEG, 2019d).

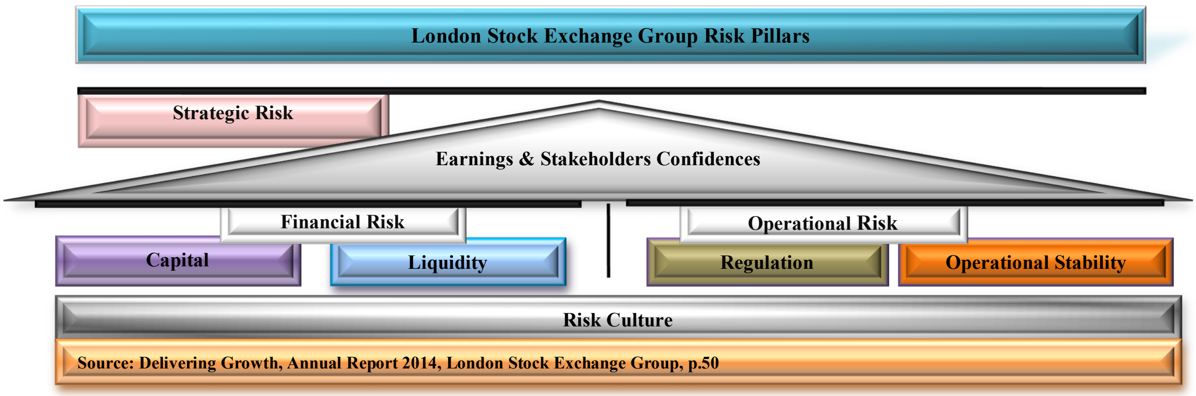
3.3.5 Functions and Legal Control of the LSE

LSEG is a specialised global stock market institution which is positioned right at the centre of the international financial environment. Its origins and birth can be dated all the way back to 1801.

Functions

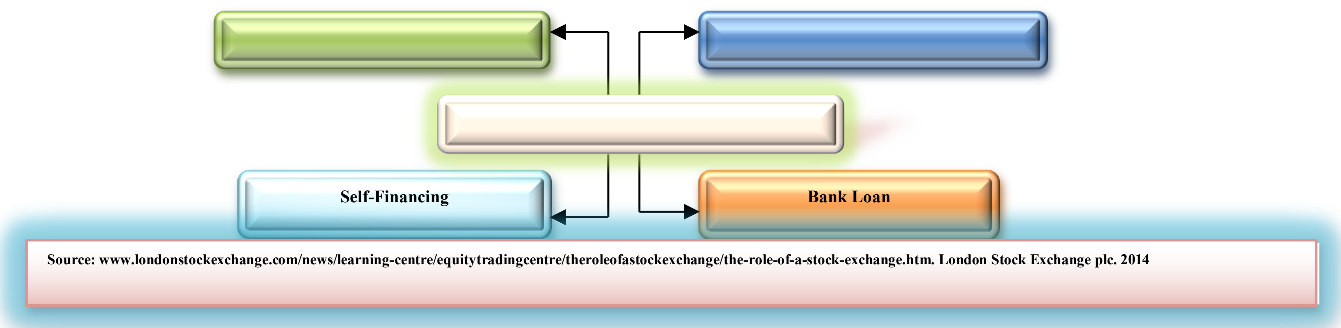
The LSEG manages a wide variety of global bond, equity, and derivatives markets. They include Turquoise (for pan-European equities), MTS (the primary fixed income market for Europe), Borsa Italiana, and the LSE. With these markets, it gives global enterprises and stakeholders the opportunity to enjoy unrestricted access to the capital markets across Europe and beyond (LSEG, 2019b).

Figure 3.15: London Stock Exchange Group Risk Pillars



Hazard monitoring and after-trade resources are a substantial and rapidly developing facet of the LSEG and its contemporary corporate processes. It runs Monte Titoli (a major settlement enterprise in Europe) and CC&G (a CCP with its main office in Italy)[68]. The relationship with Monte Toli represents a foray into the early phases of T2S involvement.

Figure 3.16: London Stock Exchange Financial Resources



The LSEG provides its clients with access to a comprehensive selection of reference data and real-time resources. They include, but are not limited to, RNS, Proquote, UnaVista, and SEDOL. The FTSE operates thousands of essential indexes. They are used to track and make

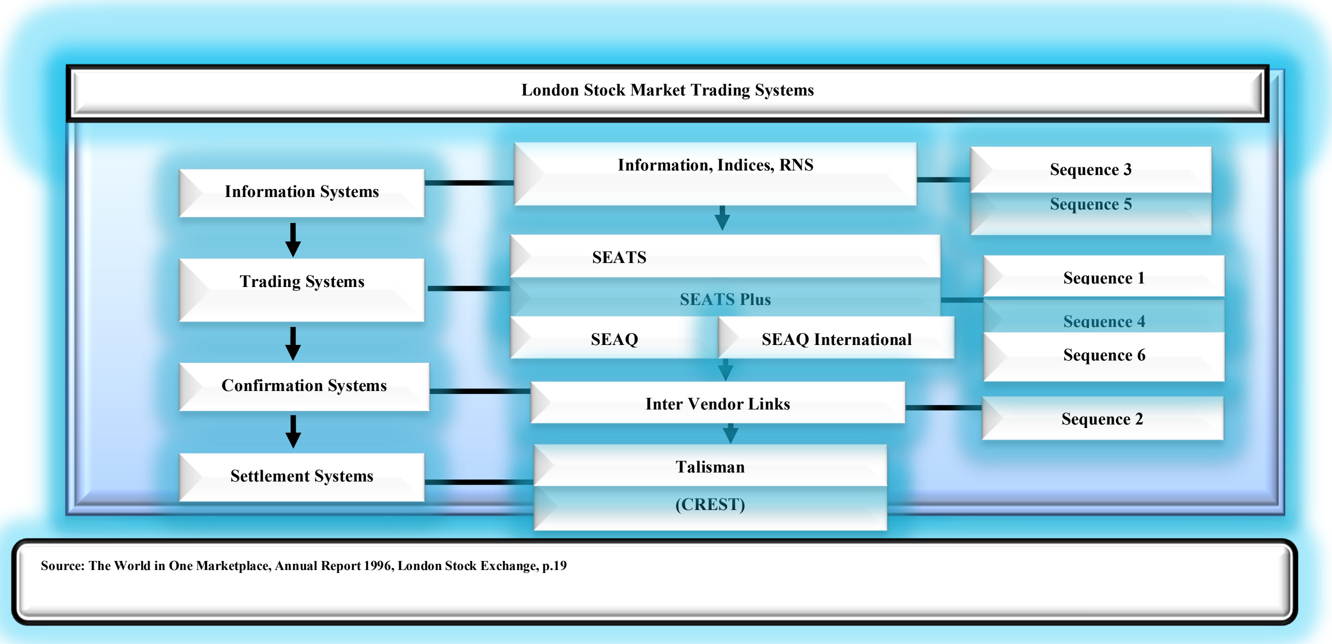
[68] Moreover, it is one of the primary owners of LCH Clearnet (a lucrative multiple asset global CCP).

valuable judgements about asset classes and markets across a variety of more than eighty nations in all four corners of the globe[69].

The LSEG also functions as a prominent support system for capital markets software and high-performance trading organisations. Alongside the markets that the LSEG personally owns and operates, a further forty exchanges and institutions, across the globe, take advantage of its MillenniumIT trading, after-trade and monitoring tools (LSEG, 2019d).

Figure 3.17: London Stock Trading System

At present, the organisation has around 2,800 registered employees. The main branch of the LSEG is located in London, Great Britain. However, it also owns and operates a number of large-scale branches in France, Italy, Thailand, and North America (LSEG 2019c).



- **Sequence One**: The first stage of the scheme turned the SEATS order market into a digital resource. For less liquid stocks, this increased the efficiency of the spread of data associated with the market.
- **Sequence Two:** The construction of Inter Vendor Links make up the second stage. This is particularly important because they established and supported cross-service access to valuable trade monitoring resources.
- **Sequence Three:** The third stage saw the implementation and application of the British Market line service. This is the main source of costing data for both information suppliers and market experts across

[69] This is an important part of helping investors and enterprises to make lucrative decisions.

Great Britain. It also established the technical foundation for a number of emerging data and trading resources.

- **Sequence Four:** The fourth stage refers to improvement of the SEATS resources designed for less liquid stocks. This was achieved by implementing digital order hitting systems. The variability of the service made it especially valuable in 1995, when it came time to accommodate the application of AIM. The all-new resource (SEATS Plus) gives details on trades, volumes, costs, and reference information.
- **Sequence Five:** The fifth stage provided new resources relating to the Regulatory News Service, UK data, and the British indexes. The initiative was introduced and managed successfully and there were no substantial disruptions. It was eventually broadened to fulfil the global publication and trade monitoring obligations later set out by the Investment Services Directive.
- **Sequence Six:** The sixth and last stage is the remaining piece of the puzzle because it is yet to be implemented. It will unveil an alternative to the SEAQ global trading resources and SEAQ. In addition, it will make it as easy to trade via an order log as it is to do so over the phone, and will also finish the implementation of digital trading resources. This is a process that started around the time of the so-called 'Big Bang,' so its completion is much anticipated across the industry.

<u>Legal Binding Process and Procedures</u>

Burden of proof

C010: The responsibility for providing evidence is solely with the Exchange. The Appeals Committee (where applicable), the Executive Panel, and the Disciplinary Committee are not permitted to consider an accusation proven until it has been entirely satisfied, according to the weight of probabilities. The same rules apply to the Exchange itself (Rules of the London Stock Exchange, 2019f, p.81)

Warning Notices

Function of Warning Notices

Fixed Penalties

Fixed penalty regime

C100: The Exchange has the power to demand a non-negotiable punitive fee from any member company that does not adhere to the guidelines. The questionable action must already be listed as a chargeable offence, by the Exchange, for a penalty to be delivered.

Appeal

C180: All member companies found in breach of the rules and expected to pay a punitive fee have the right to lodge an appeal with the Executive Panel.

C181: All appeals need to be lodged in the form of an official document and submitted to the Exchange within five days of the original delivery date of the charge. This document must include the name of the appealing firm and details of the punitive measure that is being contested. If requested, they must also offer copies of any papers that are directly related to the appeal process. If they fail to do any of these things, the appeal may be put on hold or withdrawn.

C182: Within ten days of the submission of the appeal documents, the Exchange can (if they deem it necessary) give the member company a review of the details of the incident. All relevant paperwork should be clear, comprehensive, and transparent, so that a decision can be reached quickly (Rules of the London Stock Exchange, 2019f, p.82).

Executive Panel

Role

C200: The “Executive Panel” must, because it is a part of its job as a tribunal of first instance, review and make a judgement on allegations made about a member company, with regards to a flagrant (alleged) disregard of its policies.

C201: When serving as an appellate tribunal, the Executive Panel must review the details of an appeal and make a reasoned judgement on its outcome.

C201.1 by any “member firm” beside a set punishment;

C201.2 by any appellant beside a verdict of the organisation (Rules of LSE, 2019f, p.82).

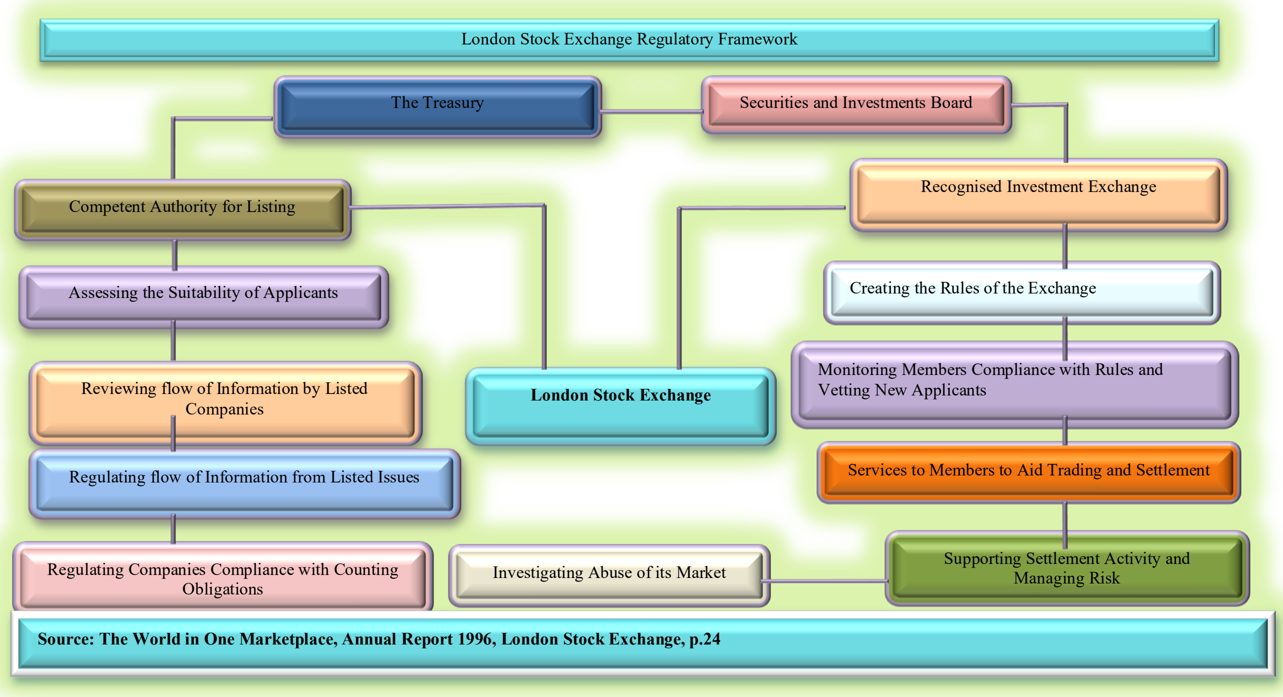
Legislative framework

The main rules that equity offerings are governed by belong to the FSMA and any statutory agents appointed by it. As such, the most important guidelines are as follows:

- Listing Policies
- Prospectus Policies
- Disclosure and Transparency Policies

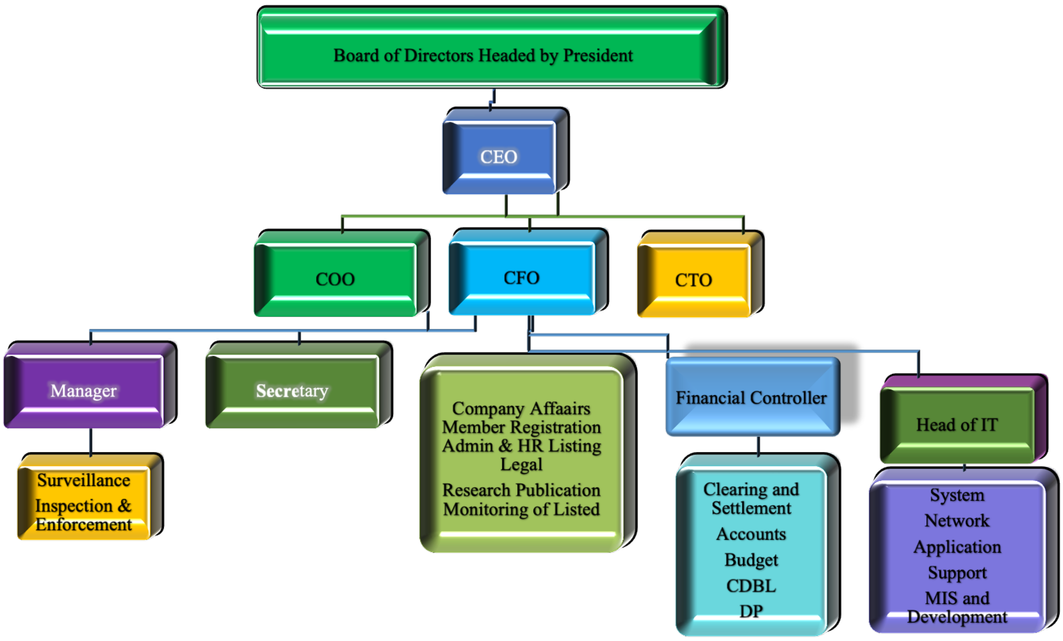
They may also be subject to the disclosure and admission policies established by the LSE. UK incorporated enterprises (Holmes and Chambers, 2015. p. 1/Q-2) obey the policies contained in the 2006 Companies Act.

Flow Chart 3.3: London Stock Exchange Regulatory Framework

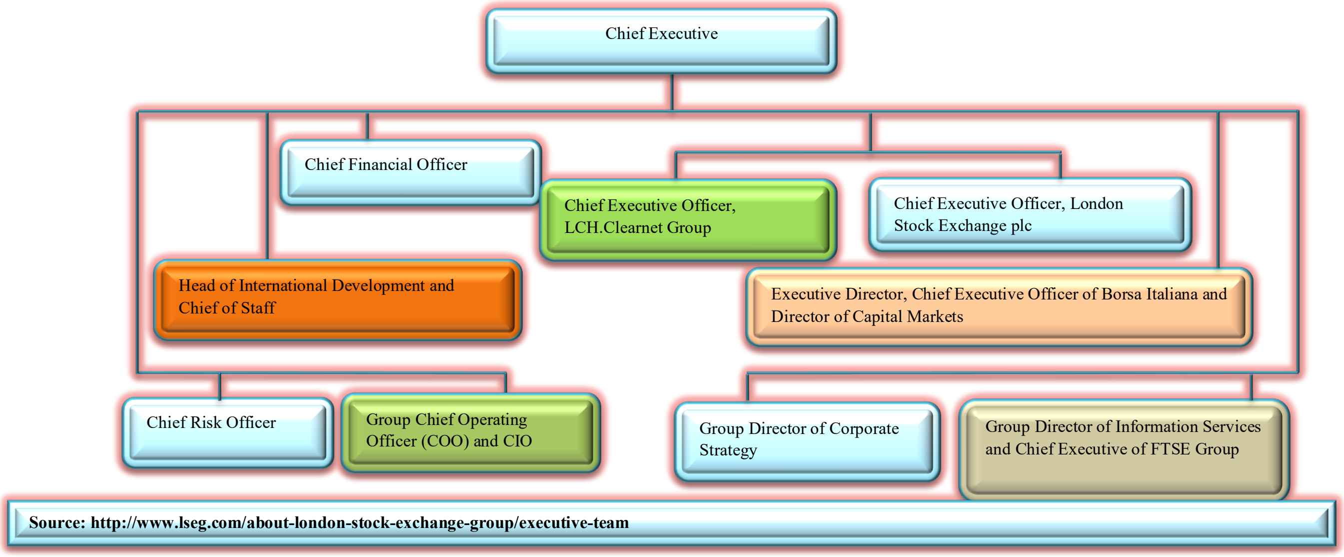


3.3.6 Management Structure of LSE

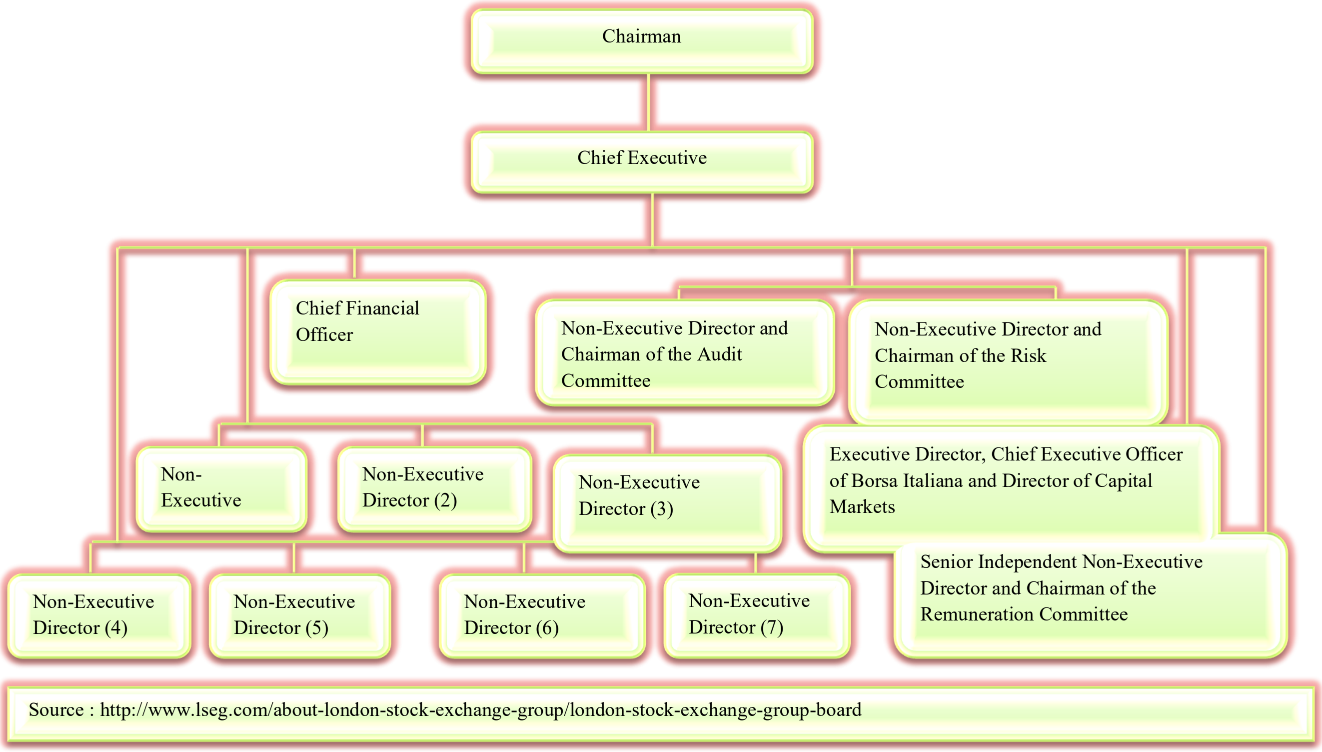
Flow Chart 3.4: London Stock Exchange Executive Board Committee



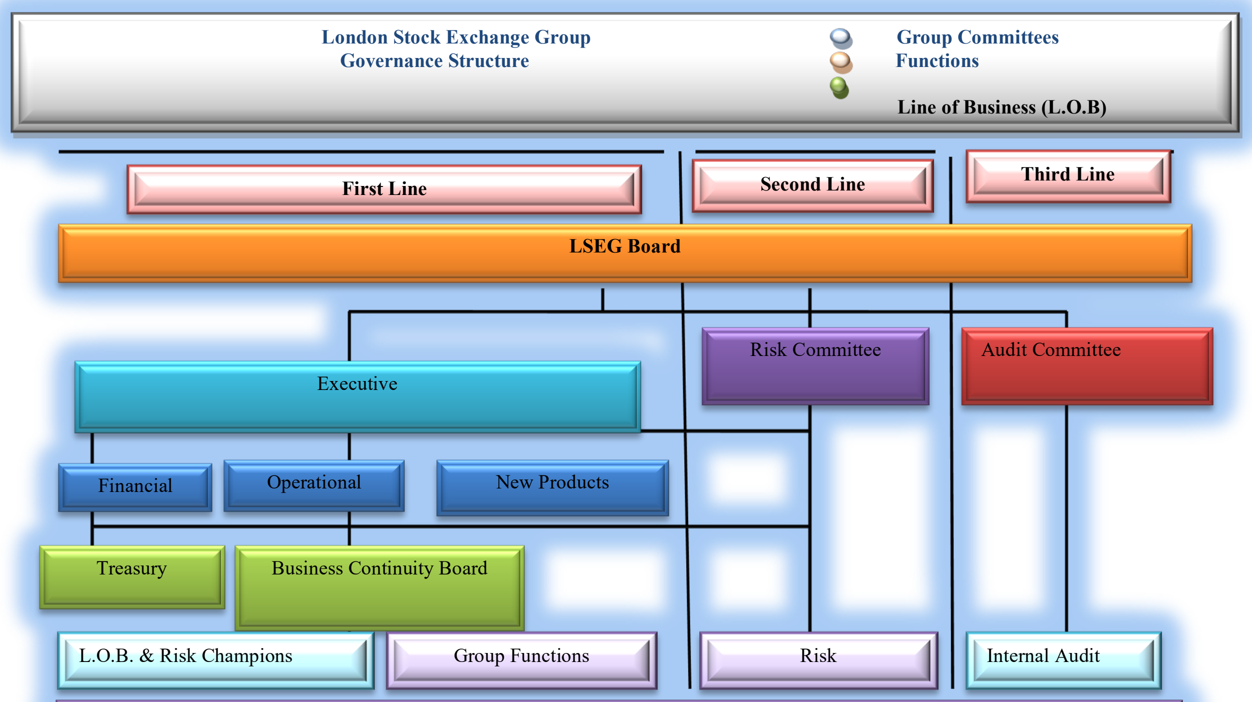
Flow Chart 3.5: London Stock Exchange Executive Team Committee



Flow Chart 3.6: London Stock Exchange Group Board Committee



Flow Chart 3.7: London Stock Exchange Group Governance Structure



Source: **Delivering Growth**, Annual Report 2014, London Stock Exchange Group, p.44

3.3.7 Criteria of the Share Category in LSE

They have laid the groundwork for the financing of the contemporary service and industrial economies of the world. This is a degree of influence that should not be underestimated. The guidelines relating to the share policies are as follows:

Ordinary Shares

In Great Britain, standard shares are the most frequently traded ones. A standard share offers the holder the right to benefit from (and partake in) money (dividends) made by the enterprise. It also gives them the opportunity to contribute to certain types of corporate appointment. For example, they have the right to express an opinion at company meetings (LSE, 2019c).

The standard shares from British enterprises may be included as part of the Main Market or submitted to "AIM". If Main Market bonds are less liquid, they can normally be found on the SETqx. In addition to SETqx and SETS entries, certain types of AIM submitted securities may also be featured on SEAQ. Alternatively, the SETS Trading Service, from the Exchange, contains the more liquid Main Market securities. For instance, components of the FTSE All Share index are usually entered here (LSEG, 2019c).

1. Ordinary Share Capital

As of 30 August, 2019, with voting rights, LSEG Plc had in issue 349,738,988 ordinary shares of 6 79/86 pence each.

Derivatives

Member companies have the opportunity to take advantage of the prominent global market for Russia's "Depositary Receipts," "Dividend Derivatives" and Indexes. In addition to this, there is an associated order-book procedure from "Oslo Børs". This represents a way to provide the primary market with Norwegian liquidity. Also, there is the exchange of options and futures associated with the FTSE 100 Index. Ultimately, member enterprises greatly benefit from emerging and cutting-edge resources as a result of their relationship with the London Stock Exchange Derivatives Market (LSEG, 2019b).

Debt Securities

Order book for Fixed Income Securities (OFIS)

Multilateral Trading Facility resources are provided by OFIS. They allow member companies to exchange listed securities from outside London via a MTF controlled by the LSE itself. There is also a tool that helps issuers to enter debt securities into the Professional Services Market. For Fixed Income Securities, the order system is in the form of a digital trading resource designed for debt securities and business bonds, this provides consistent costing and end of day prices relating to both local and global loans. The various components and features are great for handling wholesale and commercial denominated securities (LSEG, 2019f).

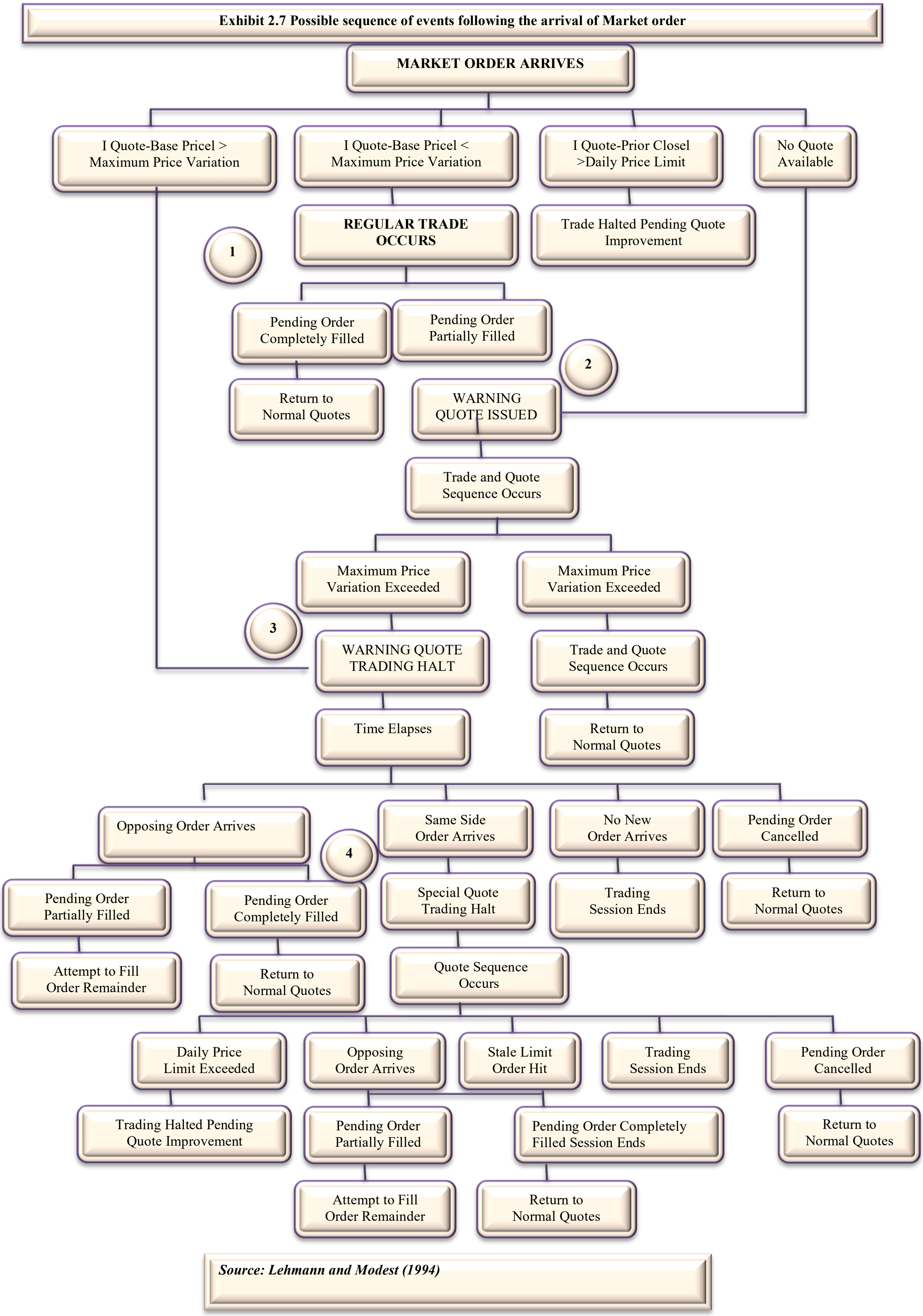
Fixed Interest (SEAQ) Trading Service

The SEAQ is the primary quotation resource that is currently in use at the LSE. It is a valuable tool, and even if debt securities are not accessible via alternative fixed income order book trading systems, it still enables market contributors to offer secure quotes for them. However, it is vital to emphasise that this trading scheme doesn't provide fully executable quotes. As such, member companies may instead choose to declare their activities directly to the LSE, in accordance with Policy 300.3 (for more details, refer to document (LSE, 2019d)).

Retail Bonds

The LSE implemented a digital Order book system specifically designed for Retail Bonds at the start of February 2010. It was created because retail investors were calling for better access to a high quality on screen secondary market that could also be suitable for fixed income securities. The LSE listened to these concerns and responded accordingly by creating a responsive and robust new system. The order-based trading resource provides easier access to a series of lucrative supranational, UK corporate and gilt bonds (LSE, 2019b).

Flow Chart 3.8 The Market Order System



Gilts

The term ‘gilt’ refers to a sterling denominated bond issued by the HM Treasury and sanctioned by the British government. They are also featured on the LSE. The most prominent and specialist traders of this type of asset are the so-called Gilt-Edged Market Makers (LSE, 2019a).

3.3.8 Clearing and Settlement Process of LSE

Clearing arrangements

5100: The leading clearing member has the power to only clear, or accept a request to clear, a transaction relating to a specific central counterparty security, if a formal clearing membership submission has been accepted and processed first. The clearing member is expected to adhere fully to the policies, guidelines, and practical considerations laid out by the central counterparty. Finally, all involved and affected parties must be happy with the arrangement and decision to clear in order for it to go ahead (Rules of the London Stock Exchange, 2019f, p.68).

Termination of clearing services

G5110: The leading clearing member needs to inform the Exchange of the process, before it can be permitted to withdraw its contribution as a clearing party to another member company.

Central counterparty contracts

5120: The leading clearing member needs to inform the Exchange of the process before it can be permitted to withdraw its contribution as a clearing party to another member company.

5121: If a central counterparty agreement is made and shared by a central counterparty and a leading clearing member, a separate central counterparty agreement will be linked to the Non-Clearing party (as a principal or an agent) and the Leading Clearing Member (as the principal). This agreement will be constructed according to the stipulations already set out in the initial central counterparty agreement. These rules apply unless the following situation occurs:

5121.1: The Leading Clearing Member is acting as the vendor. This means that it will be expected to act as the purchaser in the second (consequent) central counterparty agreement;

G5124: Alongside the settlement agreements relating to the central counterparty decisions, the clearing member responsible for clearing the transaction continues to be accountable for making sure that every single agreement to which it is still tied gets settled, fulfilled, completed, or honoured.

(Rules of the London Stock Exchange, 2019f).

Net settlements – effect of settlement

G5140: The requirements and expectations for the clearing member, the central counterparty, and the non-lead clearing party, as they pertain to the transaction, must be met after the total settlement has been reached (LSE 2019f, p.67-69). This process should adhere to all of the stipulations established by the counterparty netting resource.

Settlement, Clearing Rules

Settlement

Obligation to settle

5000: The member company is responsible for making sure that all relevant Exchange transactions that it is tied to, or involved with, are handled and closed in the appropriate manner.

Time of settlement

P5010: Relevant transactions are to be used for appropriate completion of the security or market outlined by the contract. This is always the case unless an exception is formally requested or the situation demands an alternative response.

G5011: The member company is not permitted to appoint a settlement due date for an Exchange-based transaction if it is over twenty days after the time of the actual transaction. There are no exceptions unless an alternative scenario has been approved by LSE.

(Rules of LSE, 2019f).

Method of settlement

5025: The member company leading the sale needs to make sure that all securities that are ready to be secured, via the use of a programmed action by the trading resource, are retained in a digital format. This needs to be done either before or on the actual date of the agreed settlement for the transaction. The requirement does not include standard traded securities.

Place of settlement

G5030: The member company is expected to approve the position of the settlement at the point of transaction itself. However, if this is not possible or practical, they may, as an alternative option, close the trade within a 'standard' position or location of settlement, as long as it is clearly appropriate for the market or security that is being transacted.

(Rules of the London Stock Exchange, 2019f).

Late settlement

Settlement of buying-in trades

5074: The Exchange must inform the accountable group about all the circumstances relating to the buy in agreement. Once this has been done, the company is expected to adhere to the delivery guidelines provided by CREST or an alternative settlement resource, as determined and approved by the Exchange. This should be done in a timely manner and in accordance with the rules established by the Exchange.

Liabilities
5079: In accordance with regulation 5080, the accountable company must protect the Exchange against all forms of unwarranted responsibility as it pertains to expenses or losses taken by the Exchange because it has agreed to the buy in request. (LSE 2015, Settlement, p. 63-67) and (Rules of LSE, 2019f).

3.3.9 London Stock Exchange (LSE) Indices

The FTSE UK Index was created to be a reflection and a measure of how efficiently UK enterprises are functioning. It offers market contributors a thorough and easy means of interpreting a series of indexes that can be used to determine the degree of success across all industry and capital sectors of the British equity market.

The headline indexes features are as follows.
<u>"FTSE 100 Index":</u>

"The FTSE 100" is a one-sided index that is primarily based on market capitalisation. It features blue chip enterprises operating in Great Britain. It is just one component of "FTSE UK Series", which has been used to determine the degree of efficiency of the hundred most highly capitalised blue-chip businesses in the country. The SETS trading framework operated by the LSE is how all of the FTSE 100 companies are traded. These businesses are featured on the LSE, and this means that they have met strict requirements pertaining to liquidity and scale.

Index Launch: 03/01/1984

Base Date: 30/12/1983

Base Value: 1000

Number of constituents: 101 (FTSE 100 Factsheet, 2019).

<u>"FTSE 250 Index":</u>

The "FTSE 250 Index" features "mid cap" shares that are transacted via the LSE. It reflects around 15% of the total market capitalisation in Great Britain. These FTSE 250 businesses are interacted with via the SETSmm and SETS trading frameworks operated by the LSE. The index primarily contains mid capitalised enterprises that cannot be listed by the FTSE 100 (for any number of reasons). However, they must also meet strict requirements relating to liquidity and scale.

Index Launch: 12/10/1992

Date: 31-12-85

Base: 1412.6

Number of constituents: 250 (FTSE250) (FTSE 250 Factsheet, 2019).

<u>"FTSE All-Share Index":</u>

This Index reflects the efficiency and degree of success of every qualified enterprise feature upon the "Main Market" for the London Stock Exchange. They must first meet the requirements for liquidity and scale by passing certain tests. This particular index is generally believed to be the most accurate indicator of performance for London's share market, due to the huge proportion of United Kingdom based capital invested in the assets that monitor it. It reflects around 99% of the total market capitalisation in Britain, because it is an amalgamation of the "FTSE 100", "FTSE Small Cap Index" and "FTSE 250". This measure is an extremely valuable choice for investment activities, particularly exchange traded funds and standard funds. The FTSE All-Share companies are transacted via the SETSmm and SETS frameworks operated by the LSE.

Index Launch: 26/11/1962

Base Date: 10/04/1962

Base Value: 100

Number of constituents: 646 (FTSE All-Share), 295 (FTSE SmallCap), 351 (FTSE 350)

(FTSE All-Share Index, 2019).

<u>"FTSE 350 Indices":</u>

The FTSE 350 Index reflects both mid cap and substantially sized stocks that are featured on the LSE. This particular index consists of businesses from the FTSE 250 and the FTSE 100 indexes. They are transacted via the use of the SETSmm and SETS trading frameworks operated by the LSE. However, they must first meet requirements relating to liquidity and scale.

Base Date: 30/12/1983

Base Value: 100

Number of constituents: 351 (FTSE 350), 313 ("FTSE 350 ex-Investment Trusts")

(FTSE 350 Factsheet, 2019).

"FTSE All-Share ex Investment Trust Indices":

The FTSE UK Index series reflects the value and degree of success of all qualified enterprises featured on the Main Market of the LSE. Once again, they must first meet strict requirements for liquidity and scale by passing rigorous tests. It is important to note that these FTSE All-Share ex Investment Trust measures do not include the ICB subsector 8985 (Equity Investment Instruments), as they are excluded within this series of market indicators. Nevertheless, it is very valuable when it comes to evaluating the success of investment products, especially exchange traded funds and standard funds. As usual, they are transacted via the use of the SETSmm and SETS trading frameworks operated and managed by the LSE. This particular index reflects around 98% of the total market capitalisation in Great Britain.

Base Date: 1 June 1998

Base Value: 2794.23
FTSE All-Small
Index

This is formed by combining and uniting all of the businesses that are eligible to be featured on the FTSE Fledging plus the "FTSE Small Cap indexes" ("FTSE All-Share ex-Investment Trust Indices," 2019).

FTSE SmallCap Index:

The FTSE Small Cap is an appreciated gauge for small-market capitalisation businesses that are listed in places 351 to 619 on the ranking of the biggest enterprises of the Main Market at the LSE. It consists of businesses with a market capitalisation that is not large enough for the FTSE 250, but which sits beyond an agreed threshold. The minimum threshold is routinely revaluated. As such, the FTSE Small Cap measure has a variable amount of featured companies. In July 2012, it contained 248 enterprises (SMX, 2017), which reflected approximately 2% of the overall market capitalisation in Great Britain. The index is a component of the "FTSE All Share Index" and this, in itself, is an amalgamation of the 650 businesses featured on the Main LSE market (FTSE 100 Factsheet, 2019).

FTSE AIM All-Share Super Sector Indices:

These Index measures are closely related (and, in many ways, quite similar) to the FTSE AIM All Share index. They give investors access to a total of 19 different signifiers of success. They can then use these markers to highlight lucrative macroeconomic investments and trading ventures. The series is intended to be used as a basis for activities involving tradable products, and it has been carefully structured to adhere to the Industry Classification Benchmark.

Inauguration: FTSE AIM All-Share Index-97

FTSE AIM UK 50 Index – 16/05/2005

FTSE AIM 100 Index – 16/05/2005

Number of constituents: 829 (FTSE AIM All-Share),
100 (FTSE AIM 100), (FTSE AIM 50)

(FTSE AIM All-Share Super sector Indices, 2019).

FTSE TMT:

Imitates the behaviour of businesses in the Communications, News and Engineering divisions.

"FTSE techMARK 100":

The hundred uppermost firms of the FTSE techMARK All-Share, beneath £4B by capitalisation of the complete market.

FTSE techMARK All-Share:

A directory of every corporation within the London Stock Exchange's techMARK sector

(SMX, 2019).

Note: The London Stock Exchange (LSE) Indices Features are as follows:

Objective: The index is intended to be utilised to establish a performance threshold, derivatives and index tracking funds.

Invest-ability: Shares have been weighted and nominated to guarantee that it is possible to invest in the index.

Transparency: The index utilises a policy-based, clear building procedure. Index policies are openly accessible on the FTSE's web site.

Availability: The index is computed on the basis of overall yield and value methods, both end-of-day, intra-second and real-time FTSE, (2015). But, as pertains to the FTSE Small Cap Index, this index price is recomputed in real time and issued each minute (SMX, 2017); FTSE AIM Index Series: the following end of day indices.

Industry Classification Benchmark: The constituent of an Index is characterised as per ICB, the global norm for business division research.

3.4 Crashes in the London Stock Market

Stock market crashes are huge financial happenings which can be areas of strong interest for both professionals and educators. The academic belief is that shares are effective and when an important data part is released, a crash can be brought on, even though studies of previous crashes have been unable to pinpoint what this information actually was. When it comes to practitioners, crash concerns are a constant worry, and in cases of a crash, there are critical life impacts for these traders and investors (Sornette, 2002, p.04).

The US is considered to impact the entire globe in this respect, and this can be seen when the stock market crashed in the USA, and consequently brought about a worldwide recession thereafter.

Stock market crashes and recessions have been seen throughout history, as early as the eighteenth century (Kindleberger and Aliber, 1996), while asset booms and busts have been sighted since the 1700s with the renowned Dutch tulip craze (Garber, 2000), and the “John Law Mississippi Bubble and the South Sea Bubble” in 1720[70]. When it comes to economy, risk, reward, crashes can occur in unpredictable cycles that can be seen during each generation. Greed, gossip and constant fluctuations have been the cause of numerous examples of crashes throughout history, including those mentioned above, such as the real estate influxes in the twenties and eighties, resulting in the big pop in the late twenties and mid-late eighties fall (White, 1996).

3.4.1 Collapse in 1825

One of the most well-known boom-busts of modern history was seen in England in 1824-1825 (Neal, 1998; Bordo, 1998; Bordo, 2003, p.2). It is noteworthy that this equity crash and banking panic in 1825 is closely tied to the current day's policy problems. The story resonates for three key reasons. Firstly, the disaster had been the first time that a developing share caused an economic crash in history. Secondly, it is an early indicator of how crucial an apt lender-of-last-resort interference from regulatory bodies is. Thirdly, it highlights the value of data within lending markets (Bordo, 1998, p.77). Due to its straightforward monetary policy, the Bank of England caused the stock market boom and related financial growth, allowing the British government to move some of its debt into lower yield areas. In turn, more Bank of England

[70] These were not incidents brought on by technological obsessions, but the Mississippi and South Sea inflows have been linked with predicted upcoming incomes from world trade potential (Bordo, 2003, p-2).

notes and deposits boosted the British monetary base. The banks were then able to release notes to support financial movements like share speculation. The share boom, however, turned into a bubble when investors pushed up the values of both imaginary and genuine shares, such as securities coming from the fake "Republic of Poyais"[71].

Inevitably, the bubble burst, although there is no clear reason why the April 1825 collapse happened exactly. However, the Bank of England sold a significant mass of money orders, drafts and notes in March, supposedly to reduce the flow (Clapham, 1945). Following the collapse, commercial failures happened, and by the autumn, which is normally a time of average financial state, many country banks had failed. After numerous big London financial institutions were unsuccessful, such as Henry Thornton's Institution, there was widespread panic by early December. In short, 624 companies were listed that were floated in 1824 and 1825, with a capitalisation of £372,173,100. As of 1827, there were 127 left, with a capitalisation of £102,781,600 (Hunt, 1826, p.46).

3.4.2 Factors contributing to the Stock Market Crash in 1825

The 1825 crisis was a worldwide incident involving numerous crisis aspects that happened throughout the next century, and thus is an important area to study. Monetary shocks, real shocks, and the Bank of England all played crucial roles in these historic events (Bordo, 1998, p.79).

Firstly, it is considered that expansionary monetary policy propagated the boom and led to the 1825 crash. Neal (1998, p.64) states that the Bank had a loose policy when it came to meeting the government's financial needs, and increasing the monetary base brought forward a situation where country banks could grow their note issues. Simultaneously, expansionary monetary policy in the gold standard environment was building up the reverse situation, since increasing domestic costs created a trade deficit which was clearly seen in the drop of the Bank's bullion reserves and a fall in Paris Bills prices in London. The Bank started to instigate stricter policies in the beginning of 1825, and the stock market hit its peak in April (Gayer, et. al, 1953)[72].

[71] This information asymmetry caused adverse choices, and real companies had greater difficulty finding finance that wasn't at a high premium. Banks became enclosed in the success bubble, and started to make riskier loans (Bordo, 1998).

[72] In terms of real shocks, the crisis of 1825 had various displacements happening before it, as described by Irving Fisher (1932) who termed them, such as huge investment in infrastructure and the on-going stability of the industrial revolution in England (Bordo, 1998, p.80).

The Bank of England had not taken on Bagehot's (1873) "Responsibility Doctrine" of only making decisions based on public interest, to diminish banking panic and limit a stock market crash potentially impacting the monetary system[73]. Following the crisis, country financial institutions had been accused of encouraging share bubbles and BoE was also at fault for not controlling these (Bordo, 1998, p.77). As mentioned, the bank had not followed the "Responsibility Doctrine" (Bagehot, 1873) of acting in the public interest to limit banking panic and stop stock market crashes from impacting the monetary system. After numerous leading London banks failed, such as Henry Thornton's, widespread panic was in place by the start of December. The BoE subsequently reversed discount policy and started to show the part of lender for the final option, where they lent in a timely manner based on acceptable collateral, but at a penalty rate to stock further stock market crash incidents.

3.4.3 The Great crash of October 1929

There were a number of unique aspects tied to the crash of October 1929. Firstly, the majority of people, including economists, are unaware of an upcoming stock market crash (Sornette, 2002, p.10). Secondly, the October 1929 crash is an example of the fact that financial crises never occur during times of struggle, and instead macroeconomic flows are advantageous prior to crashes[74]. This is the reason why crashes are such a shock to many parties, and particularly economists, who are always surprised by these events. It is considered that these success periods are predicted to continue without issue at these times (Sornette, 2002, p.10).

3.4.4 Factors that Contributed to the Stock Market Crash in 1929

There were several matters contributing to 1929's share fall:

1. There was considerable fraud and illegal activity going on, and many parties believe that these were causes of the 1929 crash. On the other hand, there is no evidence that insider trading or illegal manipulation actually occurred.

2. The fresh "Head of the Federal Reserve Board", Adolph Miller, established a stricter financial plan and attempted to decrease share values after he felt that rumours led the share reserves that it was able to lend, and so the majority of banks were mostly unable to pay debts owed. 1923 and 1929 saw an average of 2 banks closing per day, and up until the crash in 1929, prosperity was able to distract from the problems of the banking system.

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[73] The Bank of England was considered to not have acted suitably as a lender of final option, and the catastrophe in England impacted Europe and Latin America, bringing about a widespread default on sovereign debt (Bordo, 1998).

[74] At these times, economists made statements regarding the safety and reliability of the economy at present, stock markets grew and macro flows, such as employment, showed consistent improvement, and so on (Sornette, 2002).

3. The drop in money supply seen from 1929 to 1933 reduced financial developments, causing an abrupt shrinkage in nominal input and outcome, plus a great rise in joblessness. In the instance where the Federal Reserve influxed M2, the drop in stock market action would have been mitigated to a great extent.

4. The political mood prior to the crash of October 1929 was positive overall. Herbert Hoover had been chosen to become President of the US in November 1928, by a huge margin, leading to a sharp rise in stock buying at the time. However, Wall Street would crash within 12 months (Sornette, 2002).

3.4.5 Measures had been taken to resolve the problems

As there was no governance structure for worldwide economic control, which meant that fraudulent movements could continue, there was a clear lack of confidence in capital markets, particularly so for the London Stock Exchange (Konzelmann et al., 2009, p.19).
In the UK, the economy stayed stagnant in the 1920s with the Treasury establishing a strict monetary policy in order to restore the Gold Standard at its 1914 parity (Konzelmann et al., 2009)[75].

As a result, 'New Deal' reforms were brought out in 1933 until 1937. Arndt (1944) stated that the New Deal was the greatest effort made following the great depression to assist the recovery in stock markets through a specifically expansionist approach as the main way of booting stock market activity with no need to employ excessive control in the economic system. It was observed that from 1933 until the third quarter of 1937, the stock markets were steady (Konzelmann et al., 2009).

3.4.6 The Crash of October, 1987

As of the start of October 14th, 1987, all key world markets saw a significant drop throughout the month, which goes against the previously noted correlations of returns throughout nations, and is surprising due to the fact that world markets are so different from each other (Barro and Ursúa, 1989). The UK and the US saw a fall that was greater than 20%, while Austria had the lowest drop at -11.4%, and Hong Kong the highest at -45.8%. Apart from the US and Canada, the UK market maintained its downward trend until the end of October, 1987 (Sornette, 2002).

[75] On the other hand, 1931 saw a drop in interest rates, which was intended to limit the impact of First World War debt, which brought about a boom for durable goods and estate construction that was perpetuated in the mid-late 1930s through rearmament (Konzelmann et al., 2009).

3.4.7 Factors that contributed to the Stock Market Crash in 1987

There are certain key reasons that have been put forward as potential explanations for the Stock Market crash of 1987:

Firstly, program trading involved computers automatically ordering significant stock trades based on market trends, and specifically selling orders following losses. Certain nations were noted to have greater losses than even the UK and the US.

Secondly, derivative bonds and index futures were shown to boost the doubt, danger and erraticism throughout UK and US stock markets. However, these approaches were not seen in historic market crashes in 1914, 1929, and 1962.

Third, throughout the time of the crash, a significant measure of sell orders was not accepted by the trading mechanisms in financial markets at the time[76]. The lack of liquidity could have impacted the extent of the price drop, as investors had over-predicted liquidity. Contrarily, negative news regarding share liquidity is unable to show why such a large number of people wanted to sell stock simultaneously.

Fourth, the third quarter of 1987 saw the US trade deficit at levels that it had not reached since 1960. This, in conjunction with the budget deficit, meant that investors believed that these deficits could bring a drop in the US stock price against foreign securities[77]. It is considered that where movements in trade deficits are to the detriment of one country, then its trading partner should benefit.

Lastly, numerous analysts believe that stock prices were overvalued in September of 1987, and even though P/E and P/D proportions stood at all-time high levels, the period from 1960-1972 had levels at the same height, without any crashes. Thus, overvaluation is not thought to have brought about the crashes in each instance.

3.4.8 Measures had been taken to resolve the problems

Following the 1987 crash, the financial market underwent certain changes:
Firstly, the NYSE limited program trading to some extent. The NYSE and CME established a "circuit breaker" technique, where exchange could stop for the exchanges for an hour provided

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[76] Numerous common stocks in the NYSE did not trade until the latter part of the morning of October 19th, due to the fact that the specialists were unable to find sufficient purchasers to buy quantities of equities which the traders desired to sell at specific costs (Sornette, 2002).

[77] On the other hand, there is the question of why other nations suffered market crashes if the US budget deficit was to blame (Sornette, 2002).

the DJI mean dropped at least 250.00 levels diurnally, and 400 points in 2Hrs. It is considered that this stop allows agents and traders to interact with the customers in the instance of great price changes and gather fresh instructions or margins[78].
Secondly, uniform margin requirements were instigated, in order to limit stock, index futures and stock options volatility.

Lastly, certain stock exchanges made alterations to the workstation methods so as to boost information controlling efficiency and make the system more reliable and productive.

3.4.9 The Crash of 2008

The "Federal Home Loan Mortgage Corporation" and the "Federal National Mortgage Association" are sometimes named "Freddie Mac" and "Fanny Mae", and are the two establishments that were the owners of, or holding back, 6 trillion dollars' worth of loans, and these institutions were in an extremely difficult position when prices began to drop. The Federal Housing Finance Agency assisted these organisations in becoming stable, where national debt reached 800 billion dollars (Money-Zine, 2008). In addition, numerous banks were having difficulty, and subsequently the Bank of America assisted some of these to stay out of bankruptcy. Meryll Lynch was the first to go, on 14th September 2008, followed by the American Insurance Group (AIG) which was even more major[79]. On October 1st, the crash began, followed by the Black Week beginning on October 6th. Throughout this week, the Dow Jones Industrial Average dropped by 18.1% (Money-Zine, 2008). In turn, the White House established a bailout plan, which was not successful, and in fact increased the progression rate of the crash (Alexandra and Livia, 2007).

This economic crisis meant that nations had to close their markets for a short time. The Times of London wrote that this 'Crash of 2008' was similar to Black Monday in 1987, according to older traders. During this week, there was a 21% drop[80]. Business Week stated that the crisis was a stock market crash, called the Panic of 2008. Nonetheless, the US Dollar and Japanese Yen rose significantly over other key exchanges, particularly the GBP and CAD, due to the fact that world investors look for safer investments.

The FTSE 100 index had lost almost 9% of its value at the peak, causing a loss of £90bn from the value of leading shares (LSE, 2008). The pound also took a huge hit, showing the greatest

[78] However, others believe that this halt means that certain traders will act in anticipation, thus increasing risk (Sornette, 2002).
[79] Once AIG went bankrupt, the entire world could be badly affected (Money-Zine, 2008).
[80] However, even though in 1987 the drop was 28.3%, certain traders felt that the current situation was worse, because of the consistency of the drop over a week, rather than the abrupt fall on Black Monday.

drop in its value against the dollar since 1992, dropping to a six-year low point of less than $1.53. On that day, Charles Bean, the assistant governor of the BoE, made a statement that this was a unique crisis, and potentially the greatest of its type in human history (Wheeler, 2008, p.5)

3.4.10 Factors Contributing to the Stock Market Crash in 2008

The 2008 crash was due to sub-prime mortgages, where people were provided with loans that they did not have the potential to pay back, because house prices were going down from 2006 constantly. Thus, if people could not pay the loans back, the banks would foreclose the real estate in question, but in 2007, when house prices started to drop, problems arose because the estates weren't worth the lend (Money-Zine, 2008).

3.4.11 Measures had been taken to resolve the Problems

While this latest crisis was being recovered from, Congress offered to supply a $700 billion bailout plan, but the White House rejected this. The Federal Reserve offered potential aid worth billions to banks that were in trouble, of which there were many including the biggest banks in the country, such as Bank of America and Merill Lynch (Alexandra and Livia, 2007).

3.4.12 Measures to be taken to resolve the problems

As finances deepening and capital market progresses are closely tied, numerous financial instruments play a role, as well as the strong regulation of government and effective financial intermediation[81]. However, the stock market crash described above offered certain steps to follow in order to stop a further crash from occurring, such as the 'Flash Crash May 6, 2010'. Law experts have examined various problems linked to crashes particularly after the 1987 US stock market crash (Frankel, 1989; Jonathan et al., 1989). The sections below will describe the stages necessary to prevent future stock markets crashes:

Well-functioning Regulations

Economists feel that markets can crash because of government regulation, and it is clear that poor government policy or ineffective regulation brings about market distortions which can fix themselves quickly thereafter. An example of this can be seen in economist's discussions about the East Asia crises, where macroeconomic and government policies caused widespread credit misallocation (Eichengreen, 1999; Greenspan, 1998).

[81] The London Stock Exchange is a global leader in stock markets, with resilient strategies and regulations tied to modern technologies. There had been no such crash in the UK since 1866 (Schwartz, 1986).

It is important to remember that markets are the most effective avenue for fixing market failure, as this is the aim of stock market regulation (Crockett, 1997). Crucially, market crash protection does not specifically need legal means at the base level. Where stock markets work effectively, they can offer protection, even without any involvement of the law[82]. Along the same lines, controlling shareholders has a high chance of impacting regulation, and this can continue the market failures related to crashes. When the parties that establish the regulations are being forced to disclose, then compulsory disclosure rules will most likely be ineffective (Partnoy, 2000, p.29).

Capital Controls

Numerous different nations have implemented, or suggested the implementation of, restrictions or statutes that oversee the flow of capital. These suggestions cover limitations for capital movements inwards and outwards, as well as currency boards and bank capital minimum requirements for exchanges. This researcher believes that all of these have a single aim, which is to limit the possibility of stock market crises, but this is achieved through limiting efficiency and establishing unfair situations.

It is considered that outflow regulation intends to destroy the cycle during the crash period, through inhibiting external stockholders from moving capital away from that particular nation. The limitations of influxes have been seen widely, and with little encouragement by economists (Sebastian, 1998)[83]. This tax necessitated a deposit on short-run financial bubbles, meaning the price incurred is a waste of their assets for a certain time. These restrictions aren't exclusions for economic influxes, but instead they are intended for discouraging overseas short-run bubbles (Eichengreen, 1999).

In order to commit credibly, the currency board was created by the government, which allows the administration to release local money in order to be precisely in-line with cash deposits and gold money stashes. A money panel does not allow for inflationary policies, since this would bring shrinkage in M2, in addition to a rise in interest rates, after financial discharges (Charles and Anne, 1998, p.40).

In addition, controls can be set with bank wealth sufficiency needs, aiming to work at the bank status instead of that of the investors. These are focused on different market failures, while the key aim is to oversee moral matters, causing banks and investors to make risky decisions. Instead of restricting banks with totalitarian policies, regulators instead examine elements such

[82] Similarly, controlling shareholders can limit the amount of poor information reaching minority investors, and can bring about benefits from these parties (Greenspan, 1998).
[83] This can be seen with the capital inflow "tax" that Chile set at the start of 1990 (Eichengreen, 1999).

as whether banks hold sufficient capital to handle the risk they are exposed to (Eichengreen, 1999).

Stock Buyer of Last Resort

BoE should, in times of a crash, purchase stocks in a weighted market index, which would mean that circuit breakers are not necessary. Conversely, where the market would fall beyond a set proportion, the "Federal Reserve" will start to purchase FTSE contracts at a cost that is 20% under the opening market price, with the Bank of England standing as insurer and market supporter, in order to mitigate investor panic. This could be a policy used in other nations as well (Eichengreen, 1999).

This concept would limit moral hazards for investors, or company managers, and bailouts would not be aimed at a specific institution, as done in the funding company's situation. Instead, these buys would be aimed at the overall market, and any investor with purchase plans aiming to hold a varied portfolio would be secure in the knowledge that no more than 20% of this could be lost in a single day's loss (Partnoy, 2000).

As a result, this policy could motivate investors to purchase and maintain a diverse portfolio, which is the suggested approach by numerous financial experts. This investment can subsequently establish a greater capital pool for UK companies, and where there is a stock buyer of last resort, investor panic would not be as high in these situations[84].

This regulation could be costly in the instance of a significant market downturn, and the Bank of England would be holding substantial amounts of stocks. However, even in this case, the administration would act suitably in-line with a market crash, which is a position it would take even when there is no stock-buying policy. This concept would not alter support, and instead would simply direct it in a more beneficial way.

Lender of the Last Resort

From a theoretical standpoint, the lender of last resort is a straightforward concept with one main issue. The theory is to establish an institution that could lend whatever was needed at times of crisis or illiquidity. The properties of this lender would be based on whether or not the gains in limiting investor panic outweighed the expense of boosting investor risk. The lender could establish a policy that is somewhat vague, where it can take action to save specific institutions without actually promising to do so during a crisis (Crockett, 1997).

[84] Where an investor who was concerned on a certain day could set a sell order and feel secure that the Bank of England would purchase the stock at a floor price.

Technology

Currently, all Stock Exchange developments follow technological advances, and the problems that need to be addressed are numerous. Technological software must be planned to oversee stock market movements in real time, in order for mistakes, or fraud that could bring on stock market crashes, to be found instantly. LSE stands as an ancient firm that is still able to handle the modern business world's needs, with a focus on technological progress by moving to MillenniumIT's leading product (LSEG, 2019d). Endless innovation is necessary for an exchange to handle the rising amount of trading avenues and mitigating future stock market crashes.

Conclusion

When a financial system is working effectively, there is a great need for legal and regulatory systems to be put in place, instead of those controlling trade and investment movements (Steven and Jeffrey, 1999, p.12)[85]. The administration should not act to liberalise market before they are able to build the regulatory ability to handle such a free economy. Additionally, because of how straightforward it is for investors to use financial innovation to hide away from regulation, it is short-sighted to liberalise before regulation is in place (Partnoy, 2000, p.80; Steven and Jeffrey, 1999, p.13).

[85] The central banks must take action to assist national stock exchanges, without promoting moral hazard (Partnoy, 2000).

Chapter 4-Review of the Literature

Introduction

Most of the existing literature studies have found a significant importance in dwelling on the subject of how efficient information flow is within financial markets. For the purpose of testing the propositions concerning the effectiveness of the share market, one doesn't only have to rely on the information set but also the specified model of market equilibrium. The most useful component of contemporary financial theory, according to past research, has been proven to be EMH. This hypothesis was actively used as an investment guide during the period between the 1960s and 1990s and was undoubtedly the most acceptable theory recommended by academicians and economists (Konstantinidis et al., 2012, pp.17).

4.1 The Efficient Market Hypothesis and Stock Price Behaviour

It will be of much importance to determine the stand of empirical research as far as supporting or rejecting EMH with regards to equities of numerous nations. It is also important to point out that a mere case research cannot offer much help in deducing a substantial conclusion for this idea, considering the fact that different stock markets exhibit diversities. For this reason, an effective review can only be achieved by following specific models, one of which is geographically-based[86]. Another technique that can be implemented in conducting a productive research study is the extent to which the markets of a given country have advanced in terms of factors such as emerging marketing trends (Konstantinidis et al., 2012).

Marginally Efficient Market is slightly different than "The theory of interest" by Fama, as it is deliberated as the main research study on the reactions for share values after a split. In this theory, there are various observations that have been made pertaining to share prices before and after the declaration of stock splits (Fisher, 1930). It is generally assumed that the splits act as an indicator of what is going on with the involved company/firm. It is argued that the split is an outlook of fundamental information of the company.

The findings showed that the market interpreted the split as a sign of the directors being extremely confident of maintaining or improving high dividends in the future. This, of course, meant that the future earnings will not only be sufficient but also enough to raise dividends for shareholders. This simply implies that the shareholders of such a company would be happy if a

[86] For instance, a separate examination will be conducted on an area covering the Asian markets, which covers the Middle East and North Africa while those of the European markets are also handled separately and so forth.

split were to be announced and implemented[87]. Market Efficiency was also well supported in the research studies by the above researchers. This is not limited to the research study of Jensen and Roll, which fairly supported Market Efficiency, but includes a number of research studies of the same topic. Most research studies on the reaction of the split announcement sided with Market Efficiency, and some of the researchers that sided with EMH include Brown et al. (1988), Aharony and Swary (1980), and Christos (1992).

Zhang's (1999) argued that the challenge facing EMH is that it has an implication that in the case of the existence of arbitrage opportunities, such opportunities would instantly vanish as soon as they are speculated. He goes further to claim that arbitrage opportunities under general circumstances are merely based on probabilities and that despite them being favourable in this sense, they are never free of risks. Making opportunities profitable would require that the speculators acquire large capital and take certain risks and this makes the probability an edge to the speculators. As the speculators' actions increase, the marginal probability diminishes, though not to an extent that it disappears[88]. Zhang's (1999) final suggestion was that the marginal probability is responsible for keeping the market flexible as well as boosting its competitiveness in such a manner that it attracts all participants. He hypothesised that once the market is competitive, it could hold the marginal probability short - a factor that is attributed to its participants fiercely competing against each other. With this argument in mind, Zhang ends up with a proposal that EMH should be replaced with Marginally Efficient Market (MEM).

In the end, according to Mankiw (2008), there is much about EMH which has not even been considered, but he agrees that it is an honest description of market behaviour.

Categories of Efficient Market Hypothesis and Empirical Research

Fama is of the opinion that efficiency can be viewed in three distinct ways: strong-form efficiency is where information, whether public, personal or private, plays a specific role in the process of stock pricing, which implies that the information doesn't have any contributions towards the creation of any competition-related benefits to be enjoyed by the investors in the investments they take part in. The second form is referred to as the semi-strong-form and it assumes that the stock prices directly reflect the financial information which the public gain access to. The third and final form of efficiency, according to Fama, is weak-form efficiency

[87] Any alterations in expectations relating to the future were highly accredited to the increased prices of stocks in the preceding days to the announcement of the split - this is according to Jensen and Roll's research (Brown et al., 1988).

[88] The marginal probability can be made to disappear only by the application of infinite capital, but this would still lead to a scenario where the return due to every invested capital shrinks down to zero.

in which all the historical stock prices are incorporated in such a way that they have an influence on the currently prevailing prices. This makes such a form of efficiency unsuitable for use in predicting future price trends[89].

The claim that information is a basic tool of investment that can enable investors to outperform markets is apparently unjustified. It isn't possible for stockholders to outdo stocks; this is a fact which prevents them from achieving high returns especially considering the fact that available information is not exclusive but rather accessible by all the market participants. This concept, therefore, comes up with an interesting deduction that any individual investors can never be referred to as investment experts or market specialists. This is because all investors are exposed to similar informational environments and therefore qualify to be equally viewed as experts or specialists.

Research studies were performed to deeply examine the effect which the EMH has on emerging shares. Given the fact that there is usually more concentration on developed economies, only a few studies have been conducted on emerging markets. The general assumption is that developed equities are more effective compared to their less industrialised counterparts. The basis of this may be seen in stock trends. On a growth potentiality scale, an emerging market fits in as a rapid growing market - this is according to Mobarek and Keasey, (2000, p.3).

4.1.1 Weak-Form Efficiency: Empirical Evidence

Urich and Wachtel (1981) theorised that by weekly declarations of money supply the market is impacted, they also used interest rates in this study as a variable. The chosen data ranged from 1970-79, and the impact of the declaration was understood to be a policy prediction impact, wherein a surprising influx of M2, causes an influx in IR in expectation of upcoming tightening by UK and US's central banks. It was shown by the predictions, created by an ARIMA model and a review of money supply predictions, that: (1) There was a massive deviation within the scale of the declaration impact, during the 1970s, and this deviation is coherent with the operating processes alterations in the Federal Reserve System. As predicted, larger declaration impacts were sighted when M2 changes from goal bands and policy emphasises money aggregation; (2) It responds quickly to announcements, and solely the unpredictable nature seems to impact IR, showing that all significant information is embedded into the rates.

[89] However, according to the explanations of Konstantinidis et al. (2012), regarding the above discussed categories of efficiency, it is a vivid observation that the idea of classifying share effectiveness is a facilitative factor towards boosting the understanding of the basic concepts of EMH.

During their research, Chan et al. in 1992 examined all the stock prices, both at the individual and group levels, so that international market efficiency could be tested. They implemented the Johansen co-integration and ADF tests to investigate how the equities of Taiwan, Japan, South Korea, the US and Hong Kong were related by applying daily and weekly data from 01 February 1983 to 18 May 1987. The high-degree cointegration didn't show any signs of share cointegration and hence the suggestion was that equities in chief Asian nations and the US were weak-procedure effective both individually and collectively in the long-term.

Meanwhile, in 1998, Khababa inspected the behaviour of shares in Tadawul in search of proof of weak-form efficiency but he discovered none. He investigated the monthly data for period spanning 1991 to 1997, using the Johansen cointegration test. He explained that inefficiency may result from interruption in procedures and lack of liquidity, thin trading and high transaction cost within the market. In order to provide a counter research study, the equities of MENA, comprising of nations such as Turkey, Tunisia, U.A.E , Saudi Arabia, Qatar, Oman, Jordan, Lebanon, Palestine, Israel, Bahrain and Egypt offered a great opening to research the sequence of developing markets and reach wider summaries that the above markets followed weak-form efficiency, after conducting a chain of research studies for the Middle Eastern and Northern African shares.

On the other hand, since ATHEX had been progressed from the rank of emerging markets into the "mature markets" rank, through the post-announcement made by Morgan Stanley in 05/2001, it would have been realistic, between 2000-2002, to think that there may have been significant consequences for the growth of ATHEX. Filis, in 2006, studied the effectiveness of ATHEX, by studying the ATHEX 20 index from 2000 to 2002 and determined that the empirical information discovered favoured the opinion that ATHEX had a weak procedure.

In a recent research study, 2008, Elango and Hussein established the weak method efficiency in some economies such as the UAE, Qatar, Saudi Arabia, Oman, Kuwait and Bahrain. They took daily data readings from October 2001 to October 2006 and they used Kolmogorov-Smirnov (KS) and run tests for their research. They found that the weak procedure was invalid for the equities of the sampled countries.

While Abraham et al., (2002) and Abeysekera (2001), were testing the weak procedure in the UAE, Qatar, Saudi Arabia, Oman, Kuwait and Bahrain, Magnus (2008) was busy studying the Ghanaian stock market to experiment and discover how the markets reacted from 1990 to 2000. The findings of this research were that the market was insufficient; hence the weak-form hypothesis was disregarded.

Weak procedure effectiveness relies heavily on the background of the price of share and that the price of security reflects the past prices. It is, however, important to point out that past values do not affect the future price of securities (Otilia, 2011). This is proven through the study of Venkatesan (2010), which relied on the data collected for a specified period - January 2008 to December 2009[90]. The studies on weak-form efficiency in emerging nations and less industrialised stocks are debatable, and the majority of the latter undergo the issue of thin trading. Furthermore, large traders can easily manipulate the smaller markets[91].

[90] In contrast, according to Shah (2007), Karachi Equity wasn't revealed to have weak procedure efficiency. Shah used daily and weekly information from the stock exchange, which is then applied to the stationarity technique.
[91] Although it's commonly believed that developing economies have small effectiveness, the empirical observation doesn't constantly back that idea.

4.1.1 Summary of Researches presenting relationship between the EMH and Stock Price Behaviour:

Author(s)	Scope	Time Period	Sample Size	Macroeconomic Variables	Methodology	Main Findings	Critical Analysis
Urich and Wachtel (1981)	The USA and the UK	1970 to 1979	Weekly	Stock Prices	ARIMA model	Researchers found that the stock markets respond very quickly to the announcement. Furthermore, only the unanticipated component of the announcement seems to have a consistent effect on interest rates which indicates that the market embeds all relevant information into rates. Moreover, M2 found positively related to the stock prices in both countries and stock prices acted quickly.	As in the methodology was used as ARIMA, obviously for the thin trading in the China market which is not to be used in the present research. ARIMA tests were carried out to identify volatility cluster in the data set; however, in the contemporary research, researcher did not measure the shock or volatility and researcher took a dissimilar study field since this study was different in relation to field of investigation as it was compared between Bangladesh and the UK.
Chan et al (1992)	Japan, Hong Kong, South Korea the US and Taiwan	01 Feb'1983-18 May'1987	Daily and Weekly	Stock Prices	ADF and Johansen cointegration tests	Weak form efficiency in long run in the all markets	The present research is an enhancement on this study as researcher took a dissimilar data set for the period of January 1998 to June 2018 and added Philips Perron test with ADF test.
Khababa 1998	Bahrain, Egypt, Israel, Palestine, Lebanon, Jordan, Oman, Qatar, Saudi Arabia, United Arabic Emirates, Tunisia and Turkey	199-1997	Monthly	Stock Prices	ADF and Johansen cointegration tests	Weak form efficiency in the all markets	Market efficiency evolves overtime and diverging procedures interesting performance. The contemporary research is an improvement on this study as researcher took a dissimilar updated data set for the period of January 1998 to June 2018 and added Philips Perron test with ADF test.
Elango and Hussein (2008)	Kuwait, Bahrain, Saudi Arabia, Oman Qatar, the United Arab Emirates	Oct'01-Oct'06	Daily	Stock Prices	Kolmogorov-Smirnov (KS) test and run tests	Weak form Inefficiency, No randomness	The K-S test has a few significant confinements: It just applicable to persistent distributions. It will in general be increasingly touchy close to the focal point of the distribution than at the tails. The most genuine confinement is that the distribution must be completely determined. In the present investigation, researcher combined Ljung-Box Q-Test, Mackinlay variance ratio test, Run test and Chow-Denning Multiple Variance Ratio Test and modernised the data set.
Venkatesan (2010)	India, China, Brazil, South Korea, Russia, Germany, US	Jan'08-Dec'09	Monthly	Stock Prices	P-P and GARCH model	Not Weak form, Except India	Critical investigation of this research demonstrates that they used very short periods of monthly data in their study that is very difficult to predict and explain the situation of the market; whereas, in the present study, researcher took 20 years, 6 months data. As in the methodology was used as GARCH, obviously for the thin trading in the Turkey market which is not to be used in the present research. Since the present research is not to forecast the volatility.

4.1.2 Semi-strong Form Efficiency: Empirical Evidence

In 2011, another conflicting viewpoint was put forward in the study of Laopodis which examined whether the US, UK, Italy, Germany, and France financial markets liberalisation effort impacted on the effective procedure for its share market. The researcher took inflation, industrial production and crude oil as macroeconomic variables for the period spanning 1990 to 2009 and used VAR and VECM tests. The research demonstrated that inflation, IPI and oil did not impact all stock markets as the results showed that the EU consumers were focused on their own economic circumstances; however, it was found that the oil prices influenced the USA stock market.

Graham and Dodd (1934) published a book named “Security Analysis” leading to the growth of new security analyst professionals who examined the basic financial data of companies, such as asset values, earnings and stocks representing Great price. The method is still prevalent particularly with the increasing demand for “behavioural finance”.

The findings are reinforced by the idea which was suggested by a variety of monetary portfolio academics. The samples were taken from FTSE100 and SP500, from Jan-1963 to Dec-1974, correlation examinations were employed for both indexes. Their research upheld the theory that with regards to money information, the market is effective, this was also indicated by EMH. Specifically, the causal relationship doesn’t go towards market values from M2 but the opposite, and possibly back. Therefore, on this basis Rogalski and Vinso (1977) concluded that a bidirectional relation existed amongst the market values and M2. Implications relevant to monetary policy can be derived from the findings of the research, as a deviation in M2 can be a product of an uninterrupted effect on the market. It is imperative to accept these impacts, because there is a significance on the effect of the economic activity from the market - it is to be noted that money related regulations shouldn’t be directed by the market impacts.

Correspondingly, announcements of mergers can lead to substantial increases in market prices, particularly when there is payment of premiums to shareholders of the firm that has been acquired. Nonetheless, it seems that there is always a full adjustment of the market after public pronouncements. Moreover, Keown and Pinkerton (1981) did not find any evidence of abnormal changes in price after merger information is publicly released. Patell and Wolfson (1979) analysed the intra-day adjustment rate against dividend and earning declaration. Their findings showed that publicly released data was swiftly adapted by shares, with the biggest portion of response to price occurring within the first 5 to 15 minutes after disclosure. Although EMH has been supported by several analyses, some analyses have not supported it.

Studies on sluggish adjustment (or under-reaction) back the momentum arguments mentioned above. Nevertheless, there is no consistent pattern of under-reaction to announcements over time. Fama (1998) posited that instances of over-reaction seem to appear as frequently as those of under-reaction to announcement updates. Such anomalies are usually small so that only professional traders tend to earn economic profits.

Additionally, an illustration by Fama and French (1998) for the United States stock exchange and international stock exchanges showed that the small-firm effect can be documented. Size effect often occurs in January for small capitalisation in the US stock markets and therefore it is usually referred to as the 'January Effect'. These findings are usually regarded as 'inefficiencies' or 'anomalies'. In risk measurement, should CAPM be an inadequate design, then the findings would not be an indication of incompetence.

4.1.3 Strong Form Efficiency: Empirical Evidence

When the significant information from the public and private sectors corresponds one-to-one with the stock prices, strong-form efficiency can be said to exist. In accepting this form, it means that any individual who is privy to information, regardless of being an investor or someone else having the non-public information, cannot influence the market in order to realise anomalous profit rates. The instinct hypothesis for strong-form efficiency appears to be untrue. The stock price cannot coincide with public information or confidential information that has not arrived to the market prior to it being accounted for in the present value[92]. For the period extending up to the sixties, studies done regarding expert investment group managers appears to be extremely sparse. As such, CAPM in combination with the development of Markowitz's theory has been an instrumental standard in which the performance and return on investment could be contrasted.

However, the acquired result does not represent the proof brought forward during the debate regarding strong procedure. Based on his deductions, it is not practical to validate strong procedure. There is no clarity, therefore, on the earlier provided results regarding capital markets. This shows the necessity of further research to confirm the strong-form efficiency hypothesis using another method.

Facts provided by Keown and Pinkerton (1981) indicate that prior to public declaration of planned mergers, anomalous profit rates could be realised by the insiders. The study used a scope of 194 firms between 1975-1978. They used a Cumulative Average Market Model. A supposition can thus be made that the utilisation and trade of private data is a regular phenomenon. In accordance with the researchers (Keown and Pinkerton), utilising the confidential information for a duration of 12 days prior to its release would allow the investor to benefit from anomalous profit rates, thus differing with the concept of strong EMH for a particular market

On the other hand, Morse (1998) and Penman (1982) showed that in the stock exchange of America, there existed some incompetency. Morse indicated that on the eve of the anticipated merger, there was a boom in stock sales and reaping anomalous profit rates was a likely scenario[93]. Therefore, insiders or investors privy to the confidential information may "beat the

[92] The method of determination in strong-form focused mainly on evaluating the extent to which the institutional investors used the confidential information available to them and the various tools of investment that they applied when trading in the shares.

[93] Consequently, Penman (1982) in an analysis of information gathered from the Exchange and Security Commission of the United States (U.S. SEC) for 15,000 investment funds, approximately 8000 assets, and a wide

market" for the short-term, something which does not become visible in the stock prices. This goes a long way in discrediting the strong-form Efficient Market Hypothesis and upholding the latter hypothesis[94].

In collaboration with the U.S. SEC, Kara and Denning (1998) carried out a research study for 370,000 transactions that the insiders made from 1979 to 1980. Their findings discredited the hypothesis for strong-form EMH on grounds of the economic tools used by insiders and the gathered information on purchases. On average, the typical profits from the investigated funds were 3% more than the actual profit rates despite an estimated 40% of the transactions being considered not profitable.

The positive results had been established through the study of the Canada stock exchange by Brown et al. (2003), which proved the existence of a strong EMH after investigating the predicted share prices by brokerage firms. Brown et al. also evidenced the existence of confidential information to the professional analysts. The report illustrated that the use of APT and CAPM models did not affect the end product of the investigation. The above findings lead to the affirmation that having the significant confidential information on the stock market can help predict the stock prices. As such, the predictions that are made by professional analyst can be said to be a precise approximation of the market condition that has a probability of happening in the future, but do not reflect a strong-form EMH for the Toronto exchange market.

Miao (2010) examined the impact of forex on the market, and employed a genetic algorithm non-linear method. He examined the function of GBPUSD and how it explains the market deviations for US and UK, he also debates the heterogeneous impacts on varying customers. His research analyses the rudimentary hypothesis that if forex has an impact on the market, then portions of the knowledge within forex will be applicable to the market. He discovered using diurnal data from RBS over a range of 3.5 years (2002-2006): 1) Specifically within US's market, in comparison to financial investment effects, business investment effects maintain for a longer period – suggesting that two types of consumers may have varying groups of self-contained price related info; 2) the effect corporate customers on investment is positive, while the effect of financial firms on investment is negative.

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range of institutions and investment tools, evidenced that insiders buy stocks prior to the public announcement and then sell them immediately after the announcements have been made.

[94] Numerous analytical ventures have been carried out to prove the concept of reaping anomalous profit rates from the utilisation of confidential stock market information, thereby discrediting the strong-form EM hypothesis.

It was theorised that business clients for banks are majorly based within the UK by Miao (2010), meaning that when the global economy thrives, multinational corporations usually sell products within the United States, while expelling foreign exchanges to the UK, and USD is converted into EUR/GBP. Larger transactions of USD point towards positive upcoming projections for the global market, which means that UK and US markets will have a rise in price. Regarding financially sound firms' refunds will be requested by the mutual fund customers, if the global market experiences a decline. Assuming that the customer base is serviced by banks, it will trigger money to flow into the UK from foreign nations and the purchase of EUR/GBP for USD would happen with market sales of UK and the US. Furthermore, from the cross-market impacts it is implied that within forex macroeconomic is probable, which is of importance for the market.

Market efficiency has to be rationalised by the admission of the inefficiencies of minor markets. completely efficient markets are hard to survive in a strong procedure, the help of weak and semi-strong procedure was great, as well as the efficiency of strong-forms focused on the managers in professional investment performance.

4.1.2 Summary of Researches presenting relationship between the EMH and Stock Price Behaviour:

Author(s)	Scope	Time Period	Sample Size	Macroeconomic Variables	Methodology	Main Findings	Critical Analysis
Laopodis (2011)	US, UK, Italy, Germany, France	1990-2009	Monthly	Stock Prices	VAR Models and VECM	Weak form efficiency in the all markets	The current research is a development of this study, as the researchers took a dissimilar study area and several domestic & global macroeconomic variables. Furthermore, analyst implemented widely used Philips Perron and ADF tests for unit root test.
Rogalski and Vinso (1977)	The USA (SP500) and the UK (FTSE100)	January 1963 to December, 1974	Monthly	Money supply	Simple Correlation test	The examination supports the notion that the stock market is efficient with respect to monetary information as the efficient market theory would suggest. Specifically, causality does not appear to go from money supply to stock prices but rather from stock prices to money supply and possibly back again. What they therefore propose based on their results is a bi-directional theory of causality between money supply and stock prices.	The downside made by this examination is the strategy for investigation and these shortcomings are taken care of in the momentum research by utilized ADF as well as P-P for unit root tests and selection of dissimilar macroeconomic variables. Additionally, researcher carried out Toda Yamamoto test which was a sophisticated edition of basic granger causality test. The modern techniques, for instance, Ljung-Box Q-Test, Lo-Mackinlay variance ratio test and Chow-Denning Multiple Variance Ratio Test were applied in this study to examine market efficiency.
Miao (2010)	The USA and the UK	2002 to 2006	Daily	Foreign exchange	Genetic algorithm non-Linear Methodology	The researcher found that at least a part of the information carried by foreign exchange order flows is relevant for stock markets. Moreover, More sales of US Dollars then reflect the good future prospects of the world economy and stocks listed in both US and UK will rise in value. Furthermore, The cross market effects documented also suggest that there is information content in foreign exchange and that it is likely to be macroeconomic in nature, relevant for stock markets.	Using Genetic algorithms have some disadvantages. The formulation of fitness function, the use of population size, the choice of the important parameters such as the rate of mutation and crossover, and the selection criteria of the new population should be carried out carefully. The current research is a furtherance of this study as a comparative examination and took several domestic & global macroeconomic factors; P-P unit root tests as well as researcher took a developed version of simple granger causality test called Toda Yamamoto test. In the current examination, researcher took latest tools, for instance, Ljung-Box Q-Test, Mackinlay variance ratio test, Run test and Chow-Denning Multiple Variance Ratio Test, also took daily, weekly and monthly data set to find out a fascinating results.

4.2 Random Walk Hypothesis and Stock Price Behaviour: Empirical Evidence

Empirical Evidence, EMH, was also referred to as the Random Walk Theory hypothesises, positing that prevailing commodity prices clearly translate to the tangible information describing how valuable a firm is in such a way that the concept of earning excess profits becomes an unlikely idea when such information is well implemented. EMH tries to ponder on the striking idea of price fluctuations witnessed in the security markets giving the reasons behind this as well as the manner in which they occur (Gitman et al., 2011, p.324)[95].

However, academics and critics lowered the significance of technical analysis through the use of RWH. The basic idea behind the exact investment model is that equities are not predictable and the prices are assumed to be taking a random walk (Konstantinidis et al., 2012, p.18). In accordance with Kendall and Branford (1953), the constant variations of share values don't depend on others and possess the same probability distribution. According to Malkiel's (1973), the randomness of the market and stocks is comparable to flipping a coin, while Shiller (2000) maintains that the price fluctuations cannot be predicted due to the fact that their occurrence only counteracts new information, which is also not predictable by virtue of being new. Similarly, Lo and Hasanhodzic (2010) made an observation that our perception of stock prices are that they are random and unpredictable.

Fama (1965b) summarises that the previous research is complete evidence that the developed market is simply following random walk. Studies on the developed market, testing the weak-form efficiency, have confirmed that there is sense with weak procedure competence given the point that there are less successive links and payment prices. The reports by Osborne 1962, Fama (1965b), Cootner (1962), Kendall (1943, 1953) and Working (1934) have all shown that prices of securities are just random and that no past history affects them as such. If the transaction costs are included, this becomes more in anticipating upcoming share values

The goal of Bruno (1973) was to examine if European economies obey RWH. The securities of Switzerland, Sweden, Belgium, Italy, UK, Netherlands, Germany and France was utilised in this research (234 samples). The sample covers the daily time series from March 1966 to

[95] According to arguments put forward by Lo and McKinlay (1988), EMH considered as stand-alone is not a sufficiently elaborate hypothesis and cannot be easily challenged and hence the need to be specific, in terms of the supplementary structures such as the taste of the investors, the nature of information and the conditions under which business operations are conducted if at all it, is to be made functional.

April 1971 and has 1310 daily observations. Serial Correlation used weekly, fortnightly and monthly from the 5 years as well.

The effectiveness of the RWH was examined by researching the stability of serial correlation coefficients, with European indexes. Changes in randomness, are clearer within European economies than American economies; nonetheless, the coefficients are slightly insignificant (R square of less than 40%), which is unimportant from the perspective of a market participant. Although they seem more important with diurnal value alterations, any investment approach attempting to utilise them would include excessive diurnal transactions. Lastly, the coefficients for discrete indexes were discovered to be constant. As there weren't any systematic arrangements for the coefficients, any strategy which aims for profit should do so on individual indexes, rather than the entire market. Clarifications may be found within the institutional and technical behaviours of European markets: thin markets, no control on inside trading, discontinuity in trading and loose obligations for information disclosure. The rest of the markets exhibit the same characteristics as the US, except UK. It may be anticipated that market ineffectiveness, which has been defined, might have a larger effect on the European's characteristics; this means that the findings should be taken tentatively. The academic used a sample of the indexes. Wall Street was found to be moderately effective and the proof above indicates that Europe's indexes can be placed into 2 groups:

(a) Indexes with a negative link and short term variations around the mean (high frequency). Some particular behaviours of European indexes may describe the changes from RWH. Despite the fact that the samples were not for studying the impact, a few cautious clarifications may be made. With slow adjustments to information a serial relation could be positively made. Due to the fact the overall insignificant information dispersal procedure and that inside info exists, a distributed lag model may be present. The market is quite think in comparison to a US stock market, (b) Indexes that have a deviating average positive link or long-term variations around the mean (low frequency).

The use of RWH had been investigated by Sharma and Robert (1977) with India (a lesser developed country) compared to developed economies (US and UK). Hence, the statistical investigation of BSE (Bombay Stock Exchange), a widely reflected market for common indexes was carried out, for independence and randomness. The findings were then comparatively analysed against the findings of LSE (London Stock Exchange) and NYSE (New York Stock Exchange). A parametric examination was employed to analyse independency, and a non-parametric for randomness. The discoveries shown within the study, used data ranging from 1963-73, 132 values of monthly data. Spectral Densities Estimation and Run Tests were also used in this research.

Compared to the 2 markets studied, the overall behaviours of F.T.A (London) are slightly varied. First of all, the variance and mean is greater than that of the United States of America and India. Nonetheless, this was not entirely significant. Within this research, any discrepancies discovered had not been explained. India's characteristics are indistinguishably different, compared to the two other markets – for statistics. The Run Test examination, for successive value variations, established the observed and predicted amount of runs are similar, which was the case for all the markets - probability equals 0.5 fall or rise. Furthermore, it was predicted, by spectral densities, that the 1st difference data for each market (log and raw transformed), proved that the data set had no efficient cyclic periodicity or component, and that it was random. It is clear that India's economy exhibited a random walk, meaning that it is similar to the developed nations investigated in this study.

Alternatively, according to Roux and Gilbertson's research study in 1978, the proof of non-randomness share value behaviour and the stock's ineffectiveness and non-weak-form competence for JSE and markets of India. Similarly, the research study by Poshakwale in 1996 found the same result. However, examinations by Omran and Farrar (2006), which implemented a Lo-Mackinlay Variance Ratio test and covered Israel, Turkey, Morocco, Jordan and Egypt, with the key indexes for the above shares using weekly time series from 01/1996 to 04/2000, rejected RWH for every one of the above exchanges, with the exclusion of "Israel TA100" which seemed to obey RWH. In contrast, Cheung and Coutts in 2001 established that HSI respects RWH and that the index is weak-form effective, upon examining RWH with the index, by implementing homo- and hetero-skedastic error variances. They also applied the Lo-Mackinlay variance-ratio alongside the homo- and hetero- skedastic error variances using daily data from 1st January 1981 to 30th June 1997.

These are the likes of Khababa (1998); Poshakwale (1996); Claessens et al. (1995); Roux and Gilbertson (1978); and Harvey (1994). Nevertheless, the developing and the less-developed markets are showing rather different and very divisive findings based on the research done on such markets. Weak-form efficiency has been observed, but the RWH can't be ignored either[96].

[96] Some of the researchers with such findings include Karemera et al. (1999); Urrutia (1995); and Dickinson and Muragu (1994).

While testing for weak-form, researchers were able to deduce two approaches for making the test as accurate as possible. In the first approach, they opted to solely rely on the known tools for statistics collection. In this approach, a simple purchase and hold technique will not become profitable if the data collected is in line with the general presumption of RWH for the freedom of value variations. In this, mechanical trading rules are said to be non-applicable. The second approach is rather more direct than the first one. This is because it directly targets the trading rules of the market to observe whether or not they can give more profits than the common buy and hold technique. This research is courtesy of Christos (1992, pp.21).

Other researchers have proven to be a bit different from the above. In a study of the GPW, it was discovered that weak method effectiveness doesn't apply, according to the study of Gordon and Rittenberg (1995). It is quoted in this report that the prices do not reflect what they should with regards to the information at hand, which gives investors enough time to take advantage of the lagging time.

However, there is mixed evidence regarding some of the weak-form stocks. The stock markets were selected from Brazil, Argentina, Mexico and Chile, according to Urrutia (1995). There was, in the above nations, a weak system, only with the results from run tests while the variance-ratio worked in rejecting RWH. This shows how mixed the evidence was.

While, in 1996, Poshakwale made use of daily time series, 1987-1994, so he could deliver evidence based on the weak-form effectiveness of the BSE. The study shows that this specific Indian Equity isn't weak-form effective.

A study by Chun (2000) concluded that Hungary's financial economy was a weak procedure share. When a study for PSE by Vosvrd et al. (1998) was conducted, the findings came out as rather surprising. The market refused the weak-form, and the Budapest SE also rejected the weak-form market. Grieb and Reyes (1999) also carried out the same research and produced similar findings on the Said Stock Markets with variance ratio tests rejecting a RWH.

The study has been analysed and unit root tests were implemented by Cooray (2004) in an interesting test of RWH in different equities for Germany, the US, Japan, Hong Kong and Australia and monthly market data from these countries were used in the study in the period between 1991-2003. It was found that all the six countries showed random walk[97]. This result was purely based on ADF and P-P (1970 and 1988), as well as the spectrum analysis.

[97] However, in another study by Gilmore and McManus (2003) on weak procedure, it was discovered that no RWH was present. The study region for that report was Czech Republic, Poland and Hungary in a period from 1995-2000.

4.2.1 Summary of Researches presenting relationship between RWH and Stock Price Behaviour:

Author(s)	Scope	Time Period	Sample Size	Macroeconomic Variables	Methodology	Main Findings	Critical Analysis
Bruno (1973)	France, German, the Netherlands, the UK Italy Belgium, Sweden, and Switzerland	March 1966 to April 1971	Daily	Stock Prices	Serial correlation test	Deviations from the random walk seem slightly more apparent in the European stock price behaviour than in the American price behaviour. However, the serial correlation coefficients are still quite small (R square of less than 4%) and probably negligible from an investor point of view.	Different tools produce enthralling outcomes and market efficiency evolves overtime. The present research is an enhancement of Bruno's research, as it took 20 years, 6 months data (daily, weekly and monthly) and in the framework of this research, Ljung-Box Q-Test, Mackinlay variance ratio test, Run test and Chow-Denning Multiple Variance Ratio Test were implemented.
Sharma and Robert (1977)	UK, USA and India	1963-1973	Monthly	Stock Prices	Run test and Spectral Densities Estimation	It is evident that stocks on the India Stock Exchange obey a random walk and are equivalent in this sense to the behaviour of stock prices in the markets of advanced industrialized countries (UK and USA) examined in their research.	The primary limitation of nonparametric methods is that the computation uses data windowing, resulting in distortion of the resulting PSDs due to window effects. This research was different in relation to investigation field as it was conducted in Bangladesh and the UK and this study as researcher took a rationalised data set for the period of January 1998 to June 2018. Moreover, in the present investigation, researcher combined Ljung-Box Q-Test, Mackinlay variance ratio test, Run test and Chow-Denning Multiple Variance Ratio Test
Omran and Farrar (2006)	Egypt, Jordan, Morocco, Turkey, Israel	Jan'1996-April'2000	Weekly	Stock Prices	Lo-Mackinlay Variance Ratio test	The stock prices did not follow Random walk in all of the markets, except Israel TA100	In the current examination, researcher took latest tools, for instance, Ljung-Box Q-Test, Mackinlay variance ratio test, Run test and Chow-Denning Multiple Variance Ratio Test, also took daily, weekly and monthly data set to find out a fascinating result.
Cheung and Coutts (2001)	Hang Seng Index on the Hong Kong	01Jan' 1985-30June' 1997	Daily	Stock Prices	Lo-Mackinlay variance ratio tests	The stock prices did not follow Random walk.	The gap created by this study is the comparative study between developed and emerging markets. Furthermore, researcher combined Ljung-Box Q-Test, Mackinlay variance ratio test, Run test and Chow-Denning Multiple Variance Ratio Test for best examination. Moreover, researcher took daily, weekly and monthly data set.
Cooray (2004)	U.S, Japan, Hong Kong, Germany, Australia, U.K	1991-2003	Monthly	Stock Prices	Dickey-Fuller and Phillips-Perron	The stock prices followed Random walk in all of the markets	Different tools produce enthralling outcomes and market efficiency evolves overtime. The present research is an enhancement of Cooray's research, as it took 20 years, 6 months data and in the framework of this research, Ljung-Box Q-Test, Mackinlay variance ratio test, Run test and Chow-Denning Multiple Variance Ratio Test were implemented.

In some parts of Asia, mostly the southern parts, it is reported that RWH is a key factor which cannot be ignored for it contributed to share variations in the DSE and BSE. Abraham et al. (2002) and Abeysekera (2001) came up with rather conflicting reports from the above. The first three researchers disagreed with the weak-form efficiency for some indices in developing countries like Sri Lanka, Saudi Arabia, Kuwait and Bahrain[98].

Remarkably, Worthington and Higgs (2006) did a test and examined the stock market trends in ten emerging markets in the Asia region for the sample period spanning from 1986 to 2003[99]. The methods of study were unit root tests (ADF, P-P), run tests, and multiple variance ratio tests. The random trend test concluded that there were no random walks in all the markets that were under study. The unit root test was totally different with serial correlation tests, concluding that there was weak-form in all the exchanges under study. The only exceptions were Taiwan and Australia for unit-root. Variance ratio test findings exhibited no RWs hence no room for weak-procedure effectiveness, although the emerged exchanges in three countries i.e., Japan, New Zealand and Australia showed reliability in the random walk process.

Hoque et al., in 2007, conducted a newer study that studied 8 Asian nations including Hong Kong, Indonesia, Malaysia, Philippines, Singapore, Taiwan and Korea. This study covered a data from 04/1990 to 02/2004 and the tools they used were Lo and Mackinlay, as well as the Chow-Denning Variance Ratio. The analysis revealed that equities of nations don’t respect RWH, with the likely exclusion of Korea and Taiwan.

Moreover, in 2007, another research study conducted by Gupta and Basu observed weak procedure in the 2 highest Indian exchanges – the BSE and NSE. They used daily data from 24/05/1991 to 26/05/2006, and they implemented ADF, P-P and KPSS Tests. The outcomes showed that the exchanges were not weak procedure

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[98] In Nigeria, the above researcher (Abeysekera, 2001), sampled 24 companies to disregard the weak-form hypothesis in the country.

[99] The eight countries under the Asia region were: China, India, Taiwan, Pakistan, Malaysia, Thailand, Korea and Indonesia; as well as advanced nations which included Singapore, Australia, Japan and Hong Kong.

[100] However, Mookerjee and Yu, in 1999, also utilised diurnal data from the original trading days for Shenzhen and Shanghai equities up to 17/12/1993. Based on the empirical data, they refused RW inferences based on EMH.

4.2.2 Summary of Researches presenting relationship between RWH and Stock Price Behaviour:

Author(s)	Scope	Time Period	Sample Size	Macroeconomic Variables	Methodology	Main Findings	Critical Analysis
Worthington & Higgs'06	Developing country: China, India, Indonesia, Korea, Thailand, Malaysia, Pakistan, Philippines, Sri Lanka, Taiwan. Developed country: Japan, Hong Kong, New Zealand, Australia and Singapore.	1986-2003	Daily	Stock Prices	Unit root tests (ADF, P-P), Run tests and Chow Denning multiple variance ratio test	Run test: The stock prices did not follow Random walk in all of the markets. Unit root (ADF, P-P) tests: The stock prices follow weak form efficiency in all of the markets, except Taiwan and Australia. Multiple variance ratio tests: The stock prices neither followed Random walk nor weak form efficiency in all of the markets, except Japan, New Zealand and Australia.	In the course of the present study, investigator pooled Ljung-Box Q-Test, Mackinlay variance ratio test, Run test and Chow-Denning Multiple Variance Ratio Test and renovated the data set in the form of daily, weekly and monthly.
Hoque,Kim And Pyun (2007)	Hong Kong, Indonesia, Malaysia, the Philippines, Singapore, Thailand, Taiwan and Korea	April'90 to Feb'04	Monthly	Stock Prices	Lo-Mackinlay and Chow Denning Variance Ratio Tests	No Randomness in the all markets	In the present investigation, researcher combined Ljung-Box Q-Test, Mackinlay variance ratio test, Run test and Chow-Denning Multiple Variance Ratio Test and modernised the data set.
Gupta and Basu (2007)	India (BSE and NSE)	24 May'1991-26 May'2006	Daily	Stock Prices	ADF, P-P, KPSS Tests	The stock prices do not follow Random walk in all two exchanges as the volatility spilled-over across the both markets.	A foremost shortcoming for KPSS is, it comprises large range of Type I errors which inclines to dismiss the Ho very frequently. If tries are ended to eliminate such inaccuracies, by requiring bigger p-values (Kocenda and Cerný, 2017), which means that adversely effects the power of KPSS. To remove this affect, the present research took P-P, ADF tests as well as enhanced tools; Ljung-Box Q-Test, Mackinlay variance ratio test, Run test and Chow-Denning Multiple Variance Ratio tests.

Al-Khazali et al. (2007) investigated the performance of indexes for 8 Middle East and North Africa countries Kuwait, Jordan, Bahrain, Tunisia, Saudi Arabia, Oman, Morocco and Egypt using weekly time series from 10/1994 to 12/2003 and they used run and Lo-Mackinlay variance ratio tests. They discovered no RWH, which they imagined because of thin and rare trading for various equities within the indices.
Similarly, in another research study on weak procedure effectiveness, it was discovered that some European countries, like France, Germany, the UK, Greece and Spain had their stock indexes labelled as weak-form markets. The research conducted by Borges (2008) relied on statistical data from 1993-2007[101]. He conducted the research by using a run test along with the Lo-Mackinlay variance ratio test. However, she also decided to make a sub-division on the number of years across a five-year observation period. This gave time for structural changes, if there were any. The market would follow random walk in some period and decline to follow it in other periods.

In 2008, differs from the results of the research study by Antoniou et al. (2008), who used 20 companies that satisfied the declared conditions, and they then made an index. The research used monthly time series from this index, for the period of 01/1986-11/2005, and the findings proved that there was weak-form in Borsa Istanbul.

The mixed results were found by Roy (2018) who examined the market effectiveness and RWH in five of the topmost important stock markets, predominantly EuroStoxx 50, BSE, SSE Composite Index, LSE and Keizai Shinbun (NIKKI). The methods of study implemented were multiple variance-ratio, unit root and serial independence tests. It is established that multiple variance ratio tests results showed that there was no RW for diurnal stock prices for indexes and that in limited scenarios, they were recognised on the basis of other test results. To demonstrate the same result by Fadda (2019), the empirical results reject the RWH for all of the eleven tested indexes over the whole sample disproportionately, as far as the US stock market is concerned. He used daily and weekly data from the eleven indexes for the period spanning 2006 to 2016 from the IBEX35(Spanish), DAX(German), BSE30(India), HANG SENG (Chinese), Nikkei (Japanese), NYA (US), DJI (US), NASDAQ (US), SP500(US), FTSE100 (UK) and CAC40 (France) stock markets; the Lo-Mackinlay technique was implemented. Godwin (2010) and Power and Field (2009) also carried out a research study that proved that the shares hold a weak procedure, and therefore are poised to follow RWH.

[101] Borges (2008) ensured that all the closing values of the mentioned period were computed as per monthly basis giving nearly 3880 observations on a day. The researcher used various methods to compile her final data set over the 15-year span.

4.2.3 Summary of Researches presenting relationship between RWH and Stock Price Behaviour:

Author(s)	Scope	Time Period	Sample Size	Macroeconomic Variables	Methodology	Main Findings	Critical Analysis
Borges (2008)	France, Germany, the U.K, Greece, Spain	1993-2007	Daily	Stock Prices	Run Test and Lo-Mackinlay Variance Ratio test	Stock prices follow Random walk and Weak Form efficiency but declined in the last five years of the data set	Diverse methods provide rousing results and Market efficiency progresses overtime. Ljung-Box Q-Test, Mackinlay variance ratio test and Chow-Denning Multiple Variance Ratio Test were applied in the present study.
Roy (2018)	EuroStoxx 50, Bombay Stock Exchange, Shanghai Composite Stock Exchange, London Stock Exchange, Nihon Keizai Shinbun(NIKKI)	Jan'2001-June'2016	Daily	Stock Prices	ADF, P-P tests, Multiple Variance Ratio tests, Run test	No Randomness in the all markets	The contemporary examination is an improvement on this investigation as researcher brought updated model Ljung-Box Q-Test, and run test, Ljung-Box Q-Test, Mackinlay variance ratio test and Chow-Denning Multiple Variance Ratio Test and included 20 years and six months daily, weekly, monthly data as well.

4.3 Long Run Equilibrium Relationship and Stock Price Behaviour: Empirical Evidence

This section of the research has outlined a variety of important research results, particularly in terms of new global markets, regarding the advantages of the changes to the effectiveness of international shares. Among the main points raised in this section was that it is feasible to estimate the imminent evolutions of new market stock values based on previous prices in domestic and non-domestic markets. This suggests that investors can benefit from high profits, and these results are significant for the EMH.

The role played by the stock market is of huge significance when it comes to the financial growth of a nation. Not only does it serve as a tool for mobilising domestic capital among investors, but its mere presence tends to boost the foreign investment climate in any nation. Capital markets, theoretically, integrate domestic real economic pointers in a nation as well as one external of the nation. It ties capital, trade and other forms of financial flows. Currently, a certain link that has attracted huge reactions is the one between EXR and the stock prices of a country.

Several studies have already documented the connection between stock values and real economic factors. Nevertheless, what is missing in literature is concerned with the analysis of the cointegration between macro stimuli and the indexes of the share instead of the composite index (Maysami et al., 2004).

Perhaps it is unlikely that all the information about the market is reflected by short-term interest rates. Huge evidence suggests that interest rates reflect rather quickly all the information that is publicly available. This implies that short-term interest rates tend to fulfil the conditions for the types of market efficiency that are semi-strong. Moreover, public information tends to dominate these markets while only a limited role is played by private information, relative to, for example, the stock market. Research studies have shown that interest rates usually respond rapidly to information which is believed by market participants to be important for establishing the standpoint for monetary policy[102].

[102] For instance, interest rates rapidly responded when the stock market changed unexpectedly when the monetary policy was being implemented by the Fed from directing M1 from 10/1979 to 10/1982 (i.e., Thornton, 1989; Roley and Walsh, 1985; Cornell, 1982, 1983).

Evidence also suggests that interest rates quickly respond to different macroeconomic information, through data from various periods (see Fleming and Remolona, 1997, for an outline for this research) and that they respond intraday with regards to various real economic declarations (i.e. Fleming and Remolona, 1999).

The longer the period taken to average interest rates, the higher the possibility of every rate portraying data this was portrayed first. This implies that IR tends to imitate info which isn't recognised publicly[103]. According to certain analysts, concluding that short-term interest rates may possibly fulfil the EMH negates the effect for short-run rates within several analyses of monetary policy, when short-run IR is considered as a variable selection for the central bank.

Other arguments are that the short-term rate in such a case does not need to be an EMH since its changes are entirely made in relation to previous data. Nevertheless, if an individual truly takes proof that rules of IR are far-sighted (i.e., Clarida et al., 2000), then there is a possibility that short-run IR follows EMH even when only the central bank decides it[104]. When EMH is applied solely to economic values, it reaches variances with the recently published Keynesian works. In this literature, certain models utilise future connections for yield (+inflation) resembling the value of assets circumstances (Estrella and Fuhrer, 2002). In fact, when out analysis is extended to such variables, identification problems that have been discussed above become extremely harsh since EMH performance may be from different factors within Vector Auto Regression aside from the interest rates or financial prices.

Additionally, research studies were carried out to determine the link between US share movement and money in the forex market. According to Homa and Jaffee (1971), the rise in money resulted in a growth in the proceeds derived from equity (data set: 1954-69). However, there was reaction of equities to sudden variations in finance in a research study carried out by Rogalski and Vinso (1977) who took quarterly timeseries, 1963-1974, and used a X^2 test. They used the stock price data from the USA-NYSE, SP500, DJIA and used money supply data as the macroeconomic variable, their results differed from those of Homa and Jaffee (1971) by indicating that precedent financial variations have no information that would help foretell the movement of stock.

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[103] Therefore, frequently imposed covariance restrictions for identification are usually more problematic when there is a lengthy period of averaging interest rates.

[104] Accordingly, whether or not the central bank or the market is responsible for determining the short-term interest rate, there is a possibility that IR acts in a consistent way alongside EMH beneath particular expectations (Clarida et al., 2000).

The link between stock profits per each month and inflation (both predictable and unpredictable) was established to be negative. This was according to the investigation done by Nelson (1976) by utilising the data from the United States stock exchange for the period ranging between 1953 and 1974. Ordinary stock effectiveness can be described as the degree to which investors cushion themselves from loss of investment in the stocks due to the doubt caused by inflation on the expected price of the products in the future (Bodie, 1976).

There is a serious issue that comes up regarding the capability of stock to work when putting across money to the top industrious divisions of the nation. It is important to consider whether there are different effects on stock prices from diverse amounts of M2. According to Kraft and Kraft (1977a,1977b), who studied America from 1955-74, the detection of a lead-lag relationship between shares and M2 do not affect the choice of definition used for M2, as various decisions of M2 techniques have varying effects on equities. For instance, the Canadian market is effective alongside a narrow M2[105].

Over the past 30 years or so, there has been much empirical research pertaining to the links between the exchange rates and the equities. There is a mixed significance and direction of manipulation between shares and EXR. Through the application of traditional statistical approaches, Ayarslan (1982) described the important link between the two financial factors, in a similar manner to the works of Dropsy and Nazarian (1994) and Ajayi and Mougoue (1996). The newly structured time series methods were employed since 1987 to look into the active link between the two factors.

An earlier researcher (Fama, 1981) discovered a highly important no-adverse link between GNP, capital costs and industrial production, as well as share yields, and the sample data set was from 1953-71. On the other hand, the same researcher discovered that in America, inflation and share profitability were negatively correlated.

Using the findings from Geske and Roll's study (1983), Kaneko and Lee (1995) undertook a re-analysis of Japan and US markets, using a sample period from 1975-93. In their analysis, they used the aspects raised by Chen et al. to discover the effect of logical financial news on share prices. The research established that in the United States, the term premium, risk premium and rate of production development by the industries occupy top priority.

[105] Contrarily, M2 is the number one pointer for shares (Mookerjee, 1987). Stock market however is delicate to distinctive procedures of M2, according to Jones and Uri (1987).

4.3.1 Summary of Researches presenting relationship between Long Run Equilibrium, Short Run Disequilibrium Adjustment Relationship and Stock Price Behaviour:

Author(s)	Scope	Time Period	Sample Size	Macroeconomic Variables	Methodology	Main Findings	Critical Analysis
Maysami and Koh (2000)	Japan, Singapore and USA	Jan'1988-Jan'1995	Monthly	Trade, industrial production, money supply, price levels, exchange rates, interest rates.	ADF, Johansen cointegration test and VECM	EXT and interest rate found long term positive relation to the Singapore stock market.	The gap created by this study is the comparative study between developed and emerging markets. The present research is an enhancement on this study as researcher took a dissimilar data set for the period of January 1998 to June 2018 and added P-P unit root test. Vector Error Correction model was carried out to analysing speed of disequilibrium adjustment.
Homa and Jaffee (1971)	USA- SP500	1954-1969	Quarterly	Money supply	Simple regression analysis	There was relationship from money supply to stock market of SP500.	Critically observing at this study, researcher can argue that the year of examination is not up-to-date and quarterly observed data. The loophole made by this examination is the strategy of investigation and these shortcomings are taken care of in the current exploration stretched out by the selection of most influential economic factors with most advanced cointegration measuring tool Johansen cointegration test along with ADF and Philips Perron unit root tests.
Kraft and Kraft (1977a,b)	USA	1955-1974	Monthly	Money supply	Simple regression technique	There was no relation between money supply to stock prices.	The drawback formed by this study is the comparative study between developed and emerging markets. Additionally, researcher implemented upmost technique (Johansen cointegration test) to find out long run relationship with the stock prices and selected microeconomic variables.
Kaneko and Lee (1995)	Japan and USA	1975-`1993	Monthly	Term premium, industrial production, inflation, consumer price index, oil price	Vector Autoregressive technique	Terms premium, risk premium and industrial production were influenced the stock markets in USA and Japan	The present research is an enhancement on this study as researcher took a dissimilar study field and implemented different variables to observe the effect on stock prices. Correspondingly, The gap created by this study is as researcher took a dissimilar data set for the period of January 1998 to June 2018.
Asprem (1989)	Switzerland, Netherlands, German and the UK	January 1995 and end on June 2014	Monthly	Imports, employment, inflation and interest rates	ADF, Johansen Cointegration Model.	In Switzerland, Netherlands, German and the UK, it was found that the association within macroeconomic factors and the stock values were the strongest. The findings were that both variables had a negative effect on FTSE100; nonetheless the impact of unemployment on FTSE was higher than CPI. The findings showed that UK's economy is effective, as it responds to new information.	Basically seeing at this investigation, researcher could consider that the time of assessment was not modern data set. These shortcomings are taken care of in the momentum research by utilized P-P for unit root test and it took 20 years, 6 months data. This research was also different in relation to examination field and a varieties of variables such as foreign remittance, Treasury bills, deposit interest rates per capita GDP, and balance of trade.

The linkage amongst asset portfolios, stock values and macroeconomic variables was researched by Asprem (1989) in 4 different European nations. Imports, employment, inflation, and interest rates had a negative relation to share prices. In Germany, Netherlands, UK, and Switzerland it was found that the association within macroeconomic factors and the stock values were the strongest, which means that important impacts on asset portfolios and stock markets are held by the variables for UK, Netherlands, Germany, and Switzerland. While making judgments knowledge about the macroeconomic factors should be known to the policy makers and market participants of the 4 countries. The outcome corresponds with the results of Fama & Schwert (1977) and Jaffe & Mandelker (1977), regarding market values and inflation. In contrast it was an investigation as to the long run connections amongst macroeconomic variables and the UK was carried out by Olsen (2014). UK's market is represented by FTSE 100 (Financial Times Stock Exchange 100 Share Index) and unemployment and CPI are the relevant variables, included in this examination. The sample data beings January 1995 and end on June 2014, for everything. ADF test was employed to examine if the variables were stationary or not and Johansen Cointegration was used to discern the association in the long run. The findings were that both variables had a negative effect on FTSE100; nonetheless the impact of unemployment on FTSE was higher than CPI. The findings showed that UK's economy is effective, as it responds to new information.

In order to investigate the market, IR and EXR, Bakaert and Hodrick (1992) employed vector auto-regressions, to know if a causal link existed. An open and closed economy examination was used, and the UK, United States of America, Japan and Germany were investigated. There was specific importance on the impact of US impacts and how it was reflected in the various nations. As vector autoregression gives a decent explanation for time series, it was the core model that was used, furthermore, dynamic feedback was part of the VAR. / Bilateral EXR had been utilised amongst both the vector autoregressions. Japan, Germany, UK and the United States of America were examined using data January 1981 to December 1989 (monthly). It was indicated that the market of Japan and the US hold a positive correlation with a lagged EXR (US), but negative in the case of Japan's market. Robust proof had also been found in Germany and the UK, for their EXR and markets. It was confirmed that the indices always hold a positive relation with foreign IR, but negative with US IR, whic satisfy the sensitivity test that was employed. Compared to every index, the foreign exchange seems to be less foreseeable. In relation to the VAR's long-run results, it was indicated that the mean reversion of US and UK market is present, but not in the case of Germany or Japan.

Common research of the US has been conducted by Pearce and Roley (1983). They examined the reactions of share values to changing factors (macro), which were characterised by money supply, and extended the study. The researchers applied a simple linear response model as a research technique and found negative responses that were statistically significant for price index of the producer prior to October 1979. Surcharge and discount rate followed for three consecutive years between October of 1979 and October 1982[106]. Despite the presentation of evidence on a behaviour shift in real interest rates by Huizinga and Mishkin (1986), who studied US interest rates for the monthly data periods after October of both 1979 and 1982 for the post-World War II period, there are some issues that need to be understood. It is therefore important to carry out an examination on their evidence on how the interest rates were affected after the month of October 1982. This would help come up with a proper identification of the shift that occurred in the prices of stocks. There are authors who had reported that interest rates after October of 1979 shifted, while stock prices remained constant in response to announcements on money in account of monetary policy implication.

An analysis carried out, from 1972-83, by Solnik (1987) in eight different developed nations (the US, the UK, Germany, France, Canada, Netherlands and Switzerland) using stock market data for each month, and those released quarterly, tried to reveal the association between actual share variation and forex rate. The conclusion reached was that the two variables had a negative connection. An examination carried out by Geske and Roll's (1983) provided practical support to Solnik's findings after undertaking the study to establish the connections between stock movement, actual activity, inflation and financial availability variations.

A research study by Bulmash and Trivoli (1991) between 1980 and 1990 indicated that in the US, the present equity value is linked affirmatively with shares of the previous month, federal supply, money supply, long-term joblessness, government-debt (tax-exempt), federal rate and M2. The stock bill, TBR, longer-lagged federal debt, recent money base and the intermediate-lagged treasury bill showed a negative correlation.

[106] In addition, Smirlock and Yawitz (1985) found similar reasons for changes in discount rates. From the different results that were found, it can be concluded that news pertaining to monetary issues affects processor stacks, while news that is not related to monetary issues havean insignificant influence on stock prices.

4.3.2 Summary of Researches presenting relationship between Long Run Equilibrium, Short Run Disequilibrium Adjustment Relationship and Stock Price Behaviour:

Author(s)	Scope	Time Period	Sample Size	Macroeconomic Variables	Methodology	Main Findings	Critical Analysis
Bakaert and Hodrick (1992)	The USA, Japan, German and the UK	January 1981 to December 1989	Monthly	Exchange rate, interest rate	Vector Autoregression Model	The evidence was found that the stock prices for the US and Japan are positively correlated with lagged US exchange rate, but negatively correlated with Japanese stock market. There is equally strong evidence of co-movement in the UK and German in their stock with exchange rate. However, interest rate has negatively related to the stock prices with all countries.	This study was different in relation to investigation field as it was conducted in Bangladesh and the UK. The gap created by this study is the method and fields of analysis and these weaknesses are handled in the present research extended by the choice of most neoteric tools Johansen cointegration test with ADF and P-P tests. It was fluctuating from the theoretical approach, timeframe and methodology as researcher implemented Toda Yamamoto test was carried out which was the created rendition of basic granger causality test and Johansen cointegration tests. Furthermore, researcher used a dissimilar modernised 20 years six months data set for the period of January 1998 to June 2018.
Pearce and Roley (1983)	USA	1979-1982	Weekly	Money supply	Simple linear response model	The investigation output showed that the money supply impacted the stock prices.	Simple linear response model is used to check the synaptic transmission from one variable to other; contrarily, the Johansen Cointegration model carried out in the current research which permits for over one cointegrating correlation. On top of that, the present research is an improvement of this study, as the researchers took a dissimilar study area and several domestic & global macroeconomic variables.
Huizinga and Mishkin (1986)	USA	1979-1982	Monthly	Interest rate	Simple regression technique	The interest rate positively linked with the stock market in the USA.	The gap created by this study is the method of analysis and these weaknesses are handled in the present research extended by the choice of variables.
Solnik (1987)	UK, USA, Switzerland, Netherland, Japan, German, France, Canada.	1972-1983	Monthly and Quarterly	Exchange rate and interest rate	Simple regression technique	There was negative relationship found between stock prices and both macroeconomic factors.	This study was different in relation to investigation field as it was conducted in Bangladesh and the UK as well as the variables such as foreign remittance, international oil price, Treasury bills, money supply, and balance of trade etc. It was also fluctuating from the theoretical approach, timeframe and methodology, for instance, ADF, P-P and Johansen cointegration test.
Baillie, Chung, and Tieslau (1996)	The USA, the UK, Japan, Italy, Israel German, France, Canada, Brazil, Argentina.	1960-1992	Monthly	CPI and inflation	ARFIMA-GARCH	Researchers find strong evidence of positive relationship with mean reverting behaviour for all countries except Japan, which appears stationary. The empirical regularities of the persistence of positive relationship between stock prices and inflation across countries.	As the fractional part is done due to a binomial series, the ARFIMA (autoregressive fractionally integrated moving average) is to be used for long time series when no additional information which can model the long term dependence (covariates) is available. However, An important issue in using this model is the possibility of conflating short and long memory. Depending on the estimation method used, outliers may also cause serious problems. Additionally, As in the methodology was used as GARCH which is not to be used in the present research. Since the present research is not to forecast the volatility.

Baillie et al. (1996) investigated utilisation for long-term models, wherein CPI was used for inflation amongst 10 nations. In order to calculate the Maximum Likelihood Estimates they applied a novel method for the ARFIMA-GARCH procedure, (which is partially integrated I(d)) with an overlaid static ARMA model in its conditional average. This long run procedure had been allowed to obtain conditional heteroscedasticity for GARCH. The inflation of CPI, had been examined monthly amongst 10 varying nations (post WW2) – United States of America, Japan, Germany, Brazil, Israel, Canada, Argentina, UK, Italy & France, the range was 1960 to 1992 and wasn't seasonally adjusted. An arrangement of tenacity and slow decay was noted and a positive association was discovered within all the economies, with the exception of Japan. A couple enquiries can be made, due to the predictabilities of the persistence of the relation amongst the inflation and market values, with respect to the policies regarding monetary and value-transmissions, which have a consistency with this behaviour.

The link amongst the markets (Netherlands, Canada, Japan, Germany, United States of America and UK) and EXR was examined by Bruce (1997), using monthly data from 1974-1994. It was driven by the variation in the global fiscal atmosphere, particularly the deletion of exchange limits and the resulting increase in monetary movements within the main markets and the increase of index factors within macroeconomic examinations. It was shown in the existent theoretical studies that there is a probability for the market and EXR to relate in a various ways. Therefore, the particular signs were primarily examined as an empirical matter. The core models used were VECM, cointegration and granger causality, so that short and long run can be investigated apart from each other. The results showed an inverse relation, and common cycles, but no common trends.

It was indicated that EXR and indices generally only show common cycles, but Germany demonstrated common cycles and trends. In general, EXR is more significantly impacted by the market, hence it was not the independent variable, this was to reproduce a wider spread of information. The exam and the findings proposed necessary policy inferences regarding EXR, and backed the existent information of which variables help to regulate EXR. Particularly, there is an important impact upon EXR in the short and long run, exhibited within the 2 examinations, suggesting that to regulate variations in EXR it must be measured.

Present proof backs the idea that expected variations in EXR is ascertained by risk differentials instead of stock, when utilising models to calculate EXR variations the differentials should be used. Sudden variation appears to significantly impact EXR. For instance 1987 (market crash) in a variety of examinations there was found to be significance, in the impact on EXR. Ergo, whenever global markets suddenly deviate, the establishments must deliberate on the impacts of investment and output, and consider or maybe even interfere with forex markets.

In contrast, for Germany the market periodically doesn't pass particular examinations, while the remainder are, this indicates a varied link within the rest of the economy and Germany, particularly industry. Germany obtains most of its money from banks, which are directly involved with firms. Hence, this exemplifies that UK and Germany have a possibility of remaining incompatible, while the UK stays capital based and Germany, bank based. It is possible that this variable is important in the standards of European economies compared to European integration. A few examination findings were approving of the UK, with the error correction term obtaining significance at 0.01, but the coefficient was around 0.4, suggesting that adjustment was quite rapid.

UK's market and rate of interest are suitably seen as a negative impacts. A market influx draws moneys to economy, which results with an increase for EXR. MS's coefficient showed that an increase would lead to a decrease for EXR. The significance of the long run money supply and market impact, is highlighted when a limit of the factor being equivalent to zero is put in place. Nonetheless, it is implicit that dominance is held by the market, through the insignificance of IR which has a minimal impact.

In Pakistan, Korea, the Philippines and India, Abdalla and Murinde (1997) investigated EXR, from 1985-94, by using a co-integration approach to look into the stock markets. According to them, there is no causality trend in Korea and Pakistan, which is the opposite from the Philippines and India. A relation of share prices to EXR is present in India, but vice-versa in Philippines. The characteristic of causal relationship between shares and macros has been investigated by Bhattacharya and Mukherjee (2003), annually 1990-91 to 2000- 01[107]. According to their results, there was no important relationship.

Moreover, Ibrahim and Yussof (1999) examined how the KLSE Composite Index dynamically interacted with the seven macroeconomic variables (IR, EXR, CPI, foreign reserves, IPI, M1 and 2). He conducted the research by utilising ADF, causation and cointegration tests and took monthly-data series from 01/1977 to 06/1996. He decided that equities in Malaysia were informational incompetent once he observed that macros contributed to the stock indices of

[107] On the other hand, variations for the Indian share amounts lead to a co-integrating link with the variation for values, short- and long-run IR and money supply, according to Mookerjee and Yu (1997).

Malaysia[108]. Most amusing, however, is the different findings that were found from the study of the Sri Lanka stock market (1986-96) by Premawardhana (1997) who identified an adverse link between share price and economic indicators.

Siddiki (2000), estimates the request for M2 within Bangladesh, employing autoregressive approaches to analyse cointegration. The presence of short-term and long-term links was examined with ARDL model, using data from 1974 to 1995. It was indicated that a constant and cointegration long-run link amongst the variables (per capita income, per capita broad money demand, unofficial EXR (UM) and domestic interest rates) and the market. As the dependent factor is cash, the findings show that UM and Bangladesh hold a negative relation, while income and interest are positive. The government has to apply attention to increase per capital income, in order to enhance monetary build-up, this is emphasised by MS's income positive elasticity. The high income elasticity, shows the major suspicion of other markets, this highlights the significance of governmental activity pushing for a growth in the credibility and availability

[108] Similar results were observed by Chong and Goh (2003), showing that Malaysia's stock prices, IR and economic activities were long-term linked in the post- and pre-reserve control sub-times.

4.3.3 Summary of Researches presenting relationship between Long Run Equilibrium, Short Run Disequilibrium Adjustment Relationship and Stock Price Behaviour:

Author(s)	Scope	Time Period	Sample Size	Macroeconomic Variables	Methodology	Main Findings	Critical Analysis
Bruce (1997)	The Netherlands, Canada, Japan, Germany, the USA and the UK	1974 to 1994	Monthly	Exchange rate	Granger causality test, Johansen Cointegration test and Error Correction Models	The research shows that stock prices and exchange rates do not have common trends, but do have common cycles. In general exchange rates and stock prices are found to be inversely related. The exception to this result occurs with Germany, which shows evidence of both common trends and common cycles. Overall the stock market has a more significant effect on the exchange rate than vice-versa, reflecting the greater information incorporated in stock prices. A particularly favourable result occurred with the UK test with both the error correction term being significant at the 1% level of significance. However, the coefficient on the error correction term is roughly 0.4, so adjustment occurs fairly fast. In the UK the stock market is correctly signed as a negative influence, as is the interest rate, suggesting in the UK the stock market plays the dominant role.	The current examination is an amelioration of this study, as the researcher took a dissimilar study area and took several domestic & global macroeconomic variables; for instance, foreign remittance, Treasury bills, deposit interest rates per capita GDP, and balance of trade. Furthermore, the ADF, P-P unit root tests; Johansen cointegration test and Toda Yamamoto test was implemented which was the developed version of simple granger causality test. Vector Error Correction technique was utilized to estimate speed of disequilibrium change. The modern techniques, for instance, Ljung-Box Q-Test, Lo-Mackinlay variance ratio test and Chow-Denning Multiple Variance Ratio Test were applied in this study to examine market efficiency.
Abdalla and Murinde (1997)	Pakistan, Korea, Philippines, India	1985-1994	Monthly	Exchange rate	DF, ADF, Vector Autoregressive Model and Engle granger two step method	There was no causality found except for Philippines and India; however, stock prices caused to EXR for India and EXR had unidirectional relationship to stock for Philippines.	The contemporary research is a development on this study as researcher took a dissimilar study field and conjectural approach. Analyst used different tools, for instance, Johansen cointegration model as the all variables were set stationary at first level *I(1)*. Whereas, Abdalla and Murinde used Vector Autoregressive Model as all their variables were set stationary at level I(0). Moreover, Toda Yamamoto test was implemented in the present study which was the developed version of simple granger causality test.
Ibrahim and Yusoff (2001)	Malaysia	1996-1998	Monthly	Real output, price level and money supply	ADF and Johansen cointegration test	Long run positive relation was found from stock prices of Malaysia to M2, but negative relation was discovered with real output and price level.	Critically look at this effort, it can be observed that the researcher took very short periods in their research and naturally, that is very challenging to foresee and elucidate the condition of the market. The present research is an enhancement of the above research, as it took 20 years, 6 months data and a comparative study between United Kingdom and Bangladeshi Stock Markets.
Siddiki (2000)	Bangladesh	1974 to 1995	Monthly	Broad Money (M2), per capita, real per capita income, domestic interest rates, exchange rate.	Autoregressive Distributed Lag Model	The researcher show that stock market has a unique cointegrated and stable long-run relationship among real per capita and broad money demand, real per capita income, domestic interest rates. Furthermore, the researcher observes that distortions in the foreign exchange negatively affect stock market.	This study was different in relation to investigation field as it was conducted in Bangladesh and the UK as well as took several domestic & global macroeconomic factors. It was also fluctuating from the theoretical approach, timeframe and methodology. The gap created by this study is the method and fields of analysis and these weaknesses are handled in the present research extended by the choice of most neoteric tools Johansen cointegration test.

It is implicit that the government of Bangladesh has to discontinue the distortion of domestic IR and the market, due to the positive impacts of the IR on MS, to increase financial gains. It was also discovered that there is a negative association by deviation in forex markets upon the main market, this attests to the prediction of the degradation of BDT due to raised UM premiums. Consequently, BDT moneys are cheapened by managers, while USD is over-valued. The findings of the study show that Bangladeshi Government must either eliminate or decrease misrepresentations. They have to also deliver an agenda which is applied quickly to guard depositors.

Nasseh and Strauss (2000) discovered a substantial long-term relation between shares and local and global financial activity in Italy, Germany, France, Netherlands, the UK and Switzerland. They took quarterly data from January 1962 to April 1995. The researchers used ADF and the Johansen cointegration model as a research technique. Specifically, they discovered a significant positive ratio for IPI and CPI, and small (though non-negative) coefficients for business surveys of manufacturing and short-run IR. European share markets were found to have a strong integration against Germany. Furthermore, IPI and short-term rates positively impacted on shares in various stock markets in Europe, including in Italy, France, Switzerland, Netherlands and the UK.

Maysami and Koh (2000) conducted the study and investigated the equilibrium long-run relations with certain macros and shares in Japan, Singapore and the U.S. The month-end data is taken from January 1988 to January 1995 and is seasonally adjusted. When the correct VECM values were tested, it was that found variations of macroeconomic movements, including trade and IPI, were not combined in a similar direction as changes in Singaporean share levels. Nevertheless, a co-integrating relationship is not formed by the variations in Singaporean equity values when there are variations in M2, value amounts, EXR and short- and long-run IR. Although alterations within the exchange and interest rates significantly add to the co-integrating relations, money and value amounts don't. This implies that shares in Singapore are sensitive to exchange and interest rates. In addition, the study establishes that equities in Singapore are affirmatively and substantially co-integrated with American and Japanese markets.

Choudhry (2000), on the other hand, establised a constructive relation between inflation and stock price in 4 nations (Argentina, Chile, Venezuela and Mexico) which have high levels of inflation. These results are similar to the ones carried out in the Malaysian equity market before the financial crash period (e.g., Ibrahim and Aziz,2003; Ibrahim and Yussof, 1999).

Johnson et al. (2003) linked an affirmative association between actual equity values to EXR and actual gross domestic product for the Johannesburg's Stock Exchange. However, the connection was negative between treasury security rates and stock movement. This research was carried out for the for the period spanning 1985 to 1995. It is necessary to examine the relationships between macros and equities in order to determine the share market competencies and help the investors and policy developers to make informed choices.

Kim (2003) also analysed the presence of long-term equilibrium relations between industrial production, aggregate stock prices, interest rates, real EXR and inflation in the US. He implemented a co-integration methodology by Johansen. He found that between 1974-1998, the "S&P 500 Index" was related affirmatively to IPI and was related conversely to the other factors. When he used VECM, it showed that inflation, shares and IPI alter so as to rectify the dis-equilibrium amongst the 5 factors. Research studies show that the prices of stocks are mostly driven by innovations in the interest rate.

Another similar study was produced in Greece, during the sample period from 1988-99, which reviewed the evidence for the association between macro stimuli and shares, inclusive of CPI (inflation), and rate for 3 Months T-Bill (interest rate). The study set out an objective of assessing the effect of IR and inflation on the shares. Upon conducting the regression test, the findings showed that inflation has a substantial negative relationship (Apergis and Eleftheriou, 2002).

Despite the fact that their results are in line with those of Bahmani and Sohrabian (1992), the two downplay the previous research studies that point to a significant link between shares and EXR through their empirical work.[109] Arjun et al. (2010) investigated the association between share value and inflation in South Africa. It was found that actual values of stocks aren't impacted by a lasting alteration in inflation rate (long-term) and that abnormalities in actual share values (short-term) will become altered towards the actual share values in the long-term.

Moreover, they applied Engle-Granger two-step and Johansen co-integration techniques. It was shown by empirical studies that every variable is I (1) and co-integration proof had been found with the use of the Johansen cointegration technique. Moreover, the Granger test showed convincing indications for the existence of a long-term bilateral relation between the exchange

[109] According to Meese and Rogoff (1983), Baillie and Selover (1987), and Ghartey (1998), there are some links between exchange rates and macro-fundamentals. Additionally, empirical data for the link between shares value and macro-fundamentals are displayed by Bailey (1990) and Sadeghi (1992).

rate and shares. In terms of policies, these findings meant that Nigerian pecuniary officials are not forced to account for the development of the stock market and attaining their EXR strategy goal due to the interdependent characteristics among both. The scholars recommended actions which could enhance the efficiency and stability of the "foreign exchange market."

Chakravarty (2005) reviewed the relationship using industrial production as a macroeconomic variable for assessing the movement in the stock market in India. Using the Granger causality test, the results show unidirectional movement from industrial production to the stock market.

There have been similar research studies that have also been undertaken in New Zealand Investigating shares and real economic stimuli relationships, one such study is that of Gan et. al. (2006), who utilised data from Jan 1990 to Jan 2003[110]. The findings from New Zealand showed a long-term connection between shares and macroeconomic variables in this country. However, from the Granger causality tests, it is suggested that the stock exchange in New Zealand cannot be used as an efficient indicator because it is not consistent with other previous studies. The reason why the stock exchange in New Zealand cannot be relied upon is the low ratio between capitalisation and GDP, which leads to reduced change in the capital market. In this study, there is a negative response when inflation increases. This can be clarified by the fact that the New Zealand M2 is majorly organised by investors, and therefore when interest rates are high in the country, relative to further nations, stockholders opt to withhold their assets safely within the banks instead of risking them in investments. Meanwhile, when the IR is relatively small, the stockholders favour investment in different markets, which therefore means that the money supply in New Zealand is negative throughout. The results found that the NZSE40 was influenced by GDP, M1 and RI.

[110] The variables that were of interest include those of short and long IR, money supply, IOP in the retail market, GDP, exchange rate and inflation.

4.3.4 Summary of Researches presenting relationship between Long Run Equilibrium, Short Run Disequilibrium Adjustment Relationship and Stock Price Behaviour:

Author(s)	Scope	Time Period	Sample Size	Macroeconomic Variables	Methodology	Main Findings	Critical Analysis
Nasseh and Strauss (2000)	Germany, France, Netherlands, Italy, UK, Switzerland	Jan'1962-April'1995	Quarterly	Consumer price index and industrial production, interest rates	ADF and Johansen cointegration test	Long term positive association with stock prices and CPI, industrial production; positively relation from Industrial, interest rate to Stock prices.	Basically seeing at this investigation, researcher could consider that the time of assessment was not modern and quarterly observed data set. These shortcomings are taken care of in the momentum research by utilized P-P for unit root test and it took 20 years, 6 months data.
Maysami and Koh (2000)	Japan, Singapore and USA	Jan'1988-Jan'1995	Monthly	Trade, industrial production, money supply, price levels, exchange rates, interest rates.	ADF, Johansen cointegration test and VECM	EXT and interest rate found long term positive relation to the Singapore stock market.	The gap created by this study is the comparative study between developed and emerging markets. The present research is an enhancement on this study as researcher took a dissimilar data set for the period of January 1998 to June 2018 and added P-P unit root test. Vector Error Correction model was carried out to analysing speed of disequilibrium adjustment.
Kim (2003)	USA	1974-1998	Quarterly	Industrial production, interest rate, exchange rate, and inflation	ADF, Johansen cointegration test and VECM	Study revealed that negative relation occurred with S&P 500 and interest rate, exchange rate, and inflation, but positively linked with Industrial production. By using VECM technique, it discovered that industrial production and inflation in disequilibrium state.	Fundamentally seeing at this investigation, analyst can contend that the time of assessment isn't modern and quarterly observed data. The present research is an enhancement on this study as researcher took a dissimilar data set for the period of January 1998 to June 2018. Vector Error Correction model was carried out to analysing speed of disequilibrium adjustment.
Gan et. al (2006)	New Zealand-NZSE40	Jan'2090-Jan'2003	Monthly	Interests rate, money supply, oil price in retail market, GDP, exchange rate and inflation.	ADF, Johansen cointegration test and Granger Causality test	The study examined that interest rate, M2, GDP impacted; however, Oil price, EXR and inflation had no linked with stock prices.	This momentum research was diverse according to field of examination as it was looked at among Bangladesh and the UK. Besides, analyst took a long time series data set of January 1998 to June 2018 and Toda Yamamoto test which was the established version of simple granger causality test.
Humpe and Macmillan (2007)	Japan and USA	June'1965 - June'2005	Monthly	Industrial production index, consumer price index, interest rate, money supply	ADF, Johansen cointegration test and Vector error correction model	The investigation revealed that in terms of USA-IPI was positively; CPI, interest rate was negatively and M2 was positively but insignificant linked with stock prices. On the other hand, Japan-IPI was positively and M2 were negatively associated with the stock market.	The downside made by this examination is the strategy for investigation and these shortcomings are taken care of in the momentum research by utilized ADF as well as P-P for unit root, Johansen cointegration model and selection of dissimilar macroeconomic variables. Vector Error Correction technique was utilized to estimate speed of disequilibrium change.

An outline for a standard-discount value-model is used by Humpe and Macmillan (2007) to investigate if various real economic stimuli had any impact on share values for the US and Japan. They implemented the VECM for the period spanning June 1965 to June 2005. They applied Johansen's test to model the long-term relation between M2, CPI, share values and IR (long-term) within Japan and the U.S. The scholars found the U.S. data to be steady alongside a single cointegrating equation. Moreover, share values were shown to have a constructive relation alongside IPI, and an adverse relation against both the long-run CPI and IR. In addition, they found a relationship that is insignificant between the US Shares and M2. Nevertheless, two co-integrating vectors were found for the Japanese data. Moreover, for the first vector, they found that shares had been positively impacted by IPI, but adversely influenced by M2. Meanwhile, for the secondary vector, they found that IPI is influenced destructively by long-run CPI and IR. The conflicting findings could have been caused by a decline of Japan in the late 1900s and a subsequent cash deception (McMillan, 2001; Chaudhuri and Smile, 2004).

Gay (2008) worked on the different dimensions and conducted a comparative analysis of the four emerging BRIC markets for shares and real economic stimuli. The author utilised oil prices, in addition to EXR against shares but failed to establish any relationship across all countries. Hence, the author in conclusion referred to a wide range of domestic, as well as international factors, that have caused the no relationship results.

On the other hand, Liu and Shrestha (2008) analysed the relationship between stock and RI using Johansen-cointegration-analysis-based results, they found the presence of a relationship in the long-term. The Impact amount for the RI fluctuation was subject to the size of the bank for which influence is being considered. An important contribution revealed the significant and negative impact of the RI on share value through the period of 1981-1997. The results implied a semi-efficiency status for the KSE (Al-Qenae et al., 2002).

The assessment of the dependable connection between shares and real economic stimuli continues to be the subject of curiosity for many stakeholders (Wong et al., 2006; Thornton 1993). Inflation rates, RI term structures, and MS have an influence on the later consumption and investment decisions; hence, Chen (2009) considered them to be useful predictors of stock market performance movements. Resultantly, the variables are capitalised for anticipating economic procedures that can cause stock market fluctuation. Hence, such relationships can be useful to the stakeholders in coming up with strategies for benefiting from market-timing.

Taking everything into consideration, according to Rahman and Uddin (2009) and Muhammad and Rasheed (2002), variations in EXR do not impact shares and vice versa. Numerous studies, however, reveal the presence of a bilateral causation between shares and EXR (Bahmani and Sohrabian, 1992; Kumar, 2009; Aydemir and Demirhan, 2009; Pan et al., 2007; Ajayi and Mougoue 1996, etc.). Conversely, a study was conducted in Ghana by Siaw (2011) from 1990-2006, which showed that the exchange rates are related in a positive manner to GSE. The same study showed that in the GSE, the inflation and money supply are related negatively.

An examination was carried out by Humpe and Macmillan (2009) using a standard discount value framework. They investigated how macroeconomic stimuli impact the UK, Japan & US. They employed P-P and ADF Run tests, then Johansen Cointegration. This was to ascertain whether a long-run association existed amongst CPI, M2, IR, TBR, Industrial Production and the markets. It used time series from January 1965- June 2005. The results were constant with a single cointegrating vector, for the UK and US, there was a negative link amongst the market and CPI & IR, but a positive link between the share values and industrial production, while an insignificant, but positive, association was discovered between M2 and the market. 2 cointegration equations, however, were discovered for Japan – the primary vector showed that there is a negative impact from M2 onto market values, but positive for industrial production and the secondary vector showed a negative impact by CPI, IR and industrial production. The liquidity trap and crash in the 1990s, are the most likely reasons for the contrast in discoveries.

Part of the applicable literature for this research is Fabio and Claudio's research (2009), they employed a VAR model to examine the movements within a group of macroeconomic variables for Canada, UK, Japan, US and the Eura area ranging from 1980 to 2005. Proof was also shown supporting co-movements amongst the variables, and are significant in the market values, while being an important aspect of real activity – interest and inflation rates, to a lesser amount, monetary aggregates. Co-movements internationally have been clarified with ideas similar to shocks, except for Japan where distinctive qualities dominate. Ultimately, proof is existent showing disturbances in global demand and supply, which is the nature of global shocks.

The macroeconomic and institutional variables of a developing stock market was investigated by Yartey (2010) using a variety of countries (Mexico, Saudi Arabia, Slovenia, Ecuador, Bangladesh, China, Ghana, Kenya, Romania, Panama, Pakistan, Peru, Brazil, Philippines, Jamaica, Malaysia, Nigeria, Thailand, Bolivia, Jordan, Venezuela, Bulgaria, Slovak, South Africa, Zimbabwe, Czech Republic, Columbia, Poland, Botswana, Turkey, Egypt, Hungary, Indonesia, Costa Rica, Chile, Tunisia, Morocco, Paraguay, Sri Lanka, India & Argentina), 1990-2004. Simple regression and GMM were employed, and interesting findings were discovered. Variables like bank credit (and the square), inflation, liquidity, gross domestic investment and GDPCAP, were included in the author's regression examination – Model 1. It was found that GDPCAP, bank credit, liquidity, and gross domestic investment, along with the lagged dependent factor, contributed to a positive impact and were also significant. Bank credit was found to be significant, but negatively impacts the stock market, showing that an association between the upper ranks of banking sector development and lower growth of the stock market is present, since local agents substitute debt for equity. Moreover, inflation wasn't statistically significant however had a positive impact. The market will increase by 7.23% when there is a singular point increase for GDP and for bank credit it goes up by 0.197%. To investigate the impact of the interest rates on the market, the author uses said data in model 2. The results show that GDP per capita, , gross domestic investment, lagged capitalization ratio, market prices and bank credit are all positive and significant. It has the anticipated negative symbol though for certain countries there is no statistical significance.

The impact of domestic savings on the stocks is looked at in model 3, the variable in question was used as a portion of GDP. The findings indicate that GDPCAP, value traded and bank credit all are significant and have positive links. There is an insignificance with savings, however a positive relation is present. The autocorrelation and Sargan examinations encourage the GMM estimate. The effect of FDI (foreign direct investment) upon the market for the remaining nations is examined in model 4. The author utilises FDI as a percentage of GDP. The findings indicate that foreign direct investment is statistically significant but positive. An integral variable in undertaking investment conclusions is to know that the better reputed a firm is, the less political risk it has. Law & order, democratic accountability and bureaucracy are key to the market developing in emerging nations.

The association between economic development and the behaviour of shares was analysed in the research study carried out by Reddy and Gupta (2011). The study also reviewed the forces at work in the shares for the long- and short- term, using monthly data from 1996 to 2009. The studied factors included IIP on a monthly basis while GDP data was studies on a quarterly basis, along with the BSE and NSE Index statistics. The analysis of the monthly outcomes related to Granger concluded the presence of a bilateral connection between IIP, BSE, and

NSE. Furthermore, a review of the quarterly outcomes failed to prove any connection between the GDP and BSE[111]. However, the review of the relationship between the NSE and GDP found a unidirectional association going from the GDP to NSE. The co-integration test based on the Engle Granger residual highlighted the presence of a long-run association between economic development and the behaviour of shares. However, Gençtürk et al. (2012) reviewed the relationship with regards to stock in Istanbul (ISE) and a unidirectional relation was asserted using industrial production as a macroeconomic variable.

The durable association between shares and M2, IPI, EXR and inflation in Turkey was assessed by Ahmet (2012) who concluded that there is a long-lasting connection between the earlier mentioned components and stock prices[112].

An affirmative association exists between the GDP and US shares, in accordance with Yu Hsing et al. (2012). They applied an Exponential Generalised Autoregressive Conditional Heteroskedastic test for the period of Q1:1998-Q2:2011 as a quarterly data set. The other positively associated variables are stock earning, the UK share, and the trade weighted nominal EXR. However, there is a negative association with government-debt, GDP proportion, actual TBR, the M2/GDP ratio, expected inflation rate, real corporate bond yield and the UK Treasury bill rate[113]. The stock prices are expected to be hurt by the rising government debt/GDP ratio, and they will be kept low by the relatively low interest rates. Due to potential impacts on inflation and interest rates, the rising government debt/GDP ratio is expected to do harm to the stock prices. The US share index is also hurt by the depreciating value of its currency.

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[111] Furthermore, in the Indian context, Kumar (2009) reviewed the cause and impact association between the real economic stimuli and share index. The macroeconomic indicators used for the study included FDI, BOT IIP, and WPI. The results of the study showed that an underlying relationship between macroeconomic variables, which do not have co-integration with Nifty, was not found. Nifty and WPI do not Granger cause each other.

[112] Similarly, the analysis of the relationship between the exchange rate and the prices for gold with the BSE in the work of Sharma and Mahendru (2010) concluded that the inflation rate and Forex reserves had a limited effect on the stock index, while gold prices and the rate of inflation showed a profound impact on the stock indices.

[113] There can be a certain effect on the empirical outcomes from the choice of a suitable exchange rate. Because of this, there is need for more economical growth and better earnings; this must indicate better share values.

4.3.5 Summary of Researches presenting relationship between Long Run Equilibrium, Short Run Disequilibrium Adjustment Relationship and Stock Price Behaviour:

Author(s)	Scope	Time Period	Sample Size	Macroeconomic Variables	Methodology	Main Findings	Critical Analysis
Humpe and Macmillan (2009)	Japan, the UK and the USA	January 1965 to June 2005	Monthly	Industrial production, the consumer price index, money supply, long-term interest rates, Treasury bill rate	Augmented Dickey– Fuller, Phillips–Perron tests, Johansen Cointegration Model	For the US and the UK, researchers find that the stock prices are positively related to industrial production and negatively related to both the consumer price index and the long-term interest rate. They also find an insignificant (although positive) relationship between the US and UK stock prices and the money supply. However, for the Japanese data, they find that stock prices are influenced positively by industrial production and negatively by the money supply. For the second cointegrating vector (for Japan), they find industrial production to be negatively influenced by the consumer price index and a long-term interest rate.	The present research is enrichment on this study as researcher took a dissimilar and comparative study field and implemented different variables to observe the effect on stock prices. Furthermore, researcher implemented Philips-Perron test to add a strong argument in terms of stationarity test validation.
Fabio and Claudio (2009)	The Euro area, Japan, the US, Canada and the UK.	1980–2005	Monthly	Inflation rates and interest rates	Vector Autoregressive Approach	Evidence those co-movements in macroeconomic variables and stock prices, with the only exception of Japan, where the idiosyncratic features seem to dominate.	This research was different in relation to investigation field as it was conducted in Bangladesh and the UK as well as the variables such as foreign remittance, international oil price, Treasury bills, money supply, and exchange rate. Moreover, on this study, researcher used a dissimilar modernised data set for the period of January 1998 to June 2018. Moreover, analyst used different tools, for instance, Johansen cointegration model as the all variables were set stationary at first level I*(1).*
Reddy and Gupta (2011)	India-Bombay Stock Exchange and National Stock Exchange	April'1996 - March'2009	Monthly	Industrial production index, GDP	ADF, Granger Causality test, and Engle-Granger Cointegration test	Granger causality test found that IPI had bidirectional with BSE and NSE; however GDP had unidirectional association with NSE; Engle cointegration test found IPI and GDP both were cointegrated with BSE and NSE	The gap created by this research is the method of analysis and these weaknesses are handled in the current research by the ADF, P-P, Johansen cointegration model and choice of variables. Here is important to note that Johansen cointegration test is the most advanced cointegration measuring technique than the Engle-Granger Cointegration test and this test is a test for cointegration that considers more than one cointegrating relationship, not at all like the Engle–Granger strategy.
Khan (2013)	Pakistan	2005-2013	Monthly	KIBOR(Karachi Interbank Offered Rate), crude Oil prices, exchange rate and consumer price index	Johansen cointegration test and granger causality test	CPI, Crude, exchange rate have influenced to the Pakistan stock market, and CPI, crude oil have correlated with stock markets.	The shortcoming made by this investigation is the comparative examination among advanced and developing markets. Additionally, researcher carried out Toda Yamamoto test which was a sophisticated edition of basic granger causality test.

Seong (2013) recorded an important short- and long-term adverse association between share prices and EXR and they have an influence on the stock prices. Tsai (2012) observed the presence of an adverse association between stock markets and foreign exchange markets, which was notable whenever EXR was either very low/high. Kutty (2010) acknowledged a temporary association between EXR and shares, but failed to expose a long-lasting connection between the components. A Granger causality test had been implemented to determine the connection between the components in the research.

Khan (2013) also applied cointegration and Granger-causality tests to analyse data collected over a 108 month period from 2005 to 2013 in Pakistan. The selected variables for review included KIBOR, Crude Oil Prices, FOREX rate PKR/USD, and CPI. The research also tested for the underlying assumptions for the selected models and their applicability. Trace and Max-Eigen Value tests, both of which are co-integration tests, revealed that three variables have co-integration. The use of the Granger application showed the presence of causativeness Stock to CPI and Crude Oil Prices.

Similarly, another recent attention-grabbing study by Khan and Yousuf (2013) examined the effects of selected macroeconomic variables on market processor stocks within Bangladesh. DSE represents the stock value index and share values and macroeconomic stimuli are presented by CPI, EXR, M2 and IOP. A monthly time series was used, from 1992 and 2011 respectively, and analysed using techniques of viz. VECM and ADF. The Johansen co-integration test suggests a non-negative connection between money supply, IOP, IR and shares while an adverse link is present between exchange rate and share price. CPI is noted to insignificantly affect the prices of stocks. VDC and IRF suggest variance error in DSI, which shocks macroeconomic variables if it persists for long.

The effect of macroeconomic factors against FTSE100 Index was investigated by Olsen (2014). Interest Rate (IR), Consumer Price Index (CPI), Money Supply (M1), Exchange Rate (EXR) and Industrial Production Index (IPI), were the chosen variables and the range was a monthly sample beginning on January 1995 and ending on December 2014. VECM was utilised in order to ascertain equilibrium relationships in the short and long term, Johansen Cointegration and Unit Root Tests were also employed. A long-run link was deduced from the cointegration links within the variables, M1, IPI and IR had a long-term association and were cointegrated. Against FTSE100 EXR and CPI were shown to have a positive relation during the long term; in contrast IR, M1 and IPI exhibited negative associations. The results of the VECM suggest that IPI and

EXR help to correct disequilibrium, due to the fact that they adjust to equilibrium in the long-term but deviate in the short-term. IPI and CPI were found to have a bidirectional relationship, using Granger Causality Test and a unidirectional relationship existed amongst: FTSE100 & IPI; FTSE100 & EXR; IR & IPI; M1 & IR; M1 & IPI, EXR & M1 and EXR with IPI.

According to the Mazuruse (2014), exchange rate, CPI, money supply, and treasury bills lead to a variation of optimisation in ZSE's shares. The results were produced from the application of Canonical Correlation Analysis (CCA)[114]. Furthermore, Yu Hsing et al. (2012) deployed different applications and discussed the relationship under review. The factors used in the studies included M2, National-Income, WPI, inflation, IPI, FII, FDI, EXR, IR, trade openness, and GDP. The findings concluded the existence of an affirmative effect from all those variables on shares trends[115].

The study presented by Chee and Lim (2015) reviewed the association with shares in the Malaysian stock market with reference to macroeconomic factors[116]. The evidence of a relationship in the long-run was found by applying the ARDL bounds test. The resulting coefficient stated the indirect and direct impact of inflation and the M1 and RI and stock market prices. The results turned significant on inclusion of the exchange rate from the analysis; hence implying the presence of EXR on equities. The results have policy implications that attempt to sustain the inflation rate producing an impact on the share. In fact, the relationship between the stocks and the movement of the inflation rate in the Malaysian market have considerable policy implications.

The rate of interest depicting the time value of the money is thought to be the key predictor for shares; hence it holds a central importance for being a macroeconomic determinant and being the cost of capital[117]. The stock to the interest rate has long held the attention of researchers and a review of the relationship has been produced in different contexts and countries using it individually and in combination with other variables as discussed here under.

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116 The reviewed variables included Inflation, IPI, IR, M1 and EXR Using the first four months from 1980-the tertiary four months of 2011.

117 Consequently, Variations in equities are reported because of movement in IR that squeezes profits for the business and increases challenges for investors (Amarasinghe 2015).

A similar relationship was again tested in the work presented by Reza (2015) for Pakistan and the selected economic variables included oil price, GDP, foreign exchange and cash. The monthly data was collected considering the role of seasonality for the period spanning 2001-2014. The study implemented a VAR approach and a Granger relationship test. A prediction error review in the results concluded that the stock market receives considerable long-term influence from the foreign exchange rate while the remaining variables' impact continued to decline over the course of time.

Joshil and Giri (2015) probed the dynamic long-term and short-term association between macroeconomic factors and the share market[118]. For determining the level of forecasting error change of a condition-based share fluctuation that is depicted by modernisations of every clarifying provisional macro factor, the researcher applied Variance Decomposition (VDC). According to the results, a long-term co-integrating association within factors was evident. The results also confirmed that the Inflation, IPI and EXR will affect shares directly. Contrarily, the impact from gold price is negative. The results from the VECM found that from all the selected variables, in long-run, the causality goes to the stock prices. The decomposition of the variation revealed that development in Indian shares is significantly evidenced from shocks coming from within.

A succeeding study was done by Rudra et al. (2015) focusing on the association amongst economic development and market values, depth in the stock market, oil prices, alongside rate of inflation, interest rate and exchange rate. VAR was utilised to examine the granger causality amongst G-20 nations, the data set ranged from 1961 to 2012. This new method had a separation between short and long run association within the variables. The findings showcase a long-run link, amongst IOP, economic development, stock market depth, inflation rate, EXR and interest rate. It was discovered that economic developments reacts to variations with the variables, in the long-run. Nonetheless, in the short-term a sophisticated network of causalities existed amongst the factors. Albeit the inconsistency of the causal relations for the short-term's empirical proof, proof is available indicating that economic development reacts to market depth. This permits the movement of IOP and EXR, along with the interest rate and inflation rate.

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[118] The sample data used for the purpose included monthly information from 04/2004-07/2014. Over the long-term, a "ARDL bounds" testing technique for co-integration was used while a VECM application was implemented for testing short- and long-run causality.

4.3.6 Summary of Researches presenting relationship between Long Run Equilibrium, Short Run Disequilibrium Adjustment Relationship and Stock Price Behaviour:

Author(s)	Scope	Time Period	Sample Size	Macroeconomic Variables	Methodology	Main Findings	Critical Analysis
Khan and Yousuf (2013)	Bangladesh	1992-2011	Monthly	Exchange rates, money supply, crude oil, interest rate and consumer price index	ADF, Johansen cointegration test and VECM	M2, Crude, RI were positively correlated; EXR was negatively correlated and CPI had exogeneity with Bangladeshi stock markets.	This study was different in relation to investigation field as it was conducted in Bangladesh and the UK as well as the variables such as foreign remittance, Treasury bills, deposit interest rates per capita GDP, and balance of trade. It was also fluctuating from the theoretical approach, timeframe and methodology as researcher implemented Philips Perron test. Moreover, on this study, researcher used a dissimilar modernised data set for the period of January 1998 to June 2018.
Olsen (2014)	The United Kingdom	January 1995 to December 2014	Monthly	Interest Rate, Consumer Price Index, Money Supply, Exchange Rate and Industrial Production Index.	ADF, Johansen Cointegration Model, Vector Error Correction Model and Granger Causality test.	The research found that M1, IPI and IR had a long-term association and were cointegrated with stock market and a unidirectional relationship existed amongst: FTSE100 & IPI; FTSE100 & EXR; IR & IPI; M1 & IR; M1 & IPI, EXR & M1 and EXR with IPI. Furthermore, Against FTSE100 EXR and CPI were shown to have a positive relation during the long term; in contrast IR, M1 and IPI exhibited negative associations.	The downside made by this examination is the strategy for investigation and these shortcomings are taken care of in the momentum research by utilized ADF as well as P-P for unit root tests, Johansen cointegration model and selection of dissimilar macroeconomic variables. Vector Error Correction technique was utilized to estimate speed of disequilibrium change. Additionally, researcher carried out Toda Yamamoto test which was a sophisticated edition of basic granger causality test. Moreover, The present research is an enhancement on this study as researcher took a dissimilar data set for the period of January 1998 to June 2018.
Mazuruse (2014)	Zimbabwe	Jan'1990 to Dec'2008	Monthly	Mining and industrial index, unemployment, exchange rate, treasury bills, money supply, consumer price index	Canonical Correlation Analysis (CCA)	EXR, CPI, M2, TBR have positively impacted to the stock price of Zimbabwe	The problem of using Canonical Correlation Analysis(CCA): (a) Missing Information should be removed (b) Outliers: every single least square method, outliers may cause serious issues (c) Curvilinearity: The event of curvilinear association could lessen the viability of the investigation (d) Singularity and Multicollinearity: must preclude the culpable factors. Consequently, the present research implemented Johansen cointegration model.
Rudra, Mak and Atanu (2015)	Turkey, United States, The United Kingdom, European Union, South Africa, Saudi Arabia, Russia, Republic of Korea, Mexico, Japan, Italy, Indonesia, India, Germany, France, China, Brazil, Canada, Australia, Argentina.	1961– 2012	Monthly	Real effective exchange rate, inflation rate, and real rate of interest, economic growth, oil prices	Vector Autoregressive Model and Granger Causality	The results show a robust long-run economic relationship between economic growth, oil prices, stock market, real effective exchange rate, inflation rate, and real rate of interest. In the short run we find a complex network of causal relationships between the variables. While the empirical evidence of short-run causality is mixed	This study was different in relation to investigation field as it was conducted in Bangladesh and the UK. It was fluctuating from the theoretical approach, timeframe and methodology as researcher implemented Toda Yamamoto test was carried out which was the created rendition of basic granger causality test and Johansen cointegration tests.

Mangala and Rani (2015) re-examined the association for the period from April 2005 to March 2014, between the few chosen macroeconomic components that include TBR, M2, gold price, IPI, EXR, inflation rate and shares of India. Granger-causality, VECM and Johansen cointegration tests were implemented in this research. The findings of the Johansen co-integration test refer to a prominent inverse association between IPI, inflation rate and EXR against shares while an affirmative association exists between M2 and TBR on shares[119]. The outcomes suggested a temporary connection Nifty to inflation rate and M2; from EXR to Nifty; while a long-lasting association existed between Nifty and short-run IR and M2.

The dependence of market values on macroeconomic stimuli was examined by Peiró (2016) using: UK, Germany & France. The variables chosen were, industrial production and interest rates, since compared to GDP industrial production's relation was more definitive. Throughout a long period of time, long term industrial production and IR account for around half the yearly variation for stock prices. Regression models and descriptive statistics were employed by the researcher, although the 2 variables appeared to be equal, further enquiries showed that industrial production was more significant. Furthermore, the market prices changed concurrently with IR, and predict deviations for industrial production a year before.

Investigating 1969-2012, it was shown that the factors have the same significance when predicting the market. Nonetheless, visible dissimilarities are exhibited across varied periods of times, i.e. within the primary years IR was of utmost significance, but has decreased recently, and production is now the main variable. This is proven by the nations under examination, however when compared to the US, it seems that production is the only significant variable during the period. Nevertheless, multitudes of academics couldn't find a clear association between the macroeconomic variables and the market (Flannery and Protopapadakis, 2002). These results were also confirmed by Schwert (1990), using data from 1889-1988, while Humpe and Macmillan (2009) unearthed that the shares for Japan, US and UK has a negative relation with IR and positive with industrial production.

There is scarcity in the literature examining the effect of real economic variables on specific share indices. As an intermittent illustration, Giri and Joshi (2017) analysed the presence of long-term cointegration Indian shares and macro. They applied the "ARDL bounds" for analysing the long-term link between real economic factors and India's shares using 35 years

[119] The temporary and long-lasting associations are both declared alongside the aid of VECM between macroeconomic factors and stock price.

of annual data from 1979 to 2014 for India and the outcomes of this observation proposed that the shares and macro components as well as EXR and inflation effect equities positively. Contrarily, the price of IOP impacts the share price negatively. They also implemented the VECM method to investigate the short- and long-term causality. The long- and short-term unilateral causation was found in FDI financial development for the Indian share market.

Instead, Jahfer and Inoue (2017) analysed the presence of long-term equilibrium relations between gross money supply, domestic product, exchange rate, share market, inflation rate and TBR within the equities in Sri-Lanka. They discovered for first differencing that every factor is stationary. By using the co-integration methodology by Johansen and OLS, the results showed that there exists a very strong long-term association between the real economic stimuli and the share market. Additionally, it was discovered that inflation and M2 favourably responded with share prices. Conversely, the treasury bill rate, GDP, and exchange rate reacted negatively. However, equity prices are reactive to uncertain real growth and therefore treasury bills are positively related, which Duarte and Rosa (2013) found, using data from 20 models, and they revealed that there is an uphill trend in equity risk premiums, from 2000 to July 2013, in a 50-year extreme. Yet, because of the renowned doubts of the equity risk premium and estimation, there is still much thoughtfulness in the estimates, as recognised by Mehra and Prescott (1985). Moreover, Andersson et al. (2008) proposed that when there is an increase in doubt, unimportant variations in resource prices might be common. This corresponds to structure which was plain in many significant recessions throughout the past 100 years, i.e., across the time of The Nineteen-Thirties Depression. Conversely, the constructive relationship precedes the beginning of a catastrophe and the previous decade's volatility throughout the European-USA stock markets in 2007, and 2010-2019. Joshi (2015) also discussed the relationship between stocks and macroeconomic factors using Eviews software and deployed a relationship test. Macroeconomic variables considered in the case included WPI, EXR, IPI, M3, United States Dollar to Indian Rupee (USD/INR), Foreign Institutional Investments (FIIs), as well as Gold and Crude Oil Prices. The post financial downturn monthly data from the Bombay Stock Exchange (SENSEX) was collected from 2008-09 to 2013-14 on monthly basis. The Lag structure was produced using VAR, and the study used ADF to assess the stationarity of the data, The results of this research provide guidance for policy makers, as well as for the investors, in anticipating the index trends. This study's results show that a positive connection is present within the Indian share and most economic variables except for Foreign Institutional Investments and the Exchange Rate. There is a low positive relation between EXH and FIIs.

Furthermore, FIIs and Crude Oil prices are negatively correlated. The primary target for this research is to examine causality in-between stocks and macros in India. It was concluded, from the causality test, that BSE doesn't have causality with CPI, M3, Gold, FIIs, National Stock Exchange of India, while it does have causality with IOP, EXH and IPI.

A recent attention-grabbing study by Demir (2019) examined the impacts of selected macro stimuli on the Borsa Istanbul 100 and the following were the macroeconomic variables used; foreign direct investments, crude oil prices, interest rate, relative price of M2, financial development and portfolio investments. The findings were obtained via the ARDL Bounds Test using the data from Q1:2003–Q4:201 (across a quarterly period) and the results revealed that crude oil prices and interest rates negatively affected the BIST-100 stock prices while the relative value of the domestic currency, economic growth and portfolio investments raise the stock market index.

4.3.7 Summary of Researches presenting relationship between Long Run Equilibrium, Short Run Disequilibrium Adjustment Relationship and Stock Price Behaviour:

Author(s)	Scope	Time Period	Sample Size	Macroeconomic Variables	Methodology	Main Findings	Critical Analysis
Peiró (2016)	The United Kingdom, Germany and France.	1969–2012	Monthly	Interest rates and industrial production, GDP	Descriptive statistics and simple Regression tests	Researcher concluded that Stock prices anticipate movements in production one year in advance but move simultaneously with interest rates. Future changes in industrial production and current changes in long-term interest rates account for approximately one half of stock prices. This evidence is surprisingly similar for the three European countries, but differs noticeably from the results obtained for the US, where production seems to be the only factor behind stock prices over the whole period. Moreover, GDP has a positively related in all countries.	Limitations of the descriptive statistics technique are just applied to show findings and cannot be utilized it to accumulate ends. It is constrained in so much that it just permits to make summations about the individuals or objects that are estimated. The gathered information cannot be utilized to sum up to other objects or people. The gap created by this study is the method and fields of analysis and these weaknesses are handled in the present research extended by the choice of most neoteric tools Johansen cointegration test with ADF and P-P tests as well as established a comparative examination between two countries.
Giri and Joshi (2017)	India	1979-2014	Annual	Foreign direct investment, crude oil, exchange rate, inflation, economic growth	Autoregressive -Distributed Lag (ARDL) and Vector Error Correction based Granger causality test	Interest rate and exchange rate found positive related to the stock price. However, all variables were correlated in short run.	This existing study was different in relation to field of investigation as it was compared between Bangladesh and the UK. Moreover, researcher took a dissimilar data set for the period of January 1998 to June 2018; different tools, for instance, Johansen cointegration model as the data set was stationary at the same level, VECM and Toda Yamamoto test which was the improved version of simple granger causality test.
Jahfer and Inoue (2017)	Sri Lankan	1996-2014	Quarterly	inflation rate, exchange rate, treasury bill rate, money supply, gross domestic product	ADF, Johansen Cointegration test	The investigation of Johansen Cointegration test found that there were long run strong relationships between stock prices. M2 and Inflation have positively and TBR GDP, EXH have negatively associated with stock prices of Sri Lanka	The present research is enrichment on this study as researcher took a dissimilar and comparative study field and implemented different variables to observe the effect on stock prices. Furthermore, researcher implemented Philips-Perron test to add a strong argument in terms of stationarity test validation.
Demir (2019)	Turky-Borsa Istambul100	Q1:2003–Q4:2017	Quarterly	Foreign direct investment, crude oil, interest rate, money supply, domestic currency	ARDL Bounds Test	Crude Oil and Interest Rate (Negative), domestic currency, economic growth and portfolio investments (Positive).	This study was different in relation to investigation field as it was conducted in Bangladesh and the UK as well as the variables such as foreign remittance, international oil price, Treasury bills, money supply, and exchange rate. It was also fluctuating from the theoretical approach, timeframe and methodology.

The associations between macroeconomic variables (industrial production, IR, inflation and M2) and the market was investigated by Camilleri et al. (2019). VARs and Ordinary least square examination were employed to examine the association, using monthly data (1999-2017) - for the UK, Portugal, Netherlands, Germany, France and Belgium. It was affirmed if such associations were present within varying sub periods and a nonparametric model was employed (Pesaran-Timmermann). Varying lag-lead and concurrent associations were present amongst the variables and the prices of the market – although slight deviations were found amongst the nations. The VAR showed that stock price has significance on leading inflation, throughout all the countries, and was found to have a positive link – most of the time. The same was present for industrial production with 4 nations.

Contrasting prevalent financial theories, a plethora of significances between IR and the market had not been discovered, but amongst M2 and IR there was significance amongst 4 economies. In UK and Germany, industrial production was shown to be impacted by the market positively and with significance. IR was also discovered to mimic the economy's movements prior to 2007 (the market crash), consequently IR decrease upon recovery of the market – this is supported by the visual representation of the data, which is proof to the idea that IPI is reactive to past market performance. On the other hand, this may be due to an efficient market being able to predict future trends.

It is a surprise that there had been no significance in the associations amongst the financial variables and the market in Netherlands, due to it being one of the top banking sectors within the European Union - this can be explained by the need for credit being comparatively small. In contrast, it was found that the impact that the economy had on IPI was insignificant for Portugal, deviating from the other nations. This can be explained by the detachment of the two variables (relative to the nations under research) and the market's behaviour being lead by worries related to banking and government finance. Nonetheless, for France the market is lead significantly by IR, CPI & MS, but leads IPI and CPI. It is in line with the predictions that there is a negative link between the market and CPI, this can be confirmed since economy comprises of a multitude of extravagant goods, which, in comparison to needs, are more price elastic. This results in the heightened possibility of business profit being decreased by an influx of values.

Nevertheless, there is a negative (but significant) link amongst CPI and the indices – for Belgium. This was not exhibited amongst other economies, possibly because influx in value is seen as an issue. This is because rates of inflation are larger than that of the nearby nations, according to European Commission (2017). This can also be seen as remembering the impact of the relation within MS and CPI, with lagged stock prices. It is to be noted that it is not absurd that the indices are positively (and significantly) associated with industrial production, since the European Commission's (2017) perspective is that due to economic development there was an influx in investment.

4.3.8 Summary of Researches presenting relationship between Long Run Equilibrium, Short Run Disequilibrium Adjustment Relationship and Stock Price Behaviour:

Author(s)	Scope	Time Period	Sample Size	Macroeconomic Variables	Methodology	Main Findings	Critical Analysis
Camilleri, Scicluna and Bai (2019)	The UK, Portugal, Netherlands, Germany, Belgium and France	1999–2017	Monthly	Inflation, industrial production, interest rates, money supply, CPI	Ordinary Least Squares (OLS) regression, Pesaran-Timmermann test (non-parametric approach) and Vector Autoregression Model	The investigations show that the stock prices positively significantly lead inflation across all countries. In addition, stock prices significantly lead industrial production in all of the sampled countries and these relationships were positive as well. Contrary to long-established finance theories, they did not find numerous significant but negative links between interest rates and stock indices; however, the interaction between interest rates and money supply was a leading indicator of stock prices in France, Germany, Portugal and UK. Germany and UK are that the stock index significantly leads IPI and the relationship is positive. For Netherlands, researcher did not find any significant relationships between stock prices and the financial variables IR or IRxMS. Portugal differs from the other countries in that the leading effect from stock prices to IPI is insignificant. France index significantly leads CPI and IPI, while it is significantly leads by CPI and IRxMS. Belgium we note a significant contemporaneous negative relationship between stock prices and CPI which was not evident in other countries.	The ordinary least square could be very sensitive to the presence of unusual data points in the data used to fit a model because one or two outliers could skew the results of OLS analysis, which consequently leads to model validation. Also, employing OLS to analyse repeated measures data is not appropriate when the covariance structure is not known to be compound symmetric (Ugrinowitsch, Fellingham & Ricard, 2004). Additionally, Pesaran and Timmerman (1992, PT92 henceforth) can be used for testing the economic value of directional forecasts. The contemporary research is an augmentation on this study as researcher took a dissimilar study field and conjectural approach. Analyst used different tools, for instance, Johansen cointegration model as the all variables were set stationary at first level I(1). Additionally, researcher carried out Toda Yamamoto test which was a sophisticated edition of basic granger causality test.

4.4 Long-Run Causal Relationship and Stock Price Behaviour: Empirical Evidence

It was identified that developing stocks have been divided partially out of global financial markets. Consequently, scholars argue that instead of world risk factors, local risk variables were the basic foundation for share yield movements in those stocks.

Solnik (1983) submitted proof on the link amongst IR (as the inflation variable) and various markets (Canada, Japan, Netherlands, Switzerland, UK, France, Belgium, United States of America and Germany), utilising monthly time series from 1971 to 1980. The Fisherian hypothesis (autonomous from inflationary predictions) was not accepted for any of the markets. Solnik's data shows constant support with the Geske & Roll examination, expected of IR, using the simple theory that market value deviations lead to negative impacts. The findings proved a weak impact with IR, this is because IR was used instead of expected inflation, hence the variable was examined with a real-interest-rate-impact. Multiple hypotheses claim that if real rates experienced an influx during a time of market decline, it would result in a compound of the negative association between the interest rate and the market. It was discovered that the effect that interest rates experienced from the market was always significant, but minimal, for France, Switzerland Germany and Japan. The nations mentioned all contain authorities who would rather not monetise. Ergo, it is implicit that an insignificant global variance is existent due to the nationwide approach to debt. Ultimately, the finding's constancy throughout the many nations is astonishingly suitable, the association amongst the market and interest seem to happen across inflationary probabilities, more particularly the revisions.

The relationship between IPI and the market, alongside EXR was examined by Roll, R. (1992), using data from, Austria, Italy, Australia, Japan, Canada, Switzerland, South-Africa, Finland, New-Zealand, Netherlands, Hong-Kong, Belgium, Spain, Ireland, Singapore, US, Sweden, Germany, Norway, France, UK, Mexico, Denmark and Malaysia, in order to examine why dissimilar characteristics are present. The research utilised time series from April 1988 to March 1991 and employed a regression analysis. 3 explanations exist: 1) the industrial arrangement of the nation's play an important part when describing the characteristics of market values; 2) a part of the nationwide equity market characteristics can be credited to EXR performance, a large amount of currency designated national index values can be described by EXR, but for the majority of nations, it can be described by the structure being larger than the EXR 3) a share of the characteristics may be due to a technical feature of index manufacture, wherein a few indexes are more diverse.

Smith (1992) examined the effect that markets received from EXR. Using quarterly time series, from 1975-1988, for Germany, UK and Japan, he employed cointegration and granger causality analyses. Additionally, because of the preconceptions that the variables in use being endogenous an instrumental variables model was carried out. The hypothesis of no structural break was not accepted and the parameter constancy examination was also not accepted, with the 1979's 2nd quarter being the subject of structural break. This reproduced deviation in the capital and administration of the UK regulates lifting. The findings can be promising, since a significance was found in the impact on EXR by equities, at 95%. The findings are astonishing since US markets are predicted to most significantly effect EXR, but no impact was discovered in the exam. However, the UK exhibited comparatively robust impacts, whereas Germany was moderately small – in the first sub-period. The analysis of Germany's market was unpredicted as the 2nd sub-period usually is where markets have the greatest impact, because of the increase of capital flexibility – due to the removal of financial innovation and capital controls.

Jones and Kaul (1996) examined the idea that the response of foreign markets to prices of oil, can be proven by future and currency deviation in investments. The amount of aggregate investments is denoted to as IIP (index of industrial production) – seasonally adjusted. The researchers used data from 1947-1991 and examined the UK, Japan, Canada and the US. The employed granger causality and the data was restricted to post WW2, due to obtainability. It was discovered that during this period, the Canadian and US market response to values of oil are only because of the effect on real investment. In contrast, the value of oil resulted in deviations within the market, which can only be appropriate with deviations in real investment, for Japan and the UK. Chen et al., (1986), Ferson & Harvey (1993), and Hamao (1988) are a few instance of recent theses that implement oil prices as a risk variable.

4.4.1 Summary of Researches presenting relationship between Long Run Causal Relationship and Stock Price Behaviour:

Author(s)	Scope	Time Period	Sample Size	Macroeconomic Variables	Methodology	Main Findings	Critical Analysis
Solnik (1983)	Belgium, Canada, France, German, Japan, Netherland, Switzerland, UK and USA.	1971-1980	Monthly	Interest rates as a proxy for expected inflation	Granger Causality Test	The results showed that the impact of stock prices on the real interest rate was found to be always small, but significant for France, German, Japan, and Switzerland. However, negative relationship found between stock prices and nominal interest rates for all nine countries.	The current research is a betterment of this study as a comparative examination and took several domestic & global macroeconomic factors; ADF and P-P tests as well as the Toda Yamamoto test was implemented which was the developed version of simple granger causality test.
Roll (1992)	Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Hong Kong, Ireland, Italy, Japan, Malaysia, Mexico, Netherlands, New Zealand, Norway, Singapore, South Africa, Spain, Sweden, Switzerland, the United Kingdom, the United States	April 1988- March 1991	Monthly	Industrial Production Index and exchange rate	Simple Regression Analysis	Researcher finds that the National stock markets reflect the idiosyncrasies of the country's industrial structure. Additionally, the stock markets of all countries are influenced by exchange rates.	The gap created by this study is the method and fields of analysis and these weaknesses are handled in the present research extended by the choice of most neoteric tools Johansen cointegration test with ADF and P-P tests as well as established a comparative examination between two countries as well as the Toda Yamamoto test was implemented. Moreover, on this study, researcher used a dissimilar modernised 20 years six months data set for the period of January 1998 to June 2018.
Smith (1992)	The USA, Germany, Germany and the UK	1974 quarter 1 to 1988 quarter 3	Quarterly	Exchange rate	Granger causality test, Johansen Cointegration test	The results are fairly encouraging as during the second sub period (1979-88) UK equities have a significant effect on the exchange rate at the 95% level, and during the first sub period UK equities are significant at the 90% level of significance. But the US stock market should have the most significant impact on the exchange rate. However in these tests it is not a relevant influence. In contrast the UK stock market has a relatively powerful effect and even the fairly small German stock market is significant in the first sub period.	Since the study used the quarter data, therefore, they are often criticized for selecting the duration that has challenges in being analysed and reviewed, and must have accounted for around 12 years to 20 years' data if wanted to base it on quarterly information. However, The present research is an enhancement of the above research, as it took up-to-date 20 years, 6 months data.
Jones and Kaul (1996)	The United Kingdom, the USA, Japan and Canada.	1947 to 1991	Monthly	Oil prices and Industrial Production Index	Granger Causality Test	The examination was concluded that in the post-war period, the reaction of United States and Canadian stock prices to oil prices can be completely accounted. In contrast, in both the United Kingdom and Japan, innovations in oil prices appear to cause larger changes in stock prices	The current examination is an amelioration of this study, as the researcher took a dissimilar study area and several domestic & global macroeconomic variables as well as the ADF, P-P unit root tests; Johansen cointegration test. Additionally, Toda Yamamoto test was implemented which was the developed version of simple granger causality test.

Morley & Pentecost (2000) investigate the association of the rate of spot exchange and share prices amongst the G7 nations (US, UK, Japan, Italy, Germany, France & Canada). The data ranged from January 1982-1994, monthly, and a cointegration examination was employed. The data was made up of the principal share index, for each country; to investigate the long-run association, the exchange rate was two-sided and examined beside USD. The findings showed minimal correlation, amongst the market and EXR, and cyclic arrangements with no constant trend – showing the lack of common trends amongst the two variables. Hence, there was no influence to be found in either direction, this is supported by the findings of Vanita and Khushboo (2015), who discovered that the market and EXR shift in opposing directions. In conclusion, Morley and Pentecost suggested that there was a necessity for an error correction model, instead of a cointegration test.

The idea that the market values and EXR share a trend, has no proof – with the exception of UK and Canada. Nonetheless, robust proof indicates common trends for G-7 countries (with the exception of UK-France). The absence of co-dependence, can be explained by the retaining of French control during the 1980s, as this segmented the markets and helped France to stay within ERM. A statistical significance and dynamic link is found within Germany and Italy, by the coefficient's variation of the market index. This is confirmed by the idea of an association amongst EXR and the indices, however instead of a common trend it occurs as a cyclical pattern. Hence, to examine this relation, in place of the long-run cointegration approach, like Bahmani-Oskooee and Sohrabian (1992), an error correction model is necessary.

Between 1988 and 998, the stock prices were affected significantly by the exchange rates in seven Asian markets (Pan et al., 2007). Causality between the two markets was considered by Ramasamy and Yeung (2001). They found that according to the time that the study was conducted, the course of causation changed. They implemented ADF and Granger causality tests in their study. Shares led to adjustments in the exchange rates in all the countries during the 1997-2000 financial crises as quarterly data series, with the exception of Hong Kong.

Smyth and Nandha (2003) produced a comprehensive research study on the relationship between EXR and trends of the shares across four different nations including Sri Lanka, Bangladesh, India and Pakistan. Engle and Granger as well as Johansen's co-integration analyses were applied on the daily data from 1995 to 2001 for two variables selected for the investigation. The findings show a lack of long-term co-integration. The deployment of Granger causality techniques revealed that in India, as well as Sri Lanka, the forex rates influence shares. However, for Pakistan and Bangladesh, the results could not identify any causative association between the factors selected for the review.

In addition, the influence of real economic variables on Sri Lanka equity values was examined by Gunasekarage et al. (2004). They utilised "Colombo All-Share Price index" as a representative of the share and TBR (amount of IR), M2, EXR as macroeconomic variables. They used a 17-year monthly time series from 01/1985 to 12/2001 and implemented various tests, including co-integration, unit roots and VECM. They used these tests to study short-and long-term relations between macroeconomic indicators and share index. The VECM investigation reinforced the notion that lagged price for macros like money supply, CPI and TBR has a huge impact on shares. The relationship between long- and short-term IR is negative and positive correspondingly. This observation may be credited to interest rates connected to the long-run, which serve as a good proxy in components that are free of nominal risk, which is the element that influences discount rates and inflation. The Stock price and money supply relationship is also positive in nature, and it was found that RI, IPI, EXT and M2 all influence the stock.

Al-Rjoub (2005) conducted a research study on the USA SP 500 stock prices to examine the relationship with the oil prices, using time series from 1985-2004. He applied a simple VAR model, as well as Mixed Dynamic & Granger-causality tests. It was found, that IOP negatively impacted the prices of the SP500.

4.4.2 Summary of Researches presenting relationship between Long Run Causal Relationship and Stock Price Behaviour:

Author(s)	Scope	Time Period	Sample Size	Macroeconomic Variables	Methodology	Main Findings	Critical Analysis
Morley and Pentecost (2000)	The United States, the UK, Japan, Italy, Germany, France, Canada.	January 1982 to January 1994	Monthly	Exchange rates	Johansen Cointegration Model	The stock market data consists of the principal market index for each country. The exchange rate data is all bilateral to test the long run relationship between stock price and exchange rate. Their results showed little correlation between bilateral exchange rates and stock prices. With the exception of the Canada-UK tests there is no evidence of the exchange rate and stock market price index. Moreover, in the case of both Germany and Italy in this simple contemporaneous dynamic relationship the coefficient on the change in the relative stock market index is statistically significant.	This thesis was different in relation to investigation area and a varieties of variables such as foreign remittance, Treasury bills, deposit interest rates per capita GDP, and balance of trade. These shortcomings are taken care of in the momentum research by utilized ADF, P-P for unit root test and Johansen Cointegration Model as well as it took 20 years, 6 months data. Furthermore, Toda Yamamoto test which was a modern release of simple granger causality test.
Ramasamy and Yeung (2001)	Japan, Indonesia, Taiwan, Philippines, South Korea, Thailand, Singapore, Malaysia and Hong Kong	1997-2000	Quarterly	Exchange rate	ADF and Granger causality tests	The examination discovered varying results, the unidirectional connection found from the stock markets of Malaysia, Singapore, Thailand, and Taiwan, Japan to exchange rate; however, bidirectional linked revealed for Hong Kong. Furthermore exchange rate granger caused to Philippines and South Korea stock markets.	Critically look at this effort, it can be observed that the researcher took very short periods in their research and naturally, that is very challenging to foresee and elucidate the condition of the market. These foibles were dealt with the current study by applying 20 years, 6 month's data set. On top of that, researcher implemented Toda Yamamoto granger causality test as a replacement of ordinary causality technique.
Smyth and Nandha (2003)	Bangladesh, India, Pakistan, SriLanka	1995-2001	Daily	Exchange rate	ADF, Engle-Granger two steps, and Johansen co-integration tests	The unidirectional relationship found from exchange rate to stock prices for Sri Lanka and India only.	The gaps created by this study are the variable and data set; nonetheless, these weaknesses are handled in the present examination by choice of variables, such as, foreign remittance, international oil price, Treasury bills, money supply, and balance of trade etc. Further, analyst took up-to-date monthly data in the current study.
Gunasekarage, Pisedtasalasai and Power (2004)	Sri Lanka	Jan'1985-Dec'2001	Monthly	Money supply, consumer price index, and Treasury bill rate	ADF, Johansen cointegration test and VECM	The selected variables influenced the stock prices of Colombo markets.	The current examination is an upgrade on this investigation as analyst took a divergent informational index for the time of January 1998 to June 2018, in conjunction with, Vector Error Correction technique was utilized to estimate speed of disequilibrium change.
Al-Rjoub (2005)	USA-S&P500	1985-2004	Monthly	Oil price	Simple VAR model, Mixed Dynamic Model and Granger causality test	The result discovered that oil price had negative influenced to stock price.	The present research was not dealt with the predicting model; however, Al-Rjoub used the Mixed Dynamic Model in his study which is useful for forecasting. Analyst used different tools in the current examination, for instance, Johansen cointegration model as the all variables were set stationary at first level *I(1)* and Toda Yamamoto test which was a upgraded version of basic granger causality test.

For the relationship between trade balances, M2, IPI and between share values, Mehrara (2006) produced an analysis in the context of Iran and applied a Toda and Yamamoto test to assess the relationship, he took quarterly data from Q1:1972 to Q4:1983. The conclusion of the study made recommendations regarding the unidirectional causality link between the selected variables and it was found that all the variables were producing an influence on directing shares.

Ahmed and Imam (2007) researched Bangladeshi stock prices, using monthly data from July 1997 to June 2005, in relation to macroeconomic variables, by using VECM and Johansen cointegration tests. Furthermore, they examined the causality of share prices on macroeconomic variables and visa-versa. The VECM and co-integration proved that macroeconomic variables (like IPI, M2 and GDP) aren't co-integrated with stock prices. They found that macroeconomic effects are not reflected onto the Bangladeshi stock market and growth of stock. Nevertheless, TBR may have some impact on the market. Conversely, there is no proof of causativeness between the share market and IR, and the findings also presented that Bangladeshi share is inefficient.

One more study that added to the literature was produced by Pan et al. (2007). This study was carried out for seven countries: Japan, Taiwan, Thailand, Singapore, Hong Kong, Malaysia and Korea using a data set from 1988-98. The newly industrialised countries, excluding Japan, were included in the sample and the application of the econometric techniques, including ADF, Johansen co-integration, variance decomposition, Granger and impulse techniques, was carried out to produce comprehensive studies. An interesting outcome was presented in the results which claimed the existence of a causal connection between shares and the exchange rate; however, the relationship was found before the financial downturn.

The association between various variables, IOP and the stock market was researched by Lescaroux and Mignon (2008) for a plethora of countries. The employed models for the unit tests were, Kwiatkowski, P-P, KPSS and ADF. P-P and ADF are based on the null hypothesis of unit root, while the null hypothesis for KPSS, is no unit root. With some exemptions, everything appeared to be integrated at one, which is a usual result. Panel, granger-causality and Kao residual cointegration tests were used, the authors grouped their economies into 3. The groups were OPEC (prior to Ecuador so: Venezuela, United Arab, Saudi Arabia, Qatar, Nigeria, Libya, Kuwait, Iraq, Iran, Indonesia, Emirates, Angola and Algeria); other main oil-exporting nations (the UK, Russia, Oman, Norway, Mexico, Malaysia, Kazakhstan, Canada and Brazil) and 12 members of the Eurozone, US, India and China. To research the effect of oil prices on economic activity, 1 financial variable and 4 macroeconomic variables must be considered: market values, household consumption, GDP, unemployment rate & CPI. The researcher used annual data from 1960-2005. With regards to the short run, the findings show that the causality is usually from oil prices to the other factors, in the case that it exists. The analysis also showcases that a causal relationship runs from oil to market values, more so in the case of oil-exporting nations. This has been proved by the cyclical correlation's estimates, wherein the prices of oil were discovered to impact countercyclically market values, in the case of most countries (however there were different amount of lags for each one).

Nevertheless, for OPEC the associations were lesser than 0.10 (absolute value). Using long-term analysis, unemployment rate, share prices and GDP were found to be the focus of long run connections. Moreover, IOP and GDP progress alongside each other for a dozen countries, in the long-term. Links amongst IOP and market values or unemployment rates solely distress non-OPEC nations. The findings of the granger causality showed that it was always in the negative, and ran from IOP to the market, showcasing the integral nature of IOP.

A study for assessing the linkage between the share index and real economic stimuli for DSE was presented by Afzal and Hossain (2011), using sample data from 2003-11. The study deployed co-integration in addition to the Granger relationship technique for reviewing the relationship. The outcomes showed the existence of co-integration between the stock market inflation rate, M1 and M2 variables. This suggests that a long-term linkage is present. In the short-run, the findings reported the presence of unilateral causation going out of stock shares towards EXR and M1. The application of the bivariate Error-Correction technique exhibited the existence of a long-run linkage in M1 and M2 to the share market, and to the inflation rate from the stock market. The stretching of the analysis to a multivariate analysis also supported and endorsed the results. The research reported some indications pertaining to the M2 Granger-cause stock market and the three representative macroeconomic factors. Thus, overall, it is suggestive of the efficiency level in DSE with information efficiency.

4.4.3 Summary of Researches presenting relationship between Long Run Causal Relationship and Stock Price Behaviour:

Author(s)	Scope	Time Period	Sample Size	Macroeconomic Variables	Methodology	Main Findings	Critical Analysis
Ahmed and Imam (2007)	Bangladesh	July'1997 and June 2005	Monthly	Industrial production index, money supply, treasury bill rate and GDP	ADF, Johansen cointegration test and VECM	The result discovered that macroeconomic variables did not influence the stock prices except TBR.	This assessment was assorted by field of investigation as it was a comparative study between Dhaka Stock Exchange and London Stock Exchange. The downside made by this examination practically comparable to the selected most weighty economic factors, for instance, most powerful macroeconomic variables. In conjunction with, researcher undertaken Philips Perron for unit root test. In addition, examiner added an exciting result to the research that was evaluating degree of disequilibrium changes by utilizing VECM. The current exploration is an upgrade on this examination as investigator took a unique data collection for the time of January 1998 to June 2018.
Pan, Fok and Liu (2007)	Japan, Taiwan, Korea, Malaysia, Hong Kong, Singapore, and Thailand	1988-1998	Monthly	Exchange rate	ADF, Johansen co-integration test, Variance decomposition and Granger Causality test	The causal relationship found between stock prices and the exchange rate.	Critically observing at this study, researcher can argue that the year of examination is not up-to-date in terms of data set and these weaknesses are handled in the present research by taking 20 years, 6 months data and choice of variables. Additionally, Toda Yamamoto test was executed as an advanced tool together with P-P test. Notably, another loophole of Pan, Fok and Liu's study was: the exogeneity theories common in parallel estimations when variance decompositions modelling are considered.
Lescaroux and Mignon (2008)	The USA, the UK, India, China, Venezuela, United Arab Emirates, Saudi Arabia, Russia, Qatar, Oman, Norway, Nigeria, Mexico, Malaysia, Libya, Kuwait, Kazakhstan, Iraq, Iran, Indonesia, Ecuador, Canada, Brazil, Angola and Algeria.	1960–2005	Yearly	Oil Prices, GDP, CPI, household consumption, unemployment rate.	Augmented Dickey–Fuller, Phillips-Perron and KPSS tests, Granger-Causality and Kao residual cointegration tests.	This result is confirmed by the calculation of cyclical correlations, where oil prices are found to lead counter-cyclically share prices for almost every country. Concerning share prices, the Granger-causality is negative and always runs from oil prices to stock markets. Additionally, all the other variables (GDP, CPI, household consumption, unemployment rate) are found negatively related to the stock prices of all selected countries.	A foremost shortcoming for KPSS is, it comprises large range of Type I errors which inclines to dismiss the Ho very frequently. If tries are ended to eliminate such inaccuracies, by requiring bigger p-values (Kocenda and Cerný, 2017), which means that adversely effects the power of KPSS. Moreover, in the present examination, the researcher has used the time series data. Here is to note that the Kao Cointegration test is efficient for the panel data analysis. Moreover, analyst used Toda Yamamoto test which was a modern release of simple granger causality test.
Afzal and Hossain (2011)	Bangladesh-DSE	2003-2011	Monthly	Exchange rate, money supply (M1), consumer price index, and Inflation	ADF, Johansen cointegration, ECM and Granger causality tests	The results found that inflation and M1 had long run relationship; however, in short run, investigation revealed one way causality from stock to M1 and EXR; additionally, ECM result showed that causality existed from M1 to stock and stock to inflation.	This study was different in relation to field of investigation as it was compared between Bangladesh (emerging) and the UK (developed). The gap created by this study in relation to the variables such as foreign remittance, international oil price, Treasury bills, balance of trade, deposit interest rate, consumer price index and other three most influential economic factors. As an Illustration, included P-P for unit root test, Toda Yamamoto test was executed which is a upgraded of simple granger causality test.

The equilibrium long-term causal link between DSE and short-run dynamics adjustments was investigated in a study by Ali in 2011. He used sample period data from 1987-2010. REMIT, CPI, share price index and import payment were also investigated, and co-integration and VECM were used in the research. Their purpose was to identify the equilibrium long-term link and the short-term dynamics alterations between these factors. The findings of the test relied on the presence of variables which are co-integrated and VECM requires that the method puts in line the past time's amount of dis-equilibrium by a monthly percentage. Causal relationships have been shown by performing Granger analyses. A trend of unilateral connection is seen between the foreign market and REMIT and CPI towards shares plus bidirectional causativeness within stock price and import payment. However, A causative link isn't present between the share price and GDP. The rule makers, academicians and investors derive certain implications from these results. Changes in monetary policy are reflected instantaneously by stock prices in a market that has plenty of information.[120]

In another comprehensive study, Hussain et al. (2012) applied various techniques including ADF and KPSS, VECM, co-integration and Granger analyses to determine the linkage of the factors selected for review. The factors selected for the review include FER, IPI, IR, M2, imports and exports and WPI. A monthly set of data was selected from 2001 to 2010. With regards to the stock market, a positive and significant relationship came from IR, WPI, and M2, while it showed a negative and a significant influence from FER. A significant first error correction term explained the short-run alterations heading to equilibrium. The outcome from the causality found that WPI and M2 are in a bidirectional relationship, meanwhile FER has a unidirectional association with the stock market. Moreover, no causal association was found from IPI. Serious theoretical implications were produced in the study to discuss the relationship, and thus the underlying study will overcome this limitation.

[120] Additionally, the future of monetary growth is accurately foreseen. The link between shares and M2 was investigated by Cornelius (1994). This was done in the six of the most active emerging markets, which are Taiwan, Thailand, Mexico, India, Korea and Malaysia. These findings are not however uniform across all the countries that have been listed. Only four of these markets, Korea, Malaysia, Mexico and India seem to be having efficiency of information, according to results from the Granger-causality test.

4.4.4 Summary of Researches presenting relationship between Long Run Causal Relationship and Stock Price Behaviour:

Author(s)	Scope	Time Period	Sample Size	Macroeconomic Variables	Methodology	Main Findings	Critical Analysis
Ali (2011)	Bangladesh-DSE	1987-2010	Monthly	Consumer price index, foreign remittances, GDP and import.	ADF, Johansen cointegration, VECM and Granger causality tests	The study found that there was unidirectional association from FDI, CPI, REMT to stock; however, bidirectional linked revealed between stock and import, and no relation found stock prices and GDP.	This examination was diverse according to field of examination as it was analysed between Bangladesh (emergent) and the UK (advanced economy). The drawback made by this examination comparable to the variables (domestic and global), for example, international oil price, Treasury bills, balance of trade, deposit interest rate, GDP per capita, interest rate, exchange rate and other two most influential macroeconomic factors. As an Illustration, researcher applied Philips Perron for unit root test; Toda Yamamoto test was executed which is an updated of traditional granger causality test. Moreover, analyst added an intriguing flavour to the investigation that was assessing extent of disequilibrium change by using VECM.
Hussain, et, al, (2012)	Pakistan	2001-2010	Monthly	Exports, wholesale price index, money supply, imports, interest rate, industrial production index, foreign exchange reserves, exchange rate	ADF, Johansen cointegration, VECM and Granger causality tests	The investigation found that there were positive relationship between stock and IR, WPI, M2; however, FER had negative linked to stock prices. Furthermore, stock prices impacted FER but WPI and M2 had bidirectional relationship with stock prices; on the other hand, FER had unidirectional association but no causal relationship was found between IPI and stock market of Pakistan.	The gap created by this study is the comparative study between developed and emerging markets. Critically observing at this study, researcher can argue that the year of examination is not up-to-date in terms of data set and these weaknesses are handled in the present research by the methodology, as an Illustration, added P-P for unit root test, Toda Yamamoto test was implemented which is a sophisticated edition of basic granger causality test. VECM technique was utilized to evaluate speed of disequilibrium adjustment.
Naik and Phadi (2012)	India-BSE SENSEX	April'1994 - June'2011	Monthly	Exchange rates, treasury bills rates, money supply, wholesale price index, industrial production index, inflation	ADF, Johansen cointegration, VECM and Granger causality tests	There was long term equilibrium linked between stock price of India and all stimulus economic factors. Moreover, IPI and M2 were positively; inflation was negatively; IR and EXR had no association; two way causality present from IPI to stock market; one way causality found from M2 to stock but stock to interest and inflation.	This study was different in relation to field of investigation as it was compared between Bangladesh and the UK. This study as researcher took a dissimilar data set for the period of January 1998 to June 2018. For the legitimacy, analyst applied Philips Perron test alongside the Dickey Fuller tests; furthermore, added an interesting flavour to the exploration that was estimating proportion of disequilibrium adjustment by utilizing VECM and applied advanced causality test videlicet Toda Yamamoto test.

Naik and Phadi (2012) analysed the relationship in BSE-SENSEX with economic factors including EXR, WPI, M2, IPI and TBR[121]. They used data from 1994-2011. The stock market has a negative association with inflation while it is positive for IPI and money supply. The insignificant impact was reported in EXR and IR for short term to impact shares. As pertains to Granger causality, the results showed the impact from the variable in the long-term only but no impact on the short-term was observed. The existence of bilateral causativeness was reported between the stock market and IPI while there was also a unidirectional causality to inflation from the stock market.

Ray (2012) used yearly data for 10 years, from 1990-1991, in India [122]. The test results, based on the approximation of multivariate Granger causality, showed a lack of any causal relation between the shares and macroeconomic variables RI, stock market and IIP. However, it evidenced a unidirectional causality connection between shares and IR, stock market and FDI, shares and GDP, stock market and forex rate, and stock market. These results also revealed a bi-directional causality connection between the stock market and each of the following variables including forex reserve, M2, IOP and WPI. The comprehensive set of outcomes were considerable suggestions to the local and overseas stakeholders considering investment in the share market, in addition to those having a connection with the stock market such as regulators, stock market analysts, and most importantly policy-makers.

Bokhari (2013) performed a research study (using annual data from 2005-15) focusing on SAARC states and discovered that in Pakistan and Sri Lanka, the connection streams through stock market to the foreign exchange market. However, this association was viewed the other way around in case of the stock market of India. Furthermore, two dimensional associations were perceived between Bangladeshi and Nepalis shares.

[121] The study deployed VECM and Johansen cointegration using timeseries from April 1994 to 2011 and results found the presence of co-integration that also has a long-run equilibrium linkage.
[122] The study used the Granger causality tool for exploring and identifying the presence of any causative link between factors of macro and share market while multiple linear regressions were used for assessing the effect between factors and shares.

4.4.5 Summary of Researches presenting relationship between Long Run Causal Relationship and Stock Price Behaviour:

Author(s)	Scope	Time Period	Sample Size	Macroeconomic Variables	Methodology	Main Findings	Critical Analysis
Ray (2012)	India-BSE(SENSEX)	1990-2010	Annual	Wholesale index of prices, exchange rate, crude oil prices, demand deposit of bank, money supply(M3), Industrial Production index, gold price, gross fixed capita, gross domestic product, foreign exchange reserve, foreign direct investment, consumer price index, call / notice money rate, balance of trade	ADF, P-P, Descriptive Statistics, granger causality tests	Granger causality showed that there was no causality between stock prices IPI, interest rate; however, unidirectional linked found between FDI, inflation, fixed capital formation, EXR and GDP to stock; additionally, oil and gold prices had negative association; whereas, M3, IPI, GDP, FER, interest rate, BoT had positively related to stock prices of SENSEX.	Confinements of the descriptive statistics procedure are simply applied to show discoveries and can't be used it to conclude. It is obliged in so much that it just allows making summations about the people or items that are evaluated. The accumulated data can't be used to summarize to different objects or individuals. Researcher applied propelled causality test particularly Toda Yamamoto test.
Bokhari (2013)	SAARC-Pakistan, Sri Lanka, Bangladesh, Nepal, India	2005-2015	Annual	Exchange rate	ADF, Johansen cointegration test and Granger causality tests	The stock markets of Pakistan and Sri Lanka influenced to EXR; in terms of India, EXR caused stock prices; however, Bangladesh and Nepal had bidirectional relationship with the EXR.	The present research is an enhancement on this study as researcher took a dissimilar monthly data set for the period of January 1998 to June 2018 and applied additional Phillips Perron unit root test along with advanced causality test, namely Toda Yamamoto.
Kalyanaraman and Al-Tuwajri (2014)	Saudi Arabia	1994-2013	Monthly	Oil prices, exchange rate, money supply, industrial output, consumer price index	ADF, Johansen cointegration test, VECM and Variance Decomposition test	Johansen cointegration result showed that all macro factors influenced stock; short two-way causality found between stock prices and oil. The final result found that Saudi Arabia stock market followed weak form efficiency.	The downside made by this examination is the strategy for investigation and these shortcomings are taken care of in the momentum research by utilized ADF as well as P-P for unit root tests, Johansen cointegration model and selection of dissimilar macroeconomic variables. Vector Error Correction technique was utilized to estimate speed of disequilibrium change. Another loophole of Kalyanaraman and Al-Tuwajri's study is: the exogeneity presumptions regular in concurrent estimations when variance decompositions (VDC) modelling are considered. Notwithstanding, researcher carried out Toda Yamamoto test which was a sophisticated edition of basic granger causality test.

Kalyanaraman and Al-Tuwajri (2014) provided an interesting and more recent research, which examined the relationship that exists among the major real economic stimuli, that comprise of M2, CPI, IPI, as well as IOP, EXR and shares of globe standard, the Saudi stock index and the SP 500 index. Analysis on time series is put in place from monthly data between January 1994 and June 2013. Johansen co-integration tests offer a method of determining relationships, in the long-term, between the chosen variables. It was found that the majority of the macroeconomic variables have the potential to influence stock prices. The SP 500-index and standard do not in any way affect the prices of stocks in Saudi. From implementing VECM, it is evidenced that explanatory variables show long-term causality, which explains the variability in stock prices. Causality tests, which are for the short-run, on the other hand, show the existence of a bidirectional relation between the shares and IOP. From IRF, it is shown that IPI impacts equity values positively, although the same stock prices are pulled down by the consumer price index. A study of variance decompositions indicates that rises of historical stocks drive the Saudi prices of stock. Therefore, it can be deduced that the stock market in Saudi follows a market efficiency that is weak. The results that are generated in this research are thus of significance to investors attentive in Saudi shares.
The impact of real economic elements of equities for India was scrutinised by Muhanamani and Sivagnanasithi (2014)[123]. The connection was examined by implementing ADF and "Pearson's correlation matrix" tests. They also took data from April 2006 to July 2013. The conclusions of the study revealed that India's shares were dependent on IPI, WPI and M2 for India and it remained unaffected by the influx of external institutional financing and the difference in the exchange rate. The Granger Causality test exposed that the share was largely impacted by industrial efficiency and extensive value index.

In another comprehensive study, Umer (2016) applied various techniques, including Johansen cointegration, Correlations and Granger Tests, for determining the link in the variables selected for review and a monthly data set was selected from January 2005 to August 2015 for the Pakistani Stock Market. With shares, an important and constructive long-run link came from CPI, oil prices and money supply, while a negative long-run influence was shown for gold prices, forex reserve, as well as exchange and Interest rates. Nonetheless, the results of the exports and imports, Index of industrial production, and Foreign Direct Investment were found

[123] Therefore, they accumulated monthly statistics of the six main macroeconomic elements, which included M2, "Call Money Rate", FII, difference in the EXR of INR and USD, IPI, WPI and BSE for the period spanning 04/2006-07/2013.

to be insignificant for Johansen's Co-integration. The outcome from the Granger Causation is EXR to shares to FDI, while stock and IOP have a bidirectional association. As a result, stock prices showed a short- and long-term association with macro-economic factors.

Furthermore, a study assessing the link between share index and the real economic stimuli in the context of the Nigerian Stock Exchange (the All-Share Index) was presented by Paul Ndubuisi (2017), who used data from 1986-2015. The study deployed co-integration in addition to the Granger relationship technique for reviewing the relationship. The findings showed the existence of co-integration between the shares and independent variables (found at least one common stochastic trend). Hence, this suggested the presence of a long-term link. In the short-run, the outcomes reported the presence of unidirectional causality going from the stock market towards money supply growth, a bilateral linkage was discovered between EXR and share values. However, researchers did not find any short-run direction.

One more study that added to the literature was produced by Ditimi et al. (2018) for Nigerian shares using data from 1980-2016. The application of the econometric techniques, including the VECM and co-integration test, was carried out in order to produce comprehensive studies. An interesting outcome was presented in the results which claimed the existence of a causal connection between shares and the GDP (as a leading indicator) in the long- and short-term. Correspondingly, M2 and IR were discovered to strongly influence the Nigerian stock market. Similarly, the observed evaluations exhibited a long-term correlation between the Nigerian share market and macro stimuli.

4.4.6 Summary of Researches presenting relationship between Long Run Causal Relationship and Stock Price Behaviour:

Author(s)	Scope	Time Period	Sample Size	Macroeconomic Variables	Methodology	Main Findings	Critical Analysis
Muhanamani and Sivagnanasithi (2014)	India	2006-2013	Monthly	Money supply, call money rate, foreign institutional investment, industrial production, wholesale price index and exchange rate	Descriptive Statistics, ADF, Pearson coefficient correlation and Granger causality tests	IPI M2, WPI were positively related to the stock prices. FII and EXR were insignificant but IPI WPI granger caused the stock market of India.	Limitations of the descriptive statistics technique are just applied to show findings and cannot be utilized it to accumulate ends. It is constrained in so much that it just permits to make summations about the individuals or objects that are estimated. The gathered information cannot be utilized to sum up to other objects or people. Additionally, the weaknesses of the Pearson technique: (a) It expect that there is consistently o straight connection between the variables which probably won't be the situation constantly (b) It can be effortlessly misconstrued as a serious extent of relationship from enormous values of the relationship coefficient doesn't really mean extremely high direct connection between the two factors (c) The test is dull and tedious to estimate. These weaknesses were handled in the present research by carrying out Phillips Perron unit root test and Toda Yamamoto test which is a sophisticated edition of basic granger causality test.
Umer (2016)	Pakistan	2005-2015	Monthly	Consumer price index, oil price, Money supply, Foreign exchange reserve, Exchange rate, Interest rate, gold price, industrial production, foreign direct investment, import and export	ADF, Johansen cointegration test, VECM and Granger causality tests	Stock prices had a positive and significant long run relationship with CPI, oil prices and money supply; while, a negative long run influence found in FER, EXR, Interest rate and Gold prices. Nevertheless, the results of exports, imports, IPI, FDI were found insignificant for Johansen's Co-integration. The outcomes from the Granger causality run from EXR to stock prices to FDI. While stock prices and Crude Oil had bi-directional association with the stock market.	The current examination is an upgrade on this examination as analyst took a unique report field since this examination was distinctive corresponding to field of examination as it was looked at among Bangladesh and the UK. In order to enhance the inimitable literature, researcher carried out Philips Perron test along with ADF, Johansen cointegration model and most authentic Toda Yamamoto test in the present study which was the alternative and sophisticated form of simple granger causality test.
Paul Ndubuisi (2017)	Nigeria	1986-2015	Monthly	Money supply and exchange rate	ADF, Johansen cointegration test, VECM and Granger causality tests	The study found that the long run relation existed among the stock prices and the macroeconomic variables. Moreover, there was unidirectional relationship found from stock prices and money supply; however, bidirectional relationship revealed between exchange rate and stock price Nigeria.	This study was different in relation to investigation field as it was conducted in Bangladesh and the UK as well as the variables such as foreign remittance, international oil price, Treasury bills, deposit interest rate, balance of trade and four other macroeconomic variables. Besides, Toda Yamamoto test was instigated in the present study which was the advanced form of simple granger causality test. And speed of adjustment rather only cointegration issues.
Ditimi, et.al. (2018)	Nigeria	1980-2016	Monthly	GDP, interest rate and money supply	ADF, Johansen cointegration test, VECM	The researcher found that there were short and long run relationship established between GDP and the stock prices. Additionally, economic factors were influenced the stock market of Nigeria.	The impediment generated by this study is the comparative study between developed and emerging markets. For the validity, researcher applied Philips Perron test along with the Dickey Fuller tests and also added a unique flavour to the research that was measuring ratio of disequilibrium adjustment by using vector error correction model.

There was another study where the behaviour was analysed for macroeconomic variables such as Foreign Reserve, BOT, EXR, IOP with the Nigerian Index for stock market performance. In this study, Olayungbo (2019) used quarterly data from 1986Q4 to 2018Q1 (seasonally adjusted) in order to eliminate foreseeable changes in the series. It was found that very quick short-term disequilibrium adjustment happened, and there existed a co-integration between shares and oil price as well as foreign reserve; the results could not find any presence of the causal relationship between trade balance, IOP and EXR. However, the Granger causality test showed that Nigerian stock prices and oil price strongly Granger-triggered the foreign reserve.

Balcilar et al. (2019) used 44 frontier and developing markets, as defined by Morgan Stanley Capital International (Kazakhstan, Korea, Ukraine, Chile, Greece, Philippines, Brazil, Hungary, Mexico, China, Bahrain, Kenya, UAE, Estonia, Poland, Malaysia, Qatar, Lithuania, Thailand, Colombia, Indonesia, Mauritius, Czech Republic, Bangladesh, Nigeria, Pakistan, Vietnam, Kuwait, Romania, Argentina, Turkey, Russia, Serbia, Oman, Taiwan, Morocco, Egypt, Croatia, Slovenia, Tunisia, South Africa, Bulgaria, Sri Lanka and India). They obtained weekly data from differing starting points, but they all end on December 2016 and are obtained from MSCI market indices. Lastly, utilising brent crude oil values, the values of oil were computed, since brent crude is a prevalent worldwide standard. Simple regression and QQ examination were employed to examine the links amongst stock and oil markets. The QQ examination is a mixture of nonparametric quantile and approximation regressions, this allows for provisional quantiles of a factor to connect with provisional quantiles of another. This allows the link to be judged from the perspective of multiple other variables.

The academics also discovered a positive link amongst oil prices and the market, for east Europe – Turkey, Slovenia, Serbia, Russia, Hungary, Czech Republic, Croatia and Bulgaria. All the nations are anticipated to profit from lower oil values, as (with the exception of Russia) they are importers. Hence, the discoveries indicated for Eastern Europe agree with this statement, shows that the market requirement must be handled cautiously and not be abridged to arrangements reliant upon import/export behaviours. This is upheld by the positive links during the market declines, which had been witnessed in Latin American and Gulf nations (UAE, Qatar, Oman, Mexico, Colombia, Chile and Mexico), signifying that oil is an alternative for worldwide financial ambiguity, where the danger increases during declines in oil and stock markets.

Comments on broader oil impact amongst emerging economies were made (Pakistan, Nigeria, Malaysia, Kuwait, Kenya, Bangladesh and Bahrain). Particularly when the oil values were low irrespective of the market's condition, implying that emerging economies are particularly impacted by declines in oil prices, suggesting the existence of an unequal impact of oil onto stock markets. Nonetheless, both the net exporters and importers, strengthen the theory that confining a relation of stock and oil values to import/export is not probable. This is contrasted with the idea that the positive impact of negative oil values on stock, while markets are thriving, is motivated by China, India & Japan's findings. It is evident that policy makers have to report irregularities with how the market reacts to oil values, using quantile approximations or regime-based stipulations. Ultimately, it can be hypothesised that for market participants oil isn't safe, for most developing economies.

An amount of developing economies show positive oil prices while a bull market is ongoing – i.e. Turkey, Poland, Ukraine, Romania, Serbia, Russia, Greece and Croatia. This indicates that oil prices may significantly impact these markets. Positive strong oil prices are also seen within South Africa, Korea Kenya and India, at large quantities of stock market and oil prices. They contradict China, wherein the market has no overreaction with oil shocks, and the quantity of irregularity in the impact on the Chinese market is more harsh because it is a gigantic developing nation. To summarise, the results show assorted arrangements within tremendous dependency of oil and stock markets, which can't be described using export/import behaviours. Instead variables external of development rate, or the nation's export/import arrangement determine the oil-stock market connection. Furthermore, market values can be impacted by uncertainties of oil values, because inflationary predictions can be effected by oil prices, which consequently end up with larger rates of discount and lower values.

4.4.7 Summary of Researches presenting relationship between Long Run Causal Relationship and Stock Price Behaviour:

Author(s)	Scope	Time Period	Sample Size	Macroeconomic Variables	Methodology	Main Findings	Critical Analysis
Olayungbo (2019)	Nigerian	Q4:1986-Q1:2018	Quarterly	Oil price, exchange rate, trade balance, and foreign reserve	ADF, Johansen cointegration test, VECM and Granger causality tests	There was a quick short disequilibrium adjustment in all variables; however, no causal relationship among selected macroeconomic factors and stock markets of Nigeria.	Fundamentally perceiving at this investigation, analyst can contend that the time of assessment is quarterly observed data. The present research is an enhancement on this study as researcher took a monthly data set for the period of January 1998 to June 2018. In addition to the Vector Error Correction model was carried out to analysing speed of disequilibrium adjustment and researcher utilized ADF as well as P-P for unit root tests, along with Johansen cointegration model and selection of dissimilar macroeconomic variables. Moreover, Toda Yamamoto test was instigated in the present study which was the advanced form of simple granger causality test.
Balcilar, et. al. (2019)	Vietnam, United Arab Emirates (UAE), Ukraine, Turkey, Tunisia, Thailand, Taiwan, Sri Lanka, South Africa, Slovenia, Serbia, Russia, Romania, Qatar, Poland, Philippines, Pakistan, Oman, Nigeria, Morocco, Mexico, Mauritius, Malaysia, Lithuania, Kuwait, Korea, Kenya, Kazakhstan, Indonesia, India, Hungary, Greece, Estonia, Egypt, Czech Republic, Croatia, Colombia, China, Chile, Bulgaria, Brazil, Bangladesh, Bahrain and Argentina	2008-2016	Weekly	Oil prices	Quantile to Quantile approach (Quantile Regression) and Simple Regression	The researchers found positive relationship between stock market and oil prices in the case of Turkey, Slovenia, Serbia, Russia, Hungary, Czech Republic, Croatia and Bulgaria. Researcher also observed several developing nations' stock markets including Pakistan, Nigeria, Malaysia, Kuwait, Kenya, Bangladesh and Bahrain disproportionate affect from the oil market into these stock markets. Whereas, India, China, Croatia, Serbia, Russia, Greece, Romania, Poland, Kenya, South Africa, Korea and Japan have the positive and strong effect of oil price on stock prices.	The QQ approach, as a generalization of the standard quantile regression, is a combination of quantile regression and nonparametric estimation, allowing one to examine how the conditional quantiles of a variable relate to the conditional quantiles of another variable. The contemporary examination is a further step on this investigation as researcher took a justified informational index for the time of January 1998 to June 2018 as the Toda Yamamoto test was carried out which was the created rendition of basic granger causality test. The present research is an enhancement on this study as researcher took a dissimilar study field and different selected macroeconomic variables.

Conclusion

The numerous critical examinations explored within this section demonstrate various outcomes and deductions. From a few examinations it was found that significant positive correlations occur between stock prices and macroeconomic variables, whereas some relationships are slightly weak. However, these correlations are not significant for other examinations. The various results and conclusions are caused by the uses of varying techniques, factors, and periods of study. The differences within examination contexts significantly impact the behaviour of macroeconomic variables. The greatest argument within this examination contains four fronts. It has bridged the gap and decreased the differences between several of the evaluated studies through using various methodologies, research studies and macroeconomic variables. Upon critically analysing the above literature reviews, it can be summarised that very sparse literature is devoted to examining stock markets in Bangladesh, as most of it pertain to stock returns not market efficiency and has not been examined with current data sets (Khan and Yousuf, 2013; Bokhari, 2013; Afzal and Hossain, 2011; Ali, 2011), Bangladesh has always been ignored, for the most part. No research has been made in terms of a comparative study between Bangladesh and UK as a developed country, so a developed economy may provide lessons for the Bangladeshi Stock Markets, to improve market efficiency. Bangladesh has always had a tie with the UK, since, the UK had ruled Bangladesh for around two hundred years; however, there has never been a comparison of the two in relation to stock markets. This weakness has been handled in the present research, as the researcher took a unique study field and this study differed in relation to the field of investigation because it was a comparison between Bangladesh and the UK.

As a critical analysis of the above research studies, a researcher can argue that years of examination are not up-to-date, or have very short datasets. Nevertheless, in the current study, the researcher took a dissimilar data set for the period of January 1998 to June 2018 to discover the robust results as this research implemented monthly, weekly and daily data sets. The employment of sample periods from 1998 to 2018 had substantially enhanced the research.

Ultimately, selecting variables that have a clear beneficial impact on the literature regarding the relationship between the stock market and macroeconomic factors. After scrutinising the above literature reviews, it was found that nearly all research was conducted with domestic economic factors but ignored the international macroeconomic stimulus. This feebleness is fulfilled in the current research and is extended by most influential domestic and global macroeconomic variables.

Diverse methods provide rousing results. The gap created by all the above-mentioned literature reviews relates to the method of analysis and these drawbacks are taken care of in the momentum study by applying highly advanced tools, for instance, Augment Dickey Fuller, Phillips Perron tests, the Johansen co-integration model and the Vector Error Correction Model, to examine the short-run disequilibrium adjustment and long-run impact of macroeconomic variables on the Bangladeshi stock market and compare it with the United Kingdom. A Toda Yamamoto test (a sophisticated edition of the basic Granger Causality Test) was also implemented in order to investigate the long-run dynamic causal relationship between stock prices and selected macroeconomic variables in the UK and Bangladeshi stock markets. A Ljung-Box Q-Test, Lo-Mackinlay Individual Variance Ratio Test and Chow-Denning Multiple Variance Ratio Test were implemented to assess the state of market efficiency in Bangladesh using a range of tests and compare it with the United Kingdom. Henceforth, the researcher strongly believes that the contemporary investigation will contribute to the literature of the stock market efficiency. Accordingly, this examination will also provide an extraordinary theoretical contribution to the efficient market theory by measuring different aspects of stock market efficiency and the impact of macroeconomic variables in the UK and Bangladeshi stock markets.

Chapter 5

(A) Research Design and Methodology

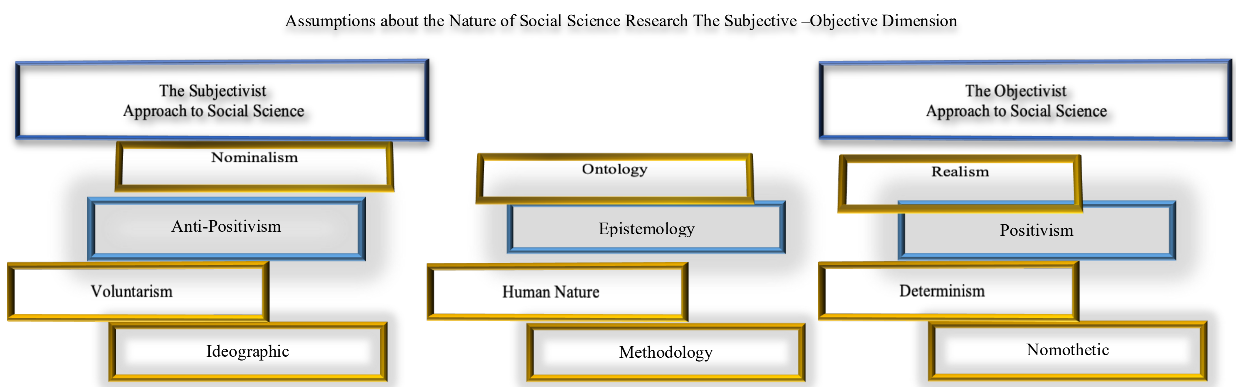
Introduction

This chapter details the methods that were used in this study. It describes the different epistemological and ontological assumptions that researchers consider when they are conducting social science research studies. Additionally, the various methodologies that are used by social science researchers were outlined and explained, particularly those that investigated finance and accounting research topics.

5.1 Social Science Research Foundation and Philosophical Point of Views

Many philosophical assumptions are typically made in social science research studies, these assumptions determine the direction of the studies, and are based on the viewpoints of researchers and their perspectives about the world. With regards to the philosophy of social science, an agenda proposed by Burrell and Morgan (1979) was founded on a subjective-objective paradigm. The concept involves four main elements of social science research: 1) epistemology 2) ontology 3) methodology 4) human nature. The researchers continued to explain how assumptions that were made about social science research tend to relate to these different aspects[124]. Subjectivism considers that entities are simply social constructs, which depend on human perception in order to properly exist. Objectivism, however, states that these entities physically exist within the world, which remains separate from ideologies constructed by sociological researcher studies (Saunders et al., 2007)[125].

Figure 5.1: Assumptions about the nature of social science research from the subjective-objective dimension



Source: Burrell and Morgan (1979, p.3) & Khan (2013)

[124] Burrell and Morgan (1979) explained how German idealism and sociological positivism help to support the subjective and objective aspects of sociological theories, respectively.
[125] Bryman (2004) continued to explain how objectivism claims that the social world and human nature are fundamentally separate and independent of one another.

The diagram above highlights the two main components of the subjective-objective paradigm, as well as the associated assumptions that relate to research in social science (Burrell and Morgan, 1979). First, the concept of the ontological perception is considered as being part of this framework. Saunders et al., (2007) explained how ontology addresses the nature of existence, as well as the related ideologies about reality. Burrell and Morgan (1979) discussed how reality presents liberation for individuals; suggesting that reality could be a construct of individuals' minds and consciousness. Ultimately, reality could be 'objective', in that it does not exist within human beings, but rather remains independent as a result of its external creation. There are two main approaches surrounding the ontological debate: 1) Nominalism, and 2) Realism. Nominalism suggests that society is a perception, which stems from a collation of names and ideas, thereby highlighting how there is no structure within the world. Realism; however, explains how society remains separate from human perception, and that it is constructed of real entities.

The epistemological component is the second aspect of the subjective-objective paradigm. It considers the way in which individuals perceive the world and process this information for it to be communicated further onto others (Burrell and Morgan, 1979). Epistemology focuses on whether or not knowledge can be acquired by individuals, which addresses the positivist aspect of the paradigm, as well as considering whether knowledge needs to be personally experienced to be understood, which addresses the concept of anti-positivism (Burrell and Morgan, 1979). A positivist approach suggests that hard facts are at the core of quantitative research studies. Saunders et al. (2007) suggest that positivism depends on the use of natural science research, which proposes new methods and models that can be utilised by social scientists to investigate human behaviour and nature. Positivism epistemology would investigate how society functions, through the exploration of causal relationships and regular occurrences that take place between different components (Burrell and Morgan, 1979).[126]

The third assumption that relates to this framework considers how the views of the researchers relate to human nature and social science studies. Epistemological and ontological assumptions are considered in this component, but are essentially different. The link between human nature and the environment has been examined by this assumption (Burrell and Morgan, 1979). There are two extremities of this component: Determinism and voluntarism. Determinism states that

[126]Anti-positivism, however, would support the idea that knowledge is not objective in nature, and instead involves subjective qualities.

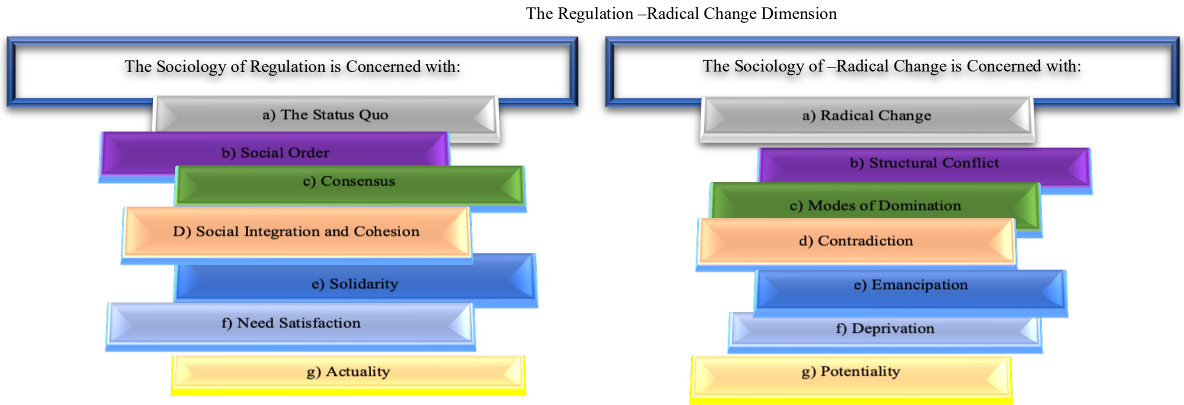
human beings are controlled by the environment in which they live, while voluntarism claims that human nature can only affect and influence the atmosphere.

The 4th component of this paradigm considers the method(s) of research. The other three components all relate to the final decision that is made regarding the design of the methodology. The research study by Burrell and Morgan (1979) explained how different aspects of the objective-subjective outline help to formulate the overall methodology that is selected by social scientists for the conductance of research. Ryan et al. (2002) continued to explain that there is a difference between methodologies and methods. The ontological epistemological and human nature components of research highlight how a method of analysis stands for the procedure of conducting the study, whereas the methods refer to the actual systems or techniques that are being employed (Ryan et al., 2002). Burrell and Morgan (1979) continued to explain the design of the methodologies, identifying two main types: 1) ideographic, which should be utilised when reality is considered to be an experience of human subjectivity and free will. This involves the obtainment of first-hand information from an investigative subject (Ryan et al., 2002) and 2) Nomothetic, which should be adopted when the deterministic view of human nature's lack of social construction is considered, often incorporating different quantitative methods of data interpretation (Burrell and Morgan, 1979). Godfrey et al. (2002) continued to support these statements, expressing how natural science and its adjustment of the techniques used in qualitative research should be adopted to further strengthen the scientific components of a research methodology.

Understanding the different approaches that are used in social science research requires further explanation[127]. The concepts of order and conflict, initially proposed by Dahrendorf in 1959, are further explained by Burrell and Morgan (1979) as the sociologies rule and radical change, correspondingly. The order-conflict assumptions that arise from the social sciences could be further overawed by considering regulation and radical change. These two concepts help to distinguish between the different types of social science that are being investigated by researchers. The table below highlights the regulation-radical change framework and how it is structured (Burrell and Morgan, 1979)[128], and the below diagram illustrates how these issues are overcome with the new method:

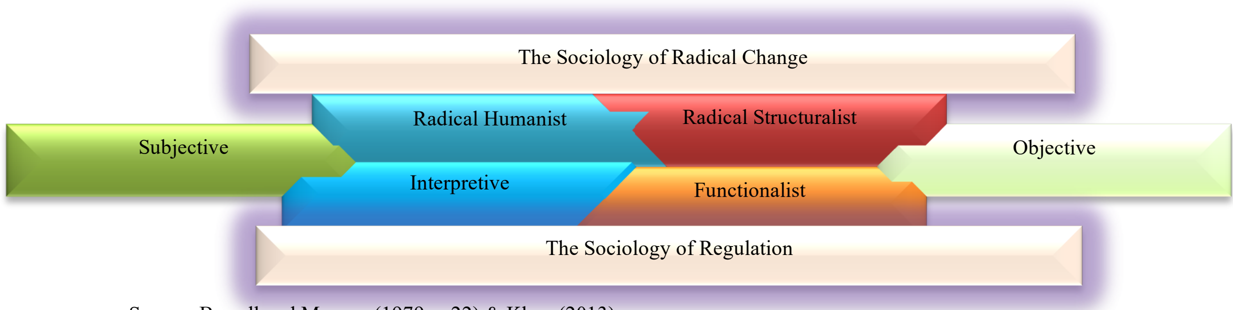
[127] Burrell and Morgan (1979) discussed how there are various assumptions that are associated with social science research, specifically differing based on the society that is being studied.
[128] This design replaces the existing paradigm that compares order against conflict, as this method was considered to be reductive and antiquated, thereby producing a great range of assumptions.

Figure 5.2: The Regulation-Redical Change Dimension



Source: Burrell and Morgan (1979, p.18) & Khan (2013)

Figure 5.3: Four Paradigms for the Analysis of Social Theory



Source: Burrell and Morgan (1979, p.22) & Khan (2013)

With respect to the tables above, it is necessary to explain how the sociology of the regulation component considers researchers that are aiming to investigate different aspects of social science pertaining to human activity and the maintenance of social unity and order. Burrell and Morgan (1979) discussed how this regulation aspect is mainly focused on the requirement for regulating human affairs. The sociology of the radical change component, however, relates to researchers who are interested in investigating human nature and its freedom from social structures. These researcher studies tend to reject order and control, instead favouring fundamental changes and irregularities[129]. Incorporating the subjective-objective framework together with the regulation-radical change paradigms that are used in social science study helped Burrell and Morgan (1979) to formulate 4 main approaches to social sciences study: 1) the radical structuralist 2) the radical humanist 3) the functionalist 4) the interpretive. These

[129] Burrell and Morgan (1979) discussed how this radical change aspect focuses on the emancipation of humankind from limiting and controlling structures that hinder overall development and progress.

four paradigms help to organise the tools that are required by the researchers to establish their progression of research (Burrell and Morgan, 1979).

Figure 5.2 displays these models, indicating the functionalist approach, which is positioned in the lower right-hand side quarter. This approach considers the sociology of regulation, while also adopting an objective view of the study of social sciences, and utilises methods that are used throughout natural science research (Burrell and Morgan, 1979). Generally, it is presumed that, using the functionalist approach, which considers that society involves structured and complete entities, as well as easily identifiable and measurable relationships, is largely based on the aspects of natural sciences. A functionalist paradigm, therefore, involves an element of realism in its ontology, positivism in its epistemology, determinism in its human nature, and adopts a nomothetic methodology in its structure[130].

An interpretive paradigm adopts sociological assumptions that fit with functionalism and regulation, as well as subjectivity and radical humanism and there is a clear dichotomy with the sources of these assumptions. From the regulative perspective, an interpretive framework focuses on explaining the order, structure, status quo, actuality and solidarity that exist within society, which fits with functionalism. However, it also diverges from this paradigm, as it mainly applies to research that involves elements of subjectivity, therefore adopting an ontology that is nominalist, an epistemology that is anti-positivist, human nature that is voluntary and a methodology that is ideographic. The interpretive framework is largely focused on the world as a complete and whole entity, often in an attempt to avoid making changes to its elements and structure (Burrell and Morgan, 1979).

A radical humanist approach to research, as illustrated in the diagram (upper left-hand side quarter), is based on subjectivity and the requirement for sociological changes. This approach adopts an interpretive paradigm and an element of subjectivity. It adopts an ontology that is nominalist, an epistemology that is anti-positivist, human nature that is voluntary and a methodology that is ideographic. It is more commonly associated with the radical change component of the continuum, often in an attempt to alter the structure, solidarity and order of society, instead focusing on domination, deprivation and emancipation. This approach differs

[130] As previously discussed, the sociology of regulation approach towards society is applied in this paradigm, hence the reason that functionalism is considered when addressing the actuality, order, status quo, structure and solidarity that exist within society (Burrell and Morgan, 1979).

greatly from functionalism, as it adopts different assumptions with regards to natural sciences and sociological research.

The top right quadrant of the diagram represents the radical structuralist component of the structure. It considers different assumptions that relate to radical change and objectivity. Additionally, it has many similarities to functionalism, as they both consider similar assumptions on reality. However, they differ based on their moves to create change within society. The radical structuralist component shares many similarities with radical humanism, as it encourages radical change, which is conducted with an element of objectivity and realism (Burrell and Morgan, 1979). This aim utilises realism in its ontology, positivism in its epistemology, determinism in its human nature, and a methodology that is interpretive. Radical structuralists differ greatly from interpretive frameworks, as the assumptions that are made about society and sociology are different.

Burrell and Morgan (1979) explained how these four frameworks consider the alternative perspectives of society. Their research stated that understanding all four approaches helps to broaden our understanding of society and the way that it can be perceived. Additionally, they continued to suggest that individuals are not able to operate within multiple quadrants at the same time; they are considered to be mutually exclusive and separate from one another, due to the differences in their fundamental assumptions, which concern society and sociology[131].

The approach that Chua adopted is widely accredited, as it allows researchers to utilise a variety of different paradigms simultaneously. However, the Burrell and Morgan framework continues to be favoured for use within sociological research, as it assists with the formulation of different assumptions surrounding these research topics, hence why it is more commonly used in research. This thesis has involved the use of a functionalist paradigm; the author has opted to study only this paradigm without incorporating others. Therefore, the typology that was outlined by Burrell and Morgan (1979) was apposite for this topic. The author was able to incorporate their own opinions and perspectives into the assumptions that were made under this approach, as well as the consequent methodologies that were selected for the study, all of which were suitable for the nature of this piece of research. The following section further

[131] Chua (1986), however, produced three groups to categorise these four paradigms. Radical humanism and radical structuralism were combined together to form the critical research components. The interpretive paradigm was named interpretive accounting, while the functionalist framework was named mainstream research, thereby completing the three different categories in Chua's typology.

expands on this topic, discussed by (Burrell and Morgan 1979), regarding the functionalist paradigm fitness of how the model actually works.

5.2 Philosophical Foundation of the Research

The study discussed and considered all of the aforementioned philosophies before finalising the aims of the current study, which is: scrutinise the performance of the stock exchanges in the United Kingdom (developed) and Bangladesh (emerging) without altering the structure and order of the industry. Therefore, the radical structuralist and the radical humanist approaches were rejected, as they tend to create change and disruption throughout society. The assumptions that were proposed by the functionalist and interpretive approach were favoured instead. Johnson and Duberley (2000) discussed how the acceptance of these assumptions helps to maintain the sociology of parameters, but those related to radical change in the research of the sociology, however, should be rejected. This thesis utilised quantitative research methods, which consider share price data, which can be generalised to be suitable for other markets. Therefore, this thesis was in accordance with the functionalist paradigm which has been outlined.

Additionally, considering the general objectives and aims of this thesis, the author felt that share prices are suitable measures within the Bangladeshi stock markets, in particular, as they offer a fascinating intuition into the reality of human nature and human concepts of socially constructed entities. Share prices are representative of the wealth of individuals; they also relate heavily to the different economies of regions, which are reflective of company and business activities and investments. The share price value is considered when measuring the capital spending that relates to equity. Additionally, the liberalisation of these economies allows foreign investors to provide money and purchase shares. Therefore, share price changes are not wholly restricted to individual nations; instead, they incorporate global actions and activity. This thesis, therefore, has selected an ontology that adopts realism in its nature.

Regarding assumptions about epistemology, this thesis has adopted positivism as its main structure to determine knowledge. It aims to investigate the causal relationships that exist between different economic variables, such as the share indexes and equity returns. It consequently predicts the prices of shares, based on historical information that utilises empirical data. Burrell and Morgan (1979) defined positivist epistemologies as approaches that explain and predict the occurrences within society, through the assessment and evaluation of regularities and causalities between different components. Therefore, share prices were used as a suitable indicator for knowledge, relating to market activity and quality, which were of interest to the researcher.

This study has adopted an intermediary stance with regards to the determinism versus voluntarism debate, as pertains to human nature. The stock markets that exist within the United Kingdom and Bangladesh were considered to be externally controlled by influences outside of control. The Exchange Commissions, regulatory bodies, associated securities, SAARC policies, the European Union and SAFE are all associated with these stock markets, and were considered to have considerable control over their activities. Equity values are an example of one parameter that is of particular importance to such bodies. Therefore, a deterministic approach to human nature was appropriate for these factors. However, the stock markets are controlled to a certain extent by the region in which they operate. Internal management of exchanges contributes to the formulation of policies and frameworks that these markets operate within, as well as the overall law of the region. Such factors would lean towards a voluntary approach to human nature, instead. Consequently, the author opted to remain in between these two extremes within an intermediary position. Burrell and Morgan (1979) explained how intermediary standpoints can be selected by social scientists in order to account for both the voluntary and deterministic elements of society and its activity.

Therefore, the functionalist approach was selected for this piece of research. The study selected assumptions that were associated with area list ontology, an intermediary standpoint between determinism and voluntarism on human nature, positivist epistemology, and a nomothetic methodology. Bryman (2004) discussed how quantitative research is highly focused on the quantification and analysis of different data. It adopted a deductive approach and incorporated aspects of objectivity, thereby producing a highly scientific model that the research process followed, which is particularly supported by positivism. This thesis has adopted such quantitative research methods in order to analyse share price data and generalise the results to other markets.

5.3 Data Collection and Sources in the Research

This thesis examined the short- and long-run equilibrium adjustments, to identify a causal relationship that was dynamic in nature, between the LSE and DSE. Share values were selected accordingly from the FTSE100 and DSEGEN index for measurement, as they were suitable macroeconomic indicators for both Bangladesh and the United Kingdom, examples of this include consumer price indexes (CPI), exchange rates (EXR), deposit interest rates (DIR), broad money supplies (M2), per capita GDP (GDPCAP), balance of trade (BOT), international crude oil prices (IOP), foreign remittance (REMIT) and treasury bill rates (TBR).

The data that was selected for this research involved macroeconomic variables as well as share prices for both the DSE and LSE. Additionally, monthly time series data were implemnted in the evaluation, as these data span a period of 20 years and six months, between January 1998 and June 2018 (Daily, weekly and monthly share indices), culminating in 246 monthly values. The research was established upon secondary data that was sourced from different vendors, such as the all share price index for monthly observations of the DSE, which were collected from the DSE publication "Monthly Reviews", Dhaka Stock Exchange archive and "Statistics Bureau" and Bangladesh (BBS). Other data vendors included the Bank of England's publication, "Monthly Economic Trend", and the Office for National Statistics (ONS) as well as the World Bank. Additionally, stock closing prices of each trading day for every included month were incorporated into the analysis for this research, and monthly data for the macroeconomic variables were also selected for the analysis.

5.4 Sample Design for the Investigation

As discussed, the data that were utilised for this study included specified economic indicators and share price indexes for the DSE and LSE. Various other objectives were used by the researchers to respond to the examination questions and fulfil the targets of the investigation, including:

A) In order to evaluate and compare short- and long-term equilibrium adjustments and vigorous causation relationships that exist in both the LSE and DSE, the researcher utilised monthly stock data for the selected stock prices and macroeconomic factors, which were associated with certain UK & Bangladeshi activities.

B) In order to evaluate and research how share values of both the UK and Bangladesh could display elements of the market efficiency, only stock price data for each country was necessary. Daily, weekly and monthly information was collected for the research period that was outlined.

It is important to note that the data within the current investigation were analysed using the software 'SPSS' and 'Eviews 11'.

5.5 Explanatory Variables

Consumer Price Index:

Consumer Price Index (CPI) is a statical measure and an economic indicator that was prepared by the Bureau of Labour Statistics (BLS) in the US. CPI remains the most implemented measure of inflation and, subsequently, the most widely used measure of the effectiveness of a government's economic policy. Through CPI, citizens, businesses, and the government itself can be given an idea of the price changes within the economy, thus acting as a through which informed decisions regarding the economy can be made (ILO, 2004).

Inflation can be defined as the decline of a particular currency's purchasing power, or it can be described as an overall rise in prices (OECD, 2019). The rate of this decay can be quantitively estimated from the relative increase of the mean price of a bundle of selected items and services in an economy, over a certain time period. An overall increase in prices, expressed as a percentage usually, indicates that a unit of the defined currency buys less than that which it was able to buy in previous periods (The U.S. Bureau of Labor Statistics, 2019).

Average alterations in the values of services and goods (i.e. medical care, food and transportation) can be measured through CPI, which compares the current cost to its cost in the defined past period. Thus, the CPI quantifies the aggregate price level of a country, therefore providing a measure for the purchasing power of the country's unit of currency.

The CPI is calculated using the weighted average of the prices of services and goods, which estimates the consumption patterns of an individual. These statistics cover a variety of consumers including self-employed, professional, unemployed and retired individuals, as well as individuals whose incomes fall below the federal poverty threshold. However, the CPI report does not include armed forces, non-metro or rural populations, farm families, individuals in mental hospitals, and individuals who are currently incarcerated (Mark A. Wynne and Fiona D. Sigalla, 2014).

Deposit Interest Rate:

Normally expressed as an annual percentage, deposit interest rate is the proportion of the loaned amount that a lender charges as interest to the borrower, i.e., the rate which a bank, or other lender, charges for borrowing its money, it can also be defined as the rate which a bank pays its savers for keeping money in an account (Fisher and Irving, 1907). DIR has been previously characterised as "an index of the preference for a dollar of present [income] over a dollar of future income." This is when the borrower wants or needs, to have money as early as possible, and is therefore willing to compensate (namely, the interest rate) for this privilege (Homer et. al, 1996). DIR targets are an instrumental component of monetary policy and they are given much consideration when dealing with variables such as unemployment, inflation, and investment.

Generally, a country's central bank has a tendency to reduce interest rates at times when their focus is on increasing the levels of consumption and investment in the country's economy (Nakamichi et. al, 2016). However, as a macro-economic policy, a low deposit interest rate can have risks and there is a chance for the formation of an economic bubble where massive amounts of investments are placed into the stock market and the real-estate market. This is why in economies which are developed, adjustments to the DIR are made in order to ensure that inflation remains within a specific target range to maintain the economic health activities, the interest rate can also be capped in a manner which is concurrent with economic growth in order to sustain and protect economic momentum (Goodhart, C.A.E., 2013).

Exchange Rate:

The rate at which one currency is exchanged for another, is referred to as an exchange rate. Although currencies typically take the form of national currencies, there may also be 'supra-national currencies', such as the Euro or 'sub-national' currencies, such as in Hong Kong, (Dufrenot et al., 2005). The exchange rate can also be referred to as one country's currency value compared to a different currency, and governments can place particular controls or limits on exchange rates.

The exchange rate regime that is applied to each currency is typically determined by that currency's country, for instance, a floating exchange rate system is where the exchange rates are ascertained by the foreign exchange market, which tends to be available to a large variety of sellers and buyers and currency is traded continuously (except on weekends). The spot exchange rate refers to the current exchange rate, and the forward exchange rate is one that is traded and quoted in the present day, except when delivery and payment take place on a specified date in the future (Di Bell et. al., 2007).

Nonetheless, a number of governments aim for their currencies to remain within a defined narrow range, which ultimately results in the currencies becoming under-valued or over-valued, thus resulting in overall trading surpluses and deficits (Salto et al., 2010). In the majority of cases, high economic growth rates are beneficial to a local currency's performance in the long-term as they significantly support its strong momentum, contrarily, in the short-term, high economic growth rates have been shown to not be favourable to a local currency's performance in the foreign exchange market (Jongwanich and Juthathip, 2008).

Broad Money Supply:

The total volume of money held by the public at a certain point in time in an economy is referred to as the money supply, or money stock. The term "money" can be defined in various ways, but the standard forms of measure typically include "currency in circulation", as well as "demand deposits" - which refer to the easily assessed assets of depositors on the books of financial institutions (Milton Friedman, 1987). However, it is worth mentioning that "money" can be defined by the central bank of each country in a way that suits its purposes.

Money supply can be influenced by the central banks through open market operations. Purchasing government securities (e.g., treasury bills or government bonds) can increase the money supply, which ultimately increases the banking system's liquidity through turning the illiquid securities of commercial banks into liquid deposits at the central bank. As a result of this, these illiquid securities increase in price because of the increased demand, which is also accompanied by a fall in interest rates. As such funds become available to commercial banks for loaning, and through the fractional-reserve banking multiplier effect, there is an increase in loans and bank deposits that is manifold the original amount of funds that were injected into the banking system. However, when the money supply is restricted/ 'tightened' by the central bank, the central bank proceeds to sell securities on the open market, which draws liquid funds from the banking system. An increase in supply, and a rise in interest rates, can result in the prices of these securities falling, and this also has a multiplier effect (Lipsey et al., 2011).

The effect of this type of occurrence is either a reduction or an increase in the supply of short-term government debt both for non-bank public and banks, which also has the effect of lowering or raising interest rates. Ultimately, there will be a consequent increase or reduction in the supply of funds that can be loaned, as well as the ability of private banks to issue debt.

Per capita GDP:

There exist a variety of ways through which a country's wealth and prosperity can be assessed and analysed. The most universally used one is per capita GDP, due to its ease of calculation and usage, which are attributed to its components being tracked regularly and on a global scale. GDP, Per capita gross domestic product, is calculated through dividing the GDP of a country by its population, thus providing a measure that breaks down a country's economic output per person (World Bank, 2021), it also illustrates the amount of economic production value which can be attributed to each individual citizen.

If a country whose per capita GDP shows growth with a steady population, then this can possibly be attributed to advancements in technology that result in a greater rate of production, even with the population staying constant. In the event that a country has a small population coupled with a high per capita GDP, then this typically indicates that that country is self-sufficient and based on special resource abundance (World Economic Outlook Database, 2021).

Even if a nation has continuous economic growth, its per capita GDP growth will still be negative if its population is growing faster than its GDP. This does not occur in the overwhelming majority of established economies, where even a lukewarm rate of economic growth is still able to outpace the rate of growth of the population. However, countries which have a low per capita GDP to begin with (such as many countries in Africa) are likely to encounter a decline in living standards due to a rapidly increasing population coupled with little GDP growth.

Per capita GDP can be a useful tool for governments to utilise in understanding how the economy is growing relative to its population, as well as providing insights into a country's domestic population impact. Ultimately, in order to comprehend the way in which an economy grows or contracts relative to its country's population it is vital to examine the contribution of each variable involved (IMF, 2018).

Balance of trade:

The difference between the value of a country's imports and its exports over a given period of time is known as the Balance of trade (BOT), this is the largest component of a country's balance of payments (BOP). It is also sometimes the case that there are two separate figures for the balance of trade between a country's services and the balance of trade between its goods (Phillips, 2007). This balance of trade is a component of the current account, where debits take the form of foreign aid, imports, domestic investments abroad and domestic spending abroad; whereas credits are made up of foreign investments in the domestic economy, foreign spending in the domestic economy, as well as exports. Economists have been able to make conclusion pertaining to whether there is a trade deficit or trade surplus for a particular country over a period by subtracting the aforementioned credits from the debits. The trade balance, the international trade balance, commercial balance, or the net exports are all alternative terms for referring to the balance of trade.

BOT is implemented by economists as a means of calculating a country's economy, so a country with a trade deficit (or a negative trade balance) has greater imports of goods and services than exports, meanwhile a country with a positive trade balance, has a trade surplus, exports more goods and services than it imports (O'Sullivan, 2003). However, an economy's health is not always viably indicated by a trade deficit or surplus, as it is of utmost importance to also consider the context of the business cycle as well as other economic indicators. For instance, countries have been known to favour exporting more during a recession in order to create more jobs and increase demand in the economy, conversely, countries tend to favour greater import during times of economic expansion in order to promote price competition, thus limiting inflation (Crowther Geoffrey, 1948).

International oil prices:

Fossil fuels, such as crude oil, are crucial resources upon which the world economy is essentially reliant on. The largest reservoirs of fossil fuels are controlled by a group of countries, and therefore the demand can spur political strife. The supply to demand ratio heavily affects the prices and profitability of crude oil, as is the case in any industry. Saudi Arabia, Russia and the United States are the leading producers of oil (Kilian and Lee, 2014).

There are two types of oil contracts that are available for investors to purchase, these are spot contracts and futures contracts. Oil can be seen as a speculative asset to the individual investor, a portfolio diversifier, a speculative, or a hedge against related positions. The futures price is an indication of the price which the buyers are willing to pay for oil for a delivery date that is in the future, whereas a spot contract reflects the present market price of oil (Fattouh Bassam, 2016).

Oil futures contract prices are typically used as a gauge by the Central banks and the International Monetary Fund (IMF). The prices of crude oil futures are set by traders using two factors: supply & demand and market sentiment (Kilian Lutz, 2008). However, due to their adding an excessive variance to the current price of oil, futures prices can be a poor predictor.

As crude oil prices are in a constant state of change with greater volatility than the prices of stock or currencies, successful investors and must have good information sources reporting the many variables that impact oil prices (Mabro Robert, 2006).

Lower inflation is a result of the macroeconomics impact on lower oil prices. Consumers benefit from a lower inflation rate, as it means that the general value of a bundle of goods would increase minimally one year to another, which therefore gives consumers greater purchasing power, potentially improving the real GDP (Baffes et al., 2015).

Foreign remittance:

Derived from the word 'remit', meaning 'to send back', the term 'Foreign remittances' refers to assets that are transported to an immigrant's country, usually for need-based expenses (food and clothing). These can be from the personal savings of workers who left their native countries seeking work elsewhere. Developing nations with emerging economies are heavily dependent on foreign remittances. In fact, remittance makes up a large proportion of a nation's growth as measured by the gross domestic product (GDP) (Gupta Poonam, 2005), and foreign remittances can constitute a vital financial lifeline for many of the world's economically-vulnerable and working-poor.

However, one of the drawbacks of is the associated concerns that the money could be used nefariously for money laundering or terrorist financing as emittance payments are difficult to track. The transfer of money earned illegally through legal bank accounts with the purpose of concealing that the wealth was illegally obtained is known as Money laundering (Al-Assaf et al., 2014).

The general consensus among economists and social scientists is that due to their extremely widespread nature, remittances have effects beyond the finance of an individual. For instance, remitting can promote development due to the fact that whoever receives and sends are likely to have bank accounts, and the process therefore involves financial institutions. Additionally, in the event of armed conflicts, natural disasters and other instances where people's normal sources of income vanish, remittances can be lifesaving. This is also the case with problematic economic events, for instance if a country experiences a major economic downturn, as remittances can be used to help in alleviating economic hardship (Vargas-Silva, 2018).

An estimated 10 million Bangladeshis, working abroad have sent $15 billion to home in 2018 and $18.32 billion in 2019. It is country's second-largest source of foreign earnings after its gigantic textile industry. Bangladesh is one of the top 10 countries in the world for migration and remittance according to World Bank. Most of the remittances come from gulf countries (IMF, 2021).

Approximately 10 million Bangladeshi individuals working overseas have transferred a combined amount of $15 billion to Bangladesh in 2018 and $18.32 billion in 2019. This constitutes the country's second-largest source of foreign income after its textile industry. Bangladesh is within the top 10 countries for remittance and migration according to the World Bank, where the majority come from the gulf countries (IMF, 2021).

Treasury bill rates:

A short-term U.S. government obligation backed by the Treasury Department with a period of one year or less is known as a Treasury Bill, also known as a T-Bill. Although Treasury bills tend to be retailed in values of $1,000, in non-competitive bids a maximum of up to $5 million is possible . They are considered to be secure investments with a low-risk factor, where the T-Bill will pay the investor a higher interest rate, the longer the maturation dates are set in the future.

T-Bills tend to have a high tangible net worth and are sold using non-competitive and competitive bidding auctions, the non-competitive bids are priced based on the average of all competitive bids. They are usually kept until maturity date, although holders have the option of cashing out prior to the maturation date and then resell the investment in the secondary market, in order to capitalise on the short-term interest profits (Pender Kathleen, 2011).

Investors are paid the face value (par value) of the bought bill, when the maturation date arrives. The investor earns interest when the face value amount of the T-bill(s) is superior than purchase price - the interest earned is the difference between the these two values. Unlike coupon bonds, T-bills do not give the investor systematic interest payments, but does contain interest, which is reflected in the profit that an investor receives when it reaches maturation date.

Treasury Bills can be regarded as one of the securest investments that an investor can make, they pay a constant interest rate, which provides a steady revenue. However, there are drawbacks associated with investment in T-Bills, for instance, there is the issue of treasuries having to compete with inflation, which measures the rate at which prices rise. Therefore, despite T-Bills being the soundest and most liquid debt security, a lesser number of investors buy them during periods where inflation is higher than the return (Kenneth Garbade, 2008).

5.6 Formulation of Hypothesis

Consumer Price Index (CPI)

Fama and Schwert (1977) suggest that an adverse connection is often present among stock earnings and the CPI. The prices of stock increase when the stock valuation model's discount value drops due to CPI declines, which reduces the nominal risk-free value. It has been proposed that if the CPI and cash flow decrease simultaneously, then a mediation of the discount rate occurs (Mukherjee and Naka, 1995). Subsequently, this instigates a plunge of share values. However, it has been discovered that equity prices rise due to a decrease in discount rate, since CPI and inflation fall at a different rate to cash flow (DeFina, 1991). Additionally, Khan and Yousuf (2012) added that this correlation may have no significance in developing nations, where share values may usually be impacted by larger changes. Coinciding with analyses coordinated by Maysami and Koh (2000), Singapore; Eita (2011) researched Namibia; Wongbangpo and Sharma (2002) researched ASEAN-5 nations, and Osei (2006) researched Ghana for a connection between inflation and share values. It was found that equities were adversely linked with inflation for the researched nations. Additionally, Yu Hsing (2011) based his study on the UK and USA; Siaw (2011) studied in Ghana; by Fama and Schwert (1977); Nelson (1976) indicated adverse effects for shares and inflation, meanwhile Najand and Noronha (1998) who studied Japan; and Zhao (1999) who studied Nigeria, postulated that the negative result of inflation was a consequence of actual regular changes of commerce, variations in money availability or because of both. Ordinary stock effectiveness can be described as the degree to which investors cushion themselves from loss of investment in the stocks due to the doubt caused by inflation on the expected price of the products in the future (Bodie, 1976). Schwert (1989), on the other hand, reported that there were several theories forecasting an affirmative link between instability and volume. Firstly, investors with diverse opinions and fresh evidence instigate trading and price changes. Subsequently, particular shareholders make trading judgements based on price fluctuations and huge trading volumes are induced by huge price variations. Thus, due to liquidity causing price pressure in the short-term within sub trading markets, price variations that are in the majority of buy or sell can produce huge trading volumes. Therefore, several research papers found an adverse relationship between equity price and CPI. Based upon this, a non-positive was hypothetical in this case.

Exchange Rates (EXR)

Foreign EXR refers to when any economy's money is turned into another economy's money. The EXR is Rs./US$ at month-end. Saeed (2012) suggests the existence of a positive, yet undesirable, link between EXR and profit. For instance, earning lowers whenever domestic currency rises compared to the dollar. However, the link between EXR and profit is positive with regards to the export activity within industries. Many scholars have suggested that share market efficiency is largely driven by exchange rates (Soenen and Hennigar, 1988; Ma and Kao, 1990). A positive correlation for EXR (Rs./US$) is predicted during the current research. In 1752, Hume outlined a framework for stock prices. The majority of global purchases are carried out in US$. Therefore, a weighted average exchange rate (Rs./US$) has been gathered. Khan and Yousuf (2012) suggest that the increase in the UK's GBP and the decrease in Bangladesh's Taka (compared to the US$) has led to a higher global market price of products in the British and Bangladeshi economies. Furthermore, imports begin to rise and fewer exports are needed. As a consequence, the cash flows of GBP and Taka into firms in the UK and Bangladesh decrease, thus leading to lower stock prices. The stock valuation model also supports this. However, this should be the other way around when both the GBP and Taka lose their value against the US$.

Trade balance and the extent of global trade will largely drive the level to which the exchange rate alters the economy. Therefore, within the economy, import and export have a leading position of influence on the effect of change. With the usage of a DER citation, a positive association is acquired, this can be perceived from other studies such as those of Lee and Brahmasrene (2018) for Korea; Giri and Joshi (2017) for India; Yu Hsing (2011) for the USA and the UK; Indonesia and the Philippines; Sangmi and Hassan (2013) for India; and Adam and Tweneboah (2008) for Ghana where an affirmative link was discovered between share values and foreign EXR, but it was only a weak link. This is in addition to the studies of Gan et al. (2006) for New-Zealand in the long-term; Osamwonyi and Evbayiro (2012) for Nigeria; Asmy et al. (2009) for Kuala Lumpur; Siaw (2011) for Ghana; Jaafar (2013) for Malaysia; Khan and Yousuf (2013) for Bangladesh; Saini et al. (2006) for Malaysia; Abdalla and Murinde (1997) for India, and Bahmani and Sohrabian (1992) for the S&P 500 index, the studies provide a positive link between share values and EXR. Contrarily, with regards to conventional methods, a growth in the currency is disastrous news for resident companies because the benefits of exporting to poorer rates will be gone, which will then steer the company's stock prices and profits to a drop. It is also worth mentioning that a negative association exists between equities and EXR. However, because the results do not match up, this research hypothesises an affirmative link between foreign EXR and share market.

Deposit Interest Rates (DIR)

DIR is portrayed by the rate of return that is offered for different savings units inside an economy for the amount kept in their bank account. The proposed negative correlation is based on the underlying assumptions of the correlation within DIR and share amounts. This is supported by Fama (1981) who suggests the existence of a negative association between estimated inflation and predicted real activity, but a positive link with share prices. Henceforth, equity prices ought to be adversely related against projected inflation, which is regularly done through interest rates in the short-run. On the other hand, the effect that stock prices have once impacted on by long-term interest rates originates straight from the current value model, from discount rates of long-term IR. Asprem (1989) demonstrates that interest rates illustrate the price that equity market investors face. In other words, if stock returns seem to be greater than any other choice, stakeholders begin to further invest in stocks, this is done by the movement of current investments from existing origins. Likewise, when bank deposit returns seem greater in comparison to investment returns from stocks, investors shift their reserves to that market. Khan and Yousuf (2012) explain that investors tend to replace interest-bearing securities, such as stocks, when the interest rate increases and leads to a significant opportunity cost in holding cash. Mukherjee and Naka (1995) elucidate that discount rates will also rise based on IR and the influence upon the discount rate. Therefore, it is projected to have a deterioration of share values, and the same is true in reverse. Pursuant with the results of Demir (2019) for Borsa Istanbul; Ditimi et al. (2018) for Nigeria; Tomáš and Daniel (2017) for the Czech Republic, Hungary and Slovakia; Alam and Uddin (2009) for Bangladesh; as well as Huizinga and Mishkin (1986); Wongbangpo and Sharma (2002); Osamwonyi and Evbayiro (2012), this research theorises that a negative link exists between stock price and deposit interest rates.

Broad Money Supply (M2)

Mookerjee and Yu (1987) explain the complicated correlation between equity value and broad M2, this is due to portfolio alterations impacting stock price, which is directly influenced by M2 fluctuations. Contrarily, M2 indirectly influences economic activity factors. Existing currency, savings, the overnight repos of commercial banking institutions, the non-institutional money market and small time deposits are all part of the money supply. Because this is broader than M1, yet remains quite simple to record, the money supply is considered to be the main signifier of the economy. In the short-term, a positive connection is present within profitability and M2, this is because the money supply increases as liquidity increases. Saeed (2012) argues that, in the long-term, profitability suffers due to the positive correlation between money supply and inflation. Furthermore, many scholars have shown the ways in which stock prices are influenced by M2 (Tursoy et al., 2008; Groenworld and Fraser, 1997). Another study illustrates how in bull markets, a rise in fiscal growth rates occurs around 2 months prior, whilst decreases in fiscal growth rates occur around 9 months prior in bear markets (Sprinkel, 1971). For this reason, it can be predicted that there is an affirmative connection between share profitability and money supply.

Equity prices probably fall when risk-free rates rise, this is because inflation and efficiency for fiscal growth are thought to share a constructive relationship. Instead, it is believed that stock price may be influenced by money supply via other functions. Some studies have discovered no correlation between these two factors (Cooper, 1974; Nozar and Taylor, 1977), while a number of other studies have discovered a highly significant correlation between the two factors (Kraft and Kraft, 1977; Hamburger and Kochin, 1972). It can be suggested that the corporate earnings effect, which refers to the impact of fiscal growth, could negate the disadvantages, and this might cause a rise in the stock price and cash flow of the future. This idea was backed in one Singaporean study, which discovered that stock profitability and fluctuations to M2 share a constructive relationship (Maysami and Koh, 2000). Chaudhuri and Smiles (2004) and Mukherjee and Naka (1995) found that a rising broad money supply could create an incline of liquidity of firms. In turn, this should cause an increase of share values, which is called the corporate earnings effect. Additionally, this is further supported by the studies of Demir (2019) for Borsa Istanbul; Ditimi, et al. (2018) for Nigeria; Jahfer and Inoue (2017) for Sri Lanka; Chen et al., (2005) for Taiwan; Naik and Padhi (2012) for India; Ahmed and Imam (2007) for Bangladesh; Osamwonyi and Evbayiro (2012) for Nigeria; Asmy et al. (2009) for the Kuala Lumpur Composite Index; Khan and Yousuf (2013) for Bangladesh, as well as Samitas (2004) for ASE, these studies revealed a non-negative link between share price and M2. Henceforth, the theory is that the greater the money supply, the higher the probability that share values will undergo an uptrend.

Per Capita Gross Domestic Product (GDPCAP)

There is an affirmative association within the economic development rate and the GDP development rate. In a productive and stable corporate environment, greater returns may be achieved, which may cause a rise in equity values. Many feel that stockholders benefit from economic development. Nonetheless, Ritter (2005) argues that between 1900 and 2002, an adverse relationship existed between GDPCAP and real stock profits. Additionally, one study revealed that there was a correlation of 0.03 for 18 new markets and 0.32 for 17 developed nations between GDPCAP and share profitability from 1970 to 1997 (Siegel, 1998). The author proposes two reasons for this. The first reason is that the majority of a nation’s stock markets rely on revenue from the global economy and not only the nation’s economy, since the companies with the highest share of the market operate in multiple countries. The second reason is that a number of rapidly developing nations, such as Japan, made over-ambitious predictions, and that stock prices during the study were highly dependent on the predicted economic developments of the time. Therefore, it is suggested by the researcher that the predictions of rapid growth from the examined time period can provide an explanation for the undesirable affiliation within GDPCAP development and real stock profitability.

That being said, current studies propose a trend for markets facing rapid development predictions to allocate higher price-to-dividend and P/E multiples. Since a higher investment must be offered by individuals or companies in order to achieve equal dividends, the actual profits are thus lower than expected. This would not be an issue if this had caused dividends to rise. However, it is suggested that when dividend returns in America are small, dividend growth is also small (Arnott and Asness, 2003; Shiller, 2001). Therefore, Chandra (2004) suggests that the stock market benefits more when everything else is stable while the per capita GDP growth rate remains more substantial. The above has been confirmed by many researcher studies, such as those by Yu Hsing (2011) for the USA and the UK; Yu Hsing (2012) for Argentina and the USA; Gan et al. (2006) for New Zealand; Osamwonyi and Evbayiro (2012) for Nigeria, as well as Chandra (2002); Acikalin et al. (2008) and Ahmed and Imam (2007) for India. Although these studies observed proof, they did not achieve the contract of the influence on per capita GDP upon share value, the research theories suggested that the GDPCAP may cause an influx of share values.

Balance of Trade (BOT)

Economists have highlighted the great importance of the link between the nation and the shares in its markets, and researchers use the balance of trade as one of many indicators. Bhattacharya and Mukherjee (2003), however, found a negative correlation in India between the stock exchange price and trade balance. The fact that there is an endless shortage in the trade balance implies that there is an opposing effect upon equities. Furthermore, the growth of foreign products and the decline of domestic products, will mean that investors will want to invest into the foreign market instead.

With regards to the Wealth Effect Theory, a surge in the prices of stock, particularly if permanent, leads to an increase of use as the projected salary of a household is increased. Additionally, this allows for an array of investment opportunities for organisations to finance, thus bringing about a decrease of trade balance in a particular country (Fratzscher and Straub, 2010). Nonetheless, as indicated by Simo-Kengne et al. (2015), investors can use their wealth to expand their investments during a market boom, which lessens their usage. Simply put, an increase or decrease of utilisation can be initiated by the wealth effect, therefore enhancing or worsening the trade balance. A surge of real stock rates generally has an affirmative impact on inflation and IR in the short-term, according to EXR theory; it also leads to a significant rise in the consumption and growth of EXR, hence weakening the trade balance (Fratzscher and Straub, 2009). Conversely, stock prices can also be affected by the trade balance, with the growth of inflationary trade balances leading to an answer from the monetary official in the form of a larger IR, which is prone to adversely impact share prices (Mercereau, 2003a,b; Aggarwal and Schirm, 1992, 1998; Hogan et al., 1991). To summarise, trade balance and stock are able to impact each other, the effect that prevails, discussed above, determines whether the association within each factor is positive/negative. Moreover, Krugman and Taylor (1977) discovered that in order to generate a high request for domestic goods, you need to increase the price of foreign goods, which then diminishes imports and increases exports, as foreign goods are now undesirable. Ultimately, when exports begin to rise, this triggers a surge for domestic goods, which is proof that there is an enhancement to trade balance, because deflation is running as planned as the need for export merchandise increases. Likewise, an upsurge of domestic yield is caused by the requirement for native goods and, from the perspective of a stakeholder, an escalation of output is found to be an indication that an economy is booming, which then causes an increase in the price of shares (Ajayi and Mougoue, 1996). The results of Ajayi and Mougoue's research study (1996) are also supported by those of Ray and Mahavidyalaya's study (2012). Contrarily, inflation can sometimes be prompted by depreciation, which leads to a decreased demand for foreign goods, due to the increased price of imports, while creating an increased need for domestic products. Nevertheless, the government may reduce the interest rate if there is inflation, so it can be contained, but it has the possible adverse effect of halting economic growth. Despite the fact that the empirical evidence and literature have not reached an agreement pertaining to whether there exists an insignificant or positive influence upon the BoT on share values, the thesis conjectured that an increase of stock prices can be caused by an incline in trade balance.

International Crude Oil Price (IOP)

Hassan and Hisham's 2010 research study provides a basis for the price of crude oil in the current research, which represents the economic actions being taken within the nation due to oil price's function as an input in manufacturing, farming and other production industries.

Furthermore, Data Stream International provides the global crude oil prices in this research. Additionally, the 1993 study by Chen and Jordan, and the earlier 1985 study by Chen et al. are used to offer proof of the existence of a relationship between share profitability and IOP. One study found that the influence of rising oil prices is more significant regarding stock profitability than it is for industrial production activities, it is a destructive relationship between the cost of oil, equity profitability and industrial production (Butt et al., 2009). One of the leading oil importers is Ghana. When oil prices fluctuate, company profits also fluctuate. This also means that dividend payments fluctuate due to the impact of these elements on the expense of industry operations. Therefore, an adverse link is predicted between share profitability and IOP.

Sawyer and Nandha (2006) established that by investigating the impact of IOP against inflation and IPI, the price of oil was established to effect share market profits and macroeconomic elements. Jones et al. (2004) also found that an increase of IOP naturally leads towards greater production expenses and therefore to less projected profit or less production activity. Another study highlights this relationship via a Markov switching approach (Codo-Reyes and Quiros, 2005), although the paper also discovered that shares have been influenced more significantly by oil prices than industrial production. Increased inflation rates can occur due to increased CPI values that stem from increasing oil prices. Therefore, an affirmative relation between CPI and IOP is existent.

Furthermore, it has been proposed that stock prices, economic activity and cash flows will decrease as oil prices rise, and the profitability of industries can have a positive or negative correlation to oil price overall. For instance, Saeed (2012) explains that the linkage between IOP and IPI is negative when rising oil prices lead to companies incurring higher production-related expenses. However, the correlation between industry and oil price is positive when company profits rise based on higher oil prices. Therefore, it is suggested that the correlation between share values and oil prices is an adverse one. Nonetheless, it is important to note that a non-adverse link could also potentially occur. Khan and Yousuf (2012) suggested that IOP is not an internal element. Nonetheless, the extensive literature on the hypothetical connection between share values and IOP for a nation has indicated differed forecasts, and this outcome has been bolstered by many empirical research studies, such as those of Demir (2019) for Borsa Istanbul 100; Giri and Joshi (2017); Al-Rjoub (2005) for the USA, as well as Ray (2012) and Park and Ratti (2008) for the USA and thirteen Europa economies. The aim is to address whether global influences have an impact on (potentially) global markets, and the British and

Bangladeshi markets. Although the empirical evidence and the existing literature did not agree on the impact that stock prices receive from oil prices, this study speculates that an expansion of IOP will prompt a rise in share prices.

Foreign Remittance (REMIT)

Due to the obvious breadth of its function, it is now easy to see why economic growth depends so highly upon the stock market. A number of elements can be involved in the development of shares, these elements may be thought of as either non-domestic or domestic. Malik (2013) explains that non-domestic elements can include employee's remittance, non-domestic portfolio investment, and FDI inflow. On the other hand, expats living in other countries wish to invest in their country of birth via non-domestic remittance, for example, international investors who wish to invest in the form that non-domestic private investment takes (e.g. FDI inflow). In Bangladesh and other developing nations, one of the primary inflows of investment takes the shape of FDI. Importantly, this also facilitates improvements in the qualification level of the workforce, increased human capital, and technological assets. For this reason, portfolio investment (particularly in the stock market) is seen as a short-term activity, while on a longer-term basis, FDI inflow can help a nation to develop. When an expat becomes involved in foreign remittance, this has the benefit of allowing for extra money to be invested while supporting the expat's family members. Therefore, the evolution of a share market relies heavily upon the investment of non-domestic individuals and companies through portfolio investment, foreign remittance and FDI inflow.

While a long-term positive correlation was found to exist between market capitalisation and non-domestic portfolio investment in a recent study, portfolio investment is also proposed to be linked to various advantages and disadvantages (Chukwuemeka et al., 2012). The researchers argued that portfolio investments were transferred heavily to developing nations from developed nations prior to fiscal emergencies.

In terms of remittances, one study explains that this refers to the situation in which an expat sends funding to their family members who still live in the individual's country of birth (Azeez and Begum, 2012). The advantages of this form of investment include a better standard of living (particularly for uneducated or incompetent individuals with little money) as well as the ability to share income. Thus, families 'left behind' in developing countries are able to benefit from the higher wages of the family member who has left to secure a well-paid job abroad. Because of this, employee remittances are a fundamental avenue of investment for developing nations in particular, since this somewhat negates the challenge of low income households, and investment levels generally rise due to remittances (Bjuggren et al., 2010). In another study, it was proposed that the growth of the financial industry depends largely upon remittance, with a relatively strong positive correlation between the economic growth of developing regions and employee remittances (Aggarwal et al., 2006). It has also been proposed that large remittances can be achieved, which can be utilised successfully for investment purposes if the economy improves, and that developing countries rely heavily upon remittances (Acosta et al., 2009). Contrarily, however, one research found that India's stock does not seem to be influenced at all by non-domestic portfolio investment (Pal, 2006), a finding which is also seen in the work of Ali (2011b).

Therefore, it is now obvious to us that the growth of the stock market may or may not be influenced by non-domestic remittance and that if it is, these influences may be either positive or negative. For this reason, this investigation aims to explore the correlation that may exist between stock price and remittance. Since there are clashing outcomes, this research theorises that there is a positive correlation between the stock market and foreign remittance.

Treasury Bill Rate (TBR)

Treasury-bills are described as "governmental securities for the short-term alongside credit periods of days until years" ("TreasuryDirect", 2009). USTBR is allotted on a constant schedule on the primary market (Treasury Direct, 2009). The secondary market, meanwhile, has universal over-the-counter trades and is an extremely lively financial market (Federal Reserve Board, 2005, p.36). The worth of bearer bills is conveyed like a profit towards a credit period. The yield to maturity, in the context of a treasury bill, is "the dissimilarity among the market price and the face value represented by a market price percentage, utilising all the days in a year it is scaled to a yearly" (Dupont and Sack, 1999). They are retailed at a reduction from the stated prices ("TreasuryDirect", 2009). Many groups have been engaged in the organisation of a treasury market, the Federal Reserve Organisation, the Treasury, as well as brokers, holders of bills and dealers (Dupont and Sack, 1999). Furthermore, many shareholders apply treasury bills to hedging and investment, investment banks, foreign central banks, commercial banks, insurance companies, money market funds, and individual investors etc. (Dupont and Sack, December 1999). Treasury bills entice stakeholders because of their security as they have an extremely low likelihood of defaulting (Dupont and Sack, December 1999).

The federal reserves were lessened to 0-0.25% in December 2008 by the Feds, which was a record low, so that they could try to instigate the falling nations ("The Federal Reserve Board", 2008). TBR experienced a quick reduction and the stock market fluctuated in a likewise manner. In accordance with this hypothesis, a destructive link should be present between treasury securities and the stock market, hence this is not in accordance with the theory. The flight to quality reasoning is a reputable concept amongst researchers (Andersson et al., 2008; Platt, 2002; Dungey et al., 2009), It states that stakeholders, in financial upsurges, have dicier situations, like stocks, as a larger return can be recovered. Conversely, stakeholders usually move to safer investments, when the market situation improves, like treasury securities. The resultant is the flight to quality, which creates a negative association between the treasury securities and stock.

This relation can be further clarified by the variations in interest. Additionally, it is the fundamental cause for the anomaly of flight to quality. The stock market tends to shift in a conflicting direction to the interest rate, for example, a weakening of shares may create an upsurge of the interest rate (Chiarella et al., 2002). Rising interest rates are affected by rising yields from treasury bills, and there is an opposite relation with the price and yield of securities, thus as interest rates incline, the price declines (TIAA-CREF, 2006). Ergo, during a period of elevated interest rates, the buying of treasuring bills is more enticing as they are more stable and thus, in times of lowered interest rates, the stock market is more appealing. In conclusion, as a general rule, anything that impacts on to the interest rate, affects the correlation of treasury bills and stock.

The association between the treasury securities and stock is significant in the central bank's battle against inflation, which is why monetary policy is vital. The Fed utilises the federal funds rate to fend off inflation. For instance, inflation might start increasing if there is an incline in, which then compels federal funds to rise and consequently decrease inflation and the stock market value (Laopodis, 2006). Ergo, the aggregate market volatility can categorise the flight into quality stages (Connolly et al., 2007), thus mounting inflation (Laopodis, 2006) and reducing trade volumes (Bae et al., 2008). Therefore, the association should be substantially affected by these factors, and more so contingent upon respective allocated importance variations. As specified by Christiansen and Ranaldo (2005), as well as by Li (2002), the significance deviates over business rotation. Henceforth, the state of the economy is also a clarifying variable, portrayed by the business succession variable.

Likewise, the association is significant for portfolio organisation and asset distribution reasons. Sensible shareholders choose to expand their assets within many different resources, incorporating treasury securities and stocks. Reliant on the stakeholders' risk aversion, their position may vary.

Certain researchers, such as Connolly et al. (2007), and Andersson et al. (2008) acquired month-long association estimations, utilising a systematic window relationship measure over a span of 20-22 days. An alternative approach that is just as usual is the usage of diverse types of the GARCH-Models. Engle suggested the DCC-GARCH Method, which is used by many researchers like Andersson et al. (2005) and Saleem (2008). After examining the empirical and literature data, conflicting results are perceived; henceforth, this research hypothesises an adverse link between equity values the TBR.

Chapter 5(B): Econometric Tools Used in the Study

5(B).1: Econometric Tools Used in the Study

In this chapter the research's econometric tools have been fully explained, step-by-step.

Objective 2: To assess the state of market efficiency in Bangladesh using a range of tests and compare it with the United Kingdom

Steps: Run Test; Ljung-Box *Q*-Test; Lo-Mackinlay Individual Lag Variance Ratio Test and finally, Chow-Denning Multiple Variance Ratio Test were used for estimating whether UK or BD stock prices follow market efficiency for the total period and in different sub-period.

Objective 3(A): To estimate and compare the long run equilibrium relationship between the selected macroeconomic variables and stock prices in the UK and Bangladeshi Stock Markets.

Step:

*(i)*The Cointegration test started with identifying the cointegration order of specific endogenous factors by applying ADF & P-P tests. f a factor did not hold a constant cointegration order, it had been used in this test.

*(ii)*Then it was needed to identify optimal lag-length. This was found by HQ, SC or AIC etc.

*(iii)*Then a VAR model had to be developed to to decide the amount of lag. The amount of lag is the "r" value which implied how many cointegrated vectors. When "r" = 0, it means there is not co-integrating equations. If 'g' factors are present within equations, a max of "g-1" co-integrating equations.

*(iv)*Two different test statistics (i.e. Max- eigen & trace values) was examined to identify How many cointegration vector in the system. Here the following hypothesis had been used to analyse trace & max- eigen statistics.

Hypothesis about Trace Statistics:

H_o: There are no cointegrating variables e.g. r = 0 or r ≤ 1
H_a: There exists cointegrating variables e.g. r ≥1 or r = 2

Hypothesis about Max-Eigen Value Statistics:

H_o: There are no cointegrating variables e.g. r = 0 or r = 1

H_a: There exists cointegrating variables e.g. r = 1 or r = 2 *(v)*If Max- eigen & trace values would be greater compared to critical-value of 5%, the test would be rejected H_o and vice versa. Rejecting H_o implied an equilibrium long-term link between endogenous factors.

*(vi)*If the endogenous variables would be found to have cointegrating relationship, then normalized cointegrating equation was needed to be discussed to identify their long run equilibrium relationship in detail.

Objective 3(B): To ascertain and evaluate the speed of short run disequilibrium adjustment between stock prices and selected macroeconomic variables in the UK and Bangladeshi Stock Markets.

Steps:
From different cointegrating equation was used and adjusted coefficient was examined to identify short run dynamics adjustment that will ultimately converges towards equilibrium long-term relation within selected factors.

Objective 4: To investigate and compare long run dynamic causal relationship between stock prices and selected macroeconomic variables in the UK and Bangladeshi Stock Markets.

Steps:

1. At first stationarity of the selected variables were examined using ADF and P-P test.

2. Then different "information criterions" were utilised to identify appropriate lag-length for Vector Autoregressive (VAR).

3. Then the existence of autocorrelation was examined with LM-test.

4. The constancy of VAR was tested using "Inverse Roots of AR Characteristic Polynomial".

5. Finally Toda-Yamamoto Granger Causation test had been employed estimate dynamic causation links among selected factors.

5(B).1.1 Unit Root Tests

5(B).1.1.1 Augmented Dickey-Fuller (ADF)

The function of being stationary can be tested within these variables, so as to reduce spuriousness within results. A time-series will be fixed if it's considered as mean- reverting; this is when series return to the average mean, without much drifting and deviation. Consequently, variance & mean values of data set remain stationary; the covariance value, however, is dependent on the gap that exists between different periods. It does not consider the time of the covariance[132]. A variety of different methods can be used to investigate the existence for unit roots. ADF & PP are those that are most commonly used, hence why they were selected for the current investigation.

The null hypothesis shows if a data set can be signified by a non-stationary unit root (has some time-dependent structure). The alternate hypothesis (rejecting the null hypothesis) is that the data is stationary.

Null Hypothesis (H_0): If accepted, shows that a non-stationary unit root is present in the data sample, i.e., it has a time dependent structure.

Alternate Hypothesis (H_1): The null hypothesis is not accepted, shows that a stationary unit root is present within the data set, i.e., a time-dependent structure is not present.

Therefore, the ADF test has null hypothesis as follows:

$H_0: \delta = 0$ (The series Y_t has unit root or series is non-stationary.

$H_1: \delta \neq 0$ (The series Y_t has not unit root or the series is stationary.

If a relation within error-term ($\mathcal{E}_t$) is present ADF will be utilised. If not, then the researcher is not able to augment the test, instead opting solely for a Dickey-Fuller test. ADF tests involves the addition of lagged dependent variable (ΔY_t) values together.

The researcher in this thesis utilised Gujarati's (1995) model for the estimation of ADF. The regression that was produced for this ADF test is as follows:

$$\Delta \mathrm{Y_t} = \beta_1 + \beta_2 t + \delta \mathrm{Y}_{t-1} + \alpha \sum_{i=1}^{m} \Delta \mathrm{Y_{t-1}} + \mathcal{E}_t \text{---}(5.1)$$

The white noise error term, $\mathcal{E}_t$, and the formula of $\Delta Y_{t-1} = (Y_{t-1} - Y_{t-2})$ are considered to be the enumerations of the lagged differences, as based on empirical data (Gujarati, 1995)[133].

Or

$$\Delta \mathrm{Y_t} = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^{k} \psi \Delta \mathrm{Y_{t-1}} + \mathcal{E}_t \text{--}(5.2)$$

In cases where ΔY_t is $I[0]$, refers to amount of lagged first-differenced terms. β_1 represents an intercept, while $\beta_2 t$ represents a linear trend, and $\mathcal{E}_t$ is still considered to be a term for white

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[132] However, if any of these circumstances aren't fully satisfied, then the data isn't considered to be stationary (Paramiah, and Akway, 2008).

[133] Additionally, the ADF has some criticisms, such as how it is of a suitable size but lacks properties of power (Paramaja and Akway, 2008).

noise error. This typically represents the ADF formula, which has unit roots that have both trend and constant properties. There are three possible equations that may emerge: 1) a unit root alongside a stationary 2) a unit root alongside trend & constant properties, 3) a unit root alongside neither trend nor stationary properties. One of the issues that need to be resolved concerns the amount of the lagged first differences that exist for the dependent factors. This needs to be established before the ADF is conducted, so that auto- correlated omitted variables can be accounted for, without becoming defaulted during the error process.

ADF tests are only effective so long as the assumption is made of "I.I.D. process", according to Brooks (2008). Probably a few of the links will emerge with error-term, as has been found when applying this test. However, the PP test tends to be less restrictive in terms of the assumptions that are being made, thereby not requiring an I.I.D assumption to be help. The error terms do not need to be uncorrelated; they are able to operate effectively in the presence of heteroscedasticity.

The probability distribution of $\hat{\delta}$ follows t - distribution.
ADF interprets the results with the tests' p-value. To accept the null hypothesis (non-stationary) the p-value should be above a threshold (e.g., 1% or 5%) otherwise if below the alternate hypothesis (stationary) would have to be accepted.

p-value > 0.05: Fail to reject the null hypothesis (H0), the data has a unit root and is non-stationary.

p-value <= 0.05: Reject the null hypothesis (H0), the data does not have a unit root and is stationary. (Dickey and Fuller, 1979)

5(B).1.1.2 Phillips-Perron (P-P)

The Phillips–Perron test makes a non-parametric correction to the t-test statistic. The PP test is utilized when testing higher-order correlations between series of data. It's a "non-parametric" statistical method which doesn't need to use added lagged differences, which are applied in ADF tests. The test is robust with respect to unspecified autocorrelation and heteroscedasticity in the disturbance process of the test equation.

The PP-test has a null hypothesis as follows:
$H_0: \delta = 0$ (The series Y_t has unit root or series is non-stationary.
$H_1: \delta \neq 0$ (The series Y_t has not unit root or the series is stationary.

A null hypothesis would claim that these series are not stationary. Therefore, to support this conclusion, the null hypothesis would need to be rejected. MacKinnon, Haugh and Michelis (1999) proposed the critical values that are applied for these tests.

The following equation is representative of the PP test that can be utilised by researcher (Jeong, Fanara and Mahone, 2002):

$\mathrm{Y_t} = \beta_1 + \delta Y_{t-1} + \mathcal{E}_\mathrm{t}$--(5.3)

Or,

$\Delta \mathrm{Y_t} = \beta_1 + \beta_2 t + \delta Y_{t-1} + \mathcal{E}_\mathrm{t}$---(5.4)

There are two types of test statistics, Z_{ρ} and Z_{τ}, which have the same asymptotic distributions as Augmented Dickey-Fuller test statistic.

The p value is calculated by the interpolation of test statistics from the critical values tables with a given sample size (n) = length(x) (Hamilton, 1994, chapter. 17).

The critical values for the Phillips–Perron test are the same as those for the augmented Dickey–Fuller test as below:

p-value > 0.05: Fail to reject the null hypothesis (H0), the data has a unit root and is non-stationary.

p-value <= 0.05: Reject the null hypothesis (H0), the data does not have a unit root and is stationary (Fuller, 1988 and 1996).

The efficient market hypothesis (EMH), or Random Walk Hypothesis (RWH), concerns the market's efficiency with information. Non-stationary, random walk model and unit root are used interchangeably in the analysis. If a unit root is displayed, it is deliberated to be non-stationary and demonstrates random walk.

The following study regarding the effectiveness of the market, uses a novel methodology to examine the randomness of market values, the unit root test, and was developed by Phillip & Perron (1988) and Dickey & Fuller (1981). The aim was to be able to discern whether a data set accepted or rejected the null hypothesis (Campbell et al. 1997, 65).

Random walk is not indicated by a non-stationary data with unit root, this is usually discovered by employing ADF (Augmented Dickey-Fuller Test), it provides proof of market values following random walk and, hence, is an examination for the weak-form efficient market. The standard P-P and ADF models are suitable for data produced by an autoregressive process of one, AR(1).

A stationary examination can be used to determine the trend of variables over a period, i.e., it can examine how predictable or stable a data set is. If the variables are non-stationary, it indicates that the data is unable to be predicted and unstable, meaning that the time series are not viable for inferences

Weak-form efficiency and random walk has been indicated by the outcomes, meaning that a wide agreement is shown by the approach – this can all be attained using P-P and ADF models. Prior to employing VECM and Johansen Cointegration Tests, to estimate cointegration relations, a unit root investigation must be performed.

If the null hypothesis failed to be rejected, it suggests that the time series has a unit root, meaning it is non-stationary, followed random walk and therefore is weak-form efficient.

5(B).1.2 Soren Johansen's Co-Integration Test

Cointegration has been considered as a link amidst two series that is especially long term – it may also be referred to as the equilibrium. Co-integration was therefore a suitable analysis technique that had been utilised to assess existence for longterm relationships amidst real economic stimuli & share values within Bangladeshi & UK markets.

(i) It was needed to identify optimal lag-length. This was found by HQ, SC or AIC etc.

(ii) Then a VAR model had to be developed to decide the amount of lag. The amount of lag is the "r" value which implied how many cointegrated vectors. When "r" = 0, it means there is not co-integrating equations. If 'g' factors are present within equations, a max of "g-1" co-integrating equations.

Two different test statistics (i.e., Max- eigen and trace values) was examined to identify How many cointegration vector in the system. Here the following hypothesis had been used to analyse trace & max- eigen statistics.

Hypothesis about Trace Statistics:

H_0: There are no cointegrating variables e.g., r = 0 or r ≤ 1

H_a: There exists cointegrating variables e.g., r ≥1 or r = 2

Hypothesis about Max-Eigen Value Statistics:

H_0: There are no cointegrating variables e.g., r = 0 or r = 1

H_a: There exists cointegrating variables e.g., r = 1 or r = 2

Within the following equation, VAR is considered to be of order p:

$$Y_t = \beta_1 Y_{t-1} + \beta_2 Y_{t-2} + \ldots\ldots\ldots\ldots + \beta_p Y_{t-p} + BX_t + \mathcal{E}_t \text{------------------------------------}(5.13)$$

Yt k-vector of dynamic factors. Xt represents d-vector for "deterministic factors". $\mathcal{E}_t$ represents an innovation vector. Therefore, VAR may be rewritten as:

$$\Delta Y_t = \prod Z_{t-1} + \sum_{i-1}^{p-1} \Gamma \Delta Y_{t-1} + BX_t + \mathcal{E}_t \text{--}(5.14)$$

Where,

$$\Pi = \sum_{j=1}^{p} A_t - 1 \; and \; \Gamma_i = \sum_{j=i+1}^{p} A_j \text{--}(5.15)$$

In the Johansen Cointegration, "X" refers to macroeconomic variables of Bangladesh and the United Kingdom, as independent variables; "Y" stands for Stock Prices as the dependent variable for Bangladesh (DSE) and United Kingdom (FTSE100).

Y_t is considered to be a vector for non-stationary factors. Info about the "coefficient matrix" that exists within level series ($\prod$) can be further deconstructed into $\prod=\alpha\beta$. The different aspects of the α matrix represent different adjustment coefficients, while the co- integrating vectors are incorporated into the β matrix.

If Max- eigen value and trace values would be greater compared to critical-value of 5%, the test would be rejected H_0 and vice versa. Rejecting H_0 Given the results generated, the null hypothesis of no cointegrating equation is rejected at the 5% level. Hence, it is concluded that a long-run relationship exists among the variables (Johansen, 1988).

In order to tackle the issue of the EMH, cointegration analysis is necessary and to be able to discern whether multiple time series have cointegration, Johansen's Cointegration Test must be employed. To be accurate, the examination tests the viability of a cointegration link, utilising maximum likelihood estimates (MLE). Estimating relationships and their number is also another function of the cointegration test. (Wee & Tan, 1997).

It is imperative to know that when a data set share underlying stochastic developments cointegration happens. Economic theories should support the concept of a shared trend. If the data in question are connected, it indicates cointegration and can then be coalesced linearly, which suggests that if short-term shocks exist, after a period they would adjust (in the long-term). To rephrase it a coalescing of multiple non-stationary variables can be stationary, if such a thing exists, then cointegration exists and may be understood as a positive/negative long-term association. It is suggested that the trends are related when an equilibrium association exists, since it means that there is no independent movement of factors. Alterations in values are unable to be predicted when they are rationally based because information is unstable. Hence, the analysis results in stock values being informationally efficient and following random walk but are effective in the long term.

To obtain viable inferences amongst the variables and markets of UK & Bangladesh and determine equilibrium relationships a group object has been used in this research, so the VAR based cointegration method developed by Soren Johansen (1990, 1995) is most applicable.

If the results generated, the null hypothesis of no cointegrating equation is rejected at the 5% level. therefore, it is concluded that a long-run relationship exists among the variables, meaning it is followed random walk and therefore is informationally efficient.

5(B).1.3 Vector Error Correction Model (VECM)

VECM involve the use of restricted VAR values, that are under limitations from co-integration restrictions. However, it is integrated in specifications, so that was used upon dynamic data which were also cointegrated. VECM specifications ultimately restrict longterm performance of these different factors, so that they can be converged with co-integrating relationships, as well as permit a range of different short-run dynamics. When it comes to calculating short run dis-equilibrium adjustment in VAR models, VECM is commonly considered to be suitable. To summarise, is a controlled VAR aimed to be employed alongside dynamic data which have proven cointegration.

The estimation process of VECM is as Johansen Cointegration Model and the hypothesis of VECM is as below:

Hypothesis about Trace Statistics:

H_0: There are no cointegrating variables e.g., r = 0 or r ≤ 1
H_a: There exists cointegrating variables e.g., r ≥1 or r = 2

Hypothesis about Max-Eigen Value Statistics:

H_0: There are no cointegrating variables e.g., r = 0 or r = 1

H_a: There exists cointegrating variables e.g., r = 1 or r = 2

Where, two data periods are x and y are non-stationary *I* [1] processes that are cointegrated, the rational distribution lag model is seen as below:

$$\Delta y_t = \lambda_0 + \beta_0 \Delta x_t + \phi_1 \Delta y_{t-1} + \beta_1 \Delta x_{t-1} + u_t \text{---} (5.5)$$

This model can use extra $I(0)$ variables as $(s_t = y_t - \beta x_t)$ for the fault within equilibrium link, at period "t". Thus, lag s_t may be included, as below:

$\Delta y_t = \lambda_0 + \beta_0 \Delta x_t + \phi_1 \Delta y_{t-1} + \beta_1 \Delta x_{t-1} + \delta s_t + u_t$-----------------------------------(5.6)

$\Delta y_t = \lambda_0 + \beta_0 \Delta x_t + \phi_1 \Delta y_{t-1} + \beta_1 \Delta x_{t-1} + \delta(y_{t-1} - \beta x_{t-1}) + u_t$------------------(5.7)

This is recognised as VECM, based on there being an equilibrium link for non-stationary at level factors x and y. The "error correction term" s_t shows effect of disequilibrium upon link, and to take this into account, a more straightforward for of the model is used, in differences, as below:

$\Delta y_t = \lambda_0 + \beta_1 \Delta x_t + \phi_1 \Delta y_{t-1} + \delta(y_{t-1} - \beta x_{t-1}) + u_t$----------------------------------(5.8)

Where δ denotes the principle of negative feedback. When last period y_{t-1} βx_{t-1}, y is greater than the equilibrium level, then error correction term pushes y down. Where y_{t-1} the error correction term allows for greater y this period. Thus, the coefficient allows the user to calculate rate of adjustment for the i-th e endogenic variables against equilibrium state.

If Max- Eigen value and Trace values would be greater compared to critical-value of 5%, the test would be rejected H_0 and vice versa.

Extra limitations are required by VECM, because of cointegrated but non-stationary data, cointegration limitation knowledge is employed into the specifications and after it is known the next procedure uses the error correction process. Interpretation of short and long run equation become possible with VECM. Determining the amount of cointegration links is integral to the process as well. VAR is disadvantageous to VECM as VECM represents more coefficient estimates and rectifies disequilibrium.

Vector Error Correction Model shows the response of market values to alteration from the long-term equilibrium, amongst the variables and market. With the results, stock values are shown to be an information factor for the deviation of the macro stimuli and the error correction model supports the results for the long-term equilibrium adjustment from stock market.

Individual coefficients encapsulate the short-term impacts, while VECM's coefficient has knowledge of past prices and whether they effect the current prices of the factors currently under study. The tendency, to adjust back to equilibrium, for each stimulus is measured by the statistical significance and size of the coefficient – significant coefficients imply that previous faults in the equilibrium affect the determining of present outcomes.

With the normalised cointegration coefficients an error term generates using the first equation, which indicates that both stocks varied from equilibrium long-term within the variables and market. Ultimately, the rate of adjustment indicates the stringency of an efficient market. The findings from VECM indicate alterations from equilibrium, it will be adjusted (standard error) by a specific percentage (short term adjustment coefficient) in defined times (in the current study, monthly) using the variations of market values, to determine equilibrium long run.

There is a high likelihood, that because of various factors (e.g., contingent, and dynamic), there is an absence of equilibrium relationships, hence it is a necessity to investigate how far the factors are into disequilibrium, and the time it would take to reconverge. This possibly could show if the market can rectify disequilibrium efficiently.

Henceforth, an integral limit for VECM estimation is the coefficient of the error correction term, this is a measure of the adjustment rate to which market values adjust back to equilibrium.

VECM findings dictate that any variation from equilibrium, will adjust (standard error) by a particular percentage (short-term adjustment coefficient) within exact times (in this study monthly) through stock market variations, to found long-run equilibrium in the future.

5(B).1.4 Toda-Yamamoto (T-Y) Granger Causality Test

Times series x_t Granger-causes a different time series y_t when series y_t is able to be estimated more accurately through historic values for x_t instead of not, where other information is the same.

The hypothesis of Toda-Yamamoto (T-Y) Granger Causality Test is as below:

	Fail to reject: $\beta_{yx1}= \beta_{yx2} =\ldots = \beta_{yxs} =0$	Reject: $\beta_{yx1}= \beta_{yx2} =\ldots = \beta_{yxs} =0$
Fail to reject: $\beta_{yx1}= \beta_{yx2} =\ldots = \beta_{yxs} =0$	$\cancel{y}\Rightarrow x$ $\cancel{x}\Rightarrow y$ (no Granger causality)	$\cancel{y}\Rightarrow x$ $x\Rightarrow y$ (x Granger causes y)
Reject: $\beta_{yx1}= \beta_{yx2} =\ldots = \beta_{yxs} =0$	$y \Rightarrow x$ $\cancel{x}\Rightarrow y$ (y Granger causes x)	$y\Rightarrow x$ $x \Rightarrow y$ (bi-directional Granger causality, or feedback)

Which means,

The Null and Alternative hypothesis for the test is as follows:

H_0: Share values do not Granger causes real economic stimuli

H_a: Share values Granger causes real macroeconomic variables

Thus, variable x_t does not Granger-cause y_t where:
Pr($y_{t+m \mid t}$)=Pr($y_{t+m \mid t}$)

Pr($y_{t+m \mid t}$)= is the conditional probability of $y_{t,t}$ is collection of every data accessible, at period t, and Pr($y_{t+m \mid t}$) is the provisional likelihood of y_t found through removing all information on x_t from y_t. This collection of data is shown as t. The choice of VAR system an examination of unit roots and cointegration that can bring about sub-standard findings (Donald, 1992). As a result, there can be unsuitable model choices when checking the causality relations, which can potentially cause denial of H_0 (Giles & Mirza, 1999). In response, Dolado & Luketerpohl (1996), Toda & Yamamoto (1995) put forward an even more appropriate methodology that is unrelated to a model's integration or cointegration characteristics.

Under this approach, a Modified Wald Test is employed to compare the VAR's parameters. An extended VAR model is employed, and its order is established through the amount of the system's optimal lag lengths in the system (k) most possible variable differentiations ((d_{max}).

In cases where a VAR ($k + d_{max}$) is estimated (d_{max}) is max co-integration order that happens within the structure), this analysis displays a robust χ^2 distribution, which is also displayed when variables are integrated to order d, and usual selection procedure stands valid in situations where $k \geq d$. The Toda and Yamamoto test is employed to find long run causality trends for stock indices, with the specifications below allowing for estimations

$$X_t = 1 + \sum_{j=1}^{k+d_{max}} 11(i)X_{t\,(k+d_{max})} + \sum_{j=1}^{k+d_{max}} 12(j)Y_{t\,(k+d_{max})} + x_t \text{---------------------(5.9)}$$

$$Y_t = 2 + \sum_{j=1}^{k+d_{max}} 21(i)X_{t\,(k+d_{max})} + \sum_{j=1}^{k+d_{max}} 22(j)Y_{t\,(k+d_{max})} + y_t \text{--------------------(5.10)}$$

The Toda Yamamoto test is a joint test where there is one dependent variable (Y) and the rest are independent (X), the dependent variable is not definite and the Toda-Yamamoto test makes it so that each variable has the chance to be examined as the dependent, while the rest are independent – this is the case for both Bangladesh and the UK.

X_t and y_t denote stationary random processes which aim to find other related information that is not found within lagged amounts of X_t and y_t. The lag-length (*k*) is established through either the HQ, SC, AIC or similar. For this research, series Y_t fails to Granger cause X_t when $12(j) = 0\ for\ (j = 1, 2, 3, \ldots\ldots_{(k+d_{max}})$; plus the data Y_t failed to instigate y_t when $21(i)$ = 0 for $(i = 1, 2, 3, \ldots\ldots_{(k+d_{max}})$.

Defining the X and Y in the Model:

<u>For Bangladesh:</u>

DSEGEN = $\beta_0 + \beta_1\, CPI + \beta_2\, EXR + \beta_3\, DIR + \beta_4\, M2 + \beta_5\, GDPCAP + \beta_6\, BOT + \beta_7\, IOP + \beta_8\, REMIT + \beta_9\, TBR + \varepsilon_t$

CPI = $\beta_0 + \beta_1 DSEGEN + \beta_2 EXR + \beta_3 DIR + \beta_4 M2 + \beta_5 GDPCAP + \beta_6 BOT + \beta_7 IOP + \beta_8 REMIT + \beta_9 TBR + \varepsilon_t$

EXR = $\beta_0 + \beta_1 DSEGEN + \beta_2 CPI + \beta_3 DIR + \beta_4 M2 + \beta_5 GDPCAP + \beta_6 BOT + \beta_7 IOP + \beta_8 REMIT + \beta_9 TBR + \varepsilon_t$

DIR = $\beta_0 + \beta_1 DSEGEN + \beta_2 CPI + \beta_3 EXR + \beta_4 M2 + \beta_5 GDPCAP + \beta_6 BOT + \beta_7 IOP + \beta_8 REMIT + \beta_9 TBR + \varepsilon_t$

M2 = $\beta_0 + \beta_1 DSEGEN + \beta_2 CPI + \beta_3 EXR + \beta_4 DIR + \beta_5 GDPCAP + \beta_6 BOT + \beta_7 IOP + \beta_8 REMIT + \beta_9 TBR + \varepsilon_t$

GDPCAP = $\beta_0 + \beta_1 DSEGEN + \beta_2 CPI + \beta_3 EXR + \beta_4 DIR + \beta_5 M2 + \beta_6 BOT + \beta_7 IOP + \beta_8 REMIT + \beta_9 TBR + \varepsilon_t$

IOP = $\beta_0 + \beta_1 DSEGEN + \beta_2 CPI + \beta_3 EXR + \beta_4 DIR + \beta_5 M2 + \beta_6 BOT + \beta_7 GDPCAP + \beta_8 REMIT + \beta_9 TBR + \varepsilon_t$

REMIT = $\beta_0 + \beta_1 DSEGEN + \beta_2 CPI + \beta_3 EXR + \beta_4 DIR + \beta_5 M2 + \beta_6 BOT + \beta_7 GDPCAP + \beta_8 IOP + \beta_9 TBR + \varepsilon_t$

TBR = $\beta_0 + \beta_1 DSEGEN + \beta_2 CPI + \beta_3 EXR + \beta_4 DIR + \beta_5 M2 + \beta_6 GDPCAP + \beta_7 BOT + \beta_8 IOP + \beta_9 REMIT + \varepsilon_t$

For the United Kingdom:

$FTSE100 = \beta_0 + \beta_1 CPI + \beta_2 EXR + \beta_3 DIR + \beta_4 M2 + \beta_5 GDPCAP + \beta_6 BOT + \beta_7 IOP + \beta_8 REMIT + \beta_9 TBR + \mathcal{E}_t$

$CPI = \beta_0 + \beta_1 FTSE100 + \beta_2 EXR + \beta_3 DIR + \beta_4 M2 + \beta_5 GDPCAP + \beta_6 BOT + \beta_7 IOP + \beta_8 REMIT + \beta_9 TBR + \mathcal{E}_t$

$EXR = \beta_0 + \beta_1 FTSE100 + \beta_2 CPI + \beta_3 DIR + \beta_4 M2 + \beta_5 GDPCAP + \beta_6 BOT + \beta_7 IOP + \beta_8 REMIT + \beta_9 TBR + \mathcal{E}_t$

$DIR = \beta_0 + \beta_1 FTSE100 + \beta_2 CPI + \beta_3 EXR + \beta_4 M2 + \beta_5 GDPCAP + \beta_6 BOT + \beta_7 IOP + \beta_8 REMIT + \beta_9 TBR + \mathcal{E}_t$

$M2 = \beta_0 + \beta_1 FTSE100 + \beta_2 CPI + \beta_3 EXR + \beta_4 DIR + \beta_5 GDPCAP + \beta_6 BOT + \beta_7 IOP + \beta_8 REMIT + \beta_9 TBR + \mathcal{E}_t$

$GDPCAP = \beta_0 + \beta_1 FTSE100 + \beta_2 CPI + \beta_3 EXR + \beta_4 DIR + \beta_5 M2 + \beta_6 BOT + \beta_7 IOP + \beta_8 REMIT + \beta_9 TBR + \mathcal{E}_t$

$IOP = \beta_0 + \beta_1 FTSE100 + \beta_2 CPI + \beta_3 EXR + \beta_4 DIR + \beta_5 M2 + \beta_6 BOT + \beta_7 GDPCAP + \beta_8 REMIT + \beta_9 TBR + \mathcal{E}_t$

$REMIT = \beta_0 + \beta_1 FTSE100 + \beta_2 CPI + \beta_3 EXR + \beta_4 DIR + \beta_5 M2 + \beta_6 BOT + \beta_7 GDPCAP + \beta_8 IOP + \beta_9 TBR + \mathcal{E}_t$

$TBR = \beta_0 + \beta_1 FTSE100 + \beta_2 CPI + \beta_3 EXR + \beta_4 DIR + \beta_5 M2 + \beta_6 GDPCAP + \beta_7 BOT + \beta_8 IOP + \beta_9 REMIT + \mathcal{E}_t$

Here,

FTSE100 = Stock Market (UK)

DSEGEN = Stock Market (Bangladesh)

CPI = Consumer Price Indexes

EXR = Exchange Rates

DIR = Deposit Interest Rates

M2 =Broad Money Supplies

GDPCAP = Per Capita GDP

BOT = Balance of Trade

IOP = International Crude Oil Prices

REMIT = Foreign Remittance

TBR = Treasury Bill Rates

The Toda-Yamamoto (T-Y) Granger Causality Test analysis displays a robust χ^2 distribution.

The test statistics for granger test should follow chi-square distribution instead of F distribution.

The possibility of all variables being independent or dependent is high since this research includes a set of factors. No existing relationship, unidirectional and bidirectional are the only types of correlations that can exist amongst macro stimuli and stock values.

If the independent or dependent variables affect one another within the research, then one must test the null hypothesis using the Toda Yamamoto Model (in this case chi-square statistics). If the null hypothesis is rejected, then the one-way (unidirectional) effect can be confirmed. If both null hypotheses are rejected, then one can say that the variables have a causal (bidirectional) relationship exist.

To rephrase it, if the values for chi square are statistically unimportant, then the findings will indicate that the independent variable (i.e., stock market) has no impact upon specific dependent variables (macroeconomic variables). On the contrary, if the values are statistically important a causal relationship would be discovered; as stated before, either variable can be the independent or the dependent.

In this study, EMH is examined using market values and macro stimuli. Therefore, this study will examine the rate at which the UK and Bangladeshi markets respond to specified pieces of info, as an Efficient Market is when there is a rapid adjustment to new information and all of it is reflected by the present values of securities. If two data sets, representing value variation, are discovered to have no relation temporarily, then proof for market efficiency is clear.

Y Vector, independent variable in the testing regression. This is the variable the cointegrating variable is normalized to. X Matrix, dependent variable(s) in the testing regression. This should contain all other variables.

The Toda Yamamoto Causation test uses basis that, under null hypothesis, no correlation exists for stock prices against any of the specific macroeconomic variables, and where the Chi-square's p-value statistics are under 0.05, then the test can discard the above null hypothesis. Whenever H_0 is denied, it's shown a causal relation linking stock prices and specific real economic factors exists.

5(B).1.5 Ljung-Box Q-Test

ACF/PACF was applied to conduct qualitative measurements of autocorrelation within certain lags. Ljung-Box Q-tests can be used to quantify the presence of autocorrelation within these different data sets, specifically measuring multiple lags (Ljung and Box, 1978). On the basis of autocorrelation coefficients, the L-B statistic is calculated and when it is past the critical level from the χ^2 table at a specific significant level, then the H_0 every correlation co-efficient were null aren't accepted, as one or more are clearly non-zero. A null hypothesis for the analysis would state that m a serial relations are null.

Therefore, the Null and alternative hypothesis are as follows:
H_0: There is no autocorrelation in the series (residuals)
H_a: There is autocorrelation in the series (residuals)
The Ljung-Box test is formulated by:

$Q^* = T(T+2)\sum_{k-n}^{h}(T-k)^{-1}\, {r^2}_k$--(5.12)

Where;
T : The Data length,
${r^2}_k$: The projected autocorrelation of the series at lag k
h : The amount of lags tested
Q^*: Specify that there are substantial autocorrelations in the residual series.

The Box-Pierce Portmanteau Q statistic can be modified in the formula, according to Box & Pierce (1970). The L-B Q-test can be used as a measure of autocorrelation, so long as the series has a constant mean value[134]. Residuals that emerge from model with k parameters (autocorrelations) require the researcher to test the statistics in accordance with a x^2 distribution, so as the degrees of freedom exist between *($h-k$)*.

Additionally, conditional heteroscedasticity can be tested through the use of a Ljung-Box Q-test, so long as the residual series are squared.
Ljung-Box has been employed to determine the random properties of market values in this study. Non-randomness of the market is indicated if the resulting statistic is significant at 5%, as this indicates significant serial correlation. Non-randomness is closely tied with autocorrelation. However, it is not inefficiency is not always implied if the market has autocorrelation (Leroy, 1973 and Levich, 1979), but comparatively large values for autocorrelation point to an encroachment of weak form, this is because market participants can gain additionally profit by manipulating serial correlation. Contrarily, if the p-value is over

[134] Residual series can also be applied, in order to test autocorrelation for different model diagnostic checks.

0.05 it means that H_0 (no autocorrelation) is true, and that the market is informationally weak form efficient and random.

The test statistics for L-B test should follow chi-square distribution and the calculations of autocorrelation coefficients, with the L-B *Q*-statistics at their corresponding *p*- values are under 0.05, underlining the fact that the no autocorrelation H_0 is denied at 5% significance.

5(B).1.6 Lo-Mackinlay Individual Variance Ratio Test

The asymptotic distribution of VR(x; k) was put forward by Lo and MacKinlay (1988), through using the basis that "k" is constant whenever "T" is infinite (∞). Lo & MacKinlay (1988) noted that where x_t is "I.I.D.", and thus below proposal of homoskedasticity, after through H_o which V(k) = 1. Therefore, the Null and alternative hypothesis for both homoscedastic and heteroskedastic test assumptions are as follows:

H_0: There is randomness in the series

H_a: There is no randomness in the series

Test-value M1(k) can be found through the equation below:

$$M_1\,(\mathrm{k}) = \frac{\mathrm{VR(x;k)}-1}{\phi(\mathrm{k})^{1/2}} \text{---}(5.16)$$

This is in line with the asymptotic variance, ϕ (k), asymptotically, and standard normal distribution, can be found with the equation below:

$$\phi(\mathrm{k}) = \frac{2(2K-1)(K-1)}{3\mathrm{KT}} \text{---}(5.17)$$

There has been discussion regarding the confusing results found through Variance-Ratio values where time-dependent instabilities can be seen within [135].

In order to react to $X_t{}'$s showing provisional heteroscedasticity, Lo & MacKinlay (1988) put forward the heteroscedasticity asymptotic analysis-value $M_2(k)$, as seen below:

$$M_2\,(K) = \frac{VR(x;k)-1}{\phi^*(K)^{½}} \text{---}(5.16)$$

[135] It can be seen that Kim & Nelson (1998) plus Kim, Nelson & Startz (1991, 1998) put forward an answer using the "Bayes" method in addition to a Gibbs sampler.

This is in line with asymptotic normal-distribution through H_o which V(k) = 1, as seen below:

$$\emptyset^*(K) = \sum_{j=1}^{k-1} \left[\frac{2(k-j)}{K}\right] 2_{\delta(j)} \text{---}(5.17)$$

$$\delta(j) = \left\{\sum_{t=j+1}^{T} (x_t - \hat{\mu})^2 \, (x_t - \mathrm{j} - \hat{\mu})^2\right\} \div \left\{\left(\sum_{t=1}^{T} (x_t - \hat{\mu})^2\right)^2\right\} \text{-------------------------}(5.18)$$

The test of $M_2(k)$ appropriate to $X_t{}'$s created from martingale variance time series. The usual rule of decision for normal-distribution is applicable to the analyses.

The sampling distribution characteristics or finite-sample of variance ratio was examined by Lo & MacKinlay (1989), they discovered bilateral tests have magnitude usually adjacent to the minimal level, providing the test is robustified in contradiction of any restricted heteroscedasticity.

The variance ratio test has been discovered by numerous researchers (for instance, Faust, 1992 Richardson & Smith, 1991) to predominantly be influential whenever analysing in contradiction of average regressive substitutes to RWM, specifically when k is larger in size.

It is implied by RWH that market fluctuation which have the same circulation, aren't dependent, and can be defined by arbitrary processes, meaning that the future deviations cannot be predicted by the past. The H_0 for Lo-Mackinlay Individual Variance Ratio Test assumes that the stock prices behaviour follows random characteristics. The principle that deviations in random walk growths are direct to the market intervals is utilised by the Variance ratio test. Heteroscedastic and Homoscedastic results provide proof indicating that the value trends are in accordance with EMH and RWH. In this instance, the associated p-values associated also provide indications that random walk behaviour is present in the values.

Ergo, if the p-values associated with each of the test statistics less than 0.05 implies that the test fails to accept the null hypothesis of random walk in the data series. On the other hand, if the p- values of test statistic is found more than 0.05 then it suggests that the data fails to reject the same null hypothesis, therefore stock prices follow random walk behaviour and weak form efficient.

5(B).1.7 Chow-Denning Multiple Variance Ratio Test

Chow & Denning (1993) put forward an idea about employing Hochberg's (1974) method throughout various comparisons for VR estimate sets with unity. This means that the user can investigate a vector of separate Variance-Ratio analyses, whilst overseeing the general analysis amount. When using a group of "m" analysis value, RWH isn't accepted when there is any single instance of strong disparity in the predicted VRs. In order to appraise the jointly calculated null-hypothesis.

Therefore, the Null and alternative hypothesis for both homoscedastic and heteroskedastic test assumptions are as follows:

H_0: There is randomness in the series

H_a: There is no randomness in the series

Chow and Denning's (1993) analysis value has been used, like shown below:

$MV_1 = \sqrt{T} \max_{1 \le i \le m} | M_1(k_i) |$ --(5.19)

$M_1(K_i)$ can be found with the below:

$M_1\text{ (k)} = \frac{\text{VR(x;k)}-1}{\phi(\text{k})^{1/2}}$--(5.20)

This is in line with standard normal distribution, asymptotically.

The above builds on the concept that null hypothesis outcomes are found through the maximum | | statistic of separate Variance-Ratio figures. To oversee the extent of "multiple V-R" analysis, because of the "limit distribution" of the values are complicated, Sidak's (1967) probability inequality was employed, with a maximum limit of critical values established with SMM distribution. The value was shown to adhere to SMM distribution with "m" plus "T" df, where SMM (a, m, T), and m, amount of k values[136]. H_o is overruled at α significant level in cases where MV_1 value is above $[1-(a^*/2)]$th percentile for normal distribution, under which a^*= 1−(1−a)1/m.

Along same lines, this equation below shows the heteroskedasticity well-defined edition of "Chow-Denning test" MV2

$MV_2 = \sqrt{T} \max_{1 \le i \le m} | M_2(k_i) |$--(5.21)

$M_2(\ k_i)$ can be found below:

$M_2\ (K) = \frac{VR(x;k)-1}{\phi^*(K)^{1/2}}$--(5.22)

[136] Stoline & Ury (1979) plus Hahn & Hendrickson (1971) present tables of the critical values, and it is important to highlight that where T is substantial, then test critical values are able to be found through the limiting distribution of the statistic.

This adheres to asymptotically, normal distribution, with H_o Which is V(k) = 1, with identical critical values as seen with MV_1. Contrarily, for finite data sizes, critical values can be more beneficial when using those produced by simulations, similar to the work of Chow and Denning. Regardless, it was underlined that Hochberg method was beneficial where vector of test statistics was multivariate normal distribution only, which was the case when Variance-Ratios involve minimal overlapping information, so where k/T was minimal, Fong et al. (1997).

Another significant model in measuring how random a sample is, is the Chow-Denning multiple variance ratio test. RWH indicates that market values which have similar distribution, are not dependent upon each other, meaning that the future deviations cannot be predicted by the past. Hence, this model was employed to measure randomness within the market and the examination approximations are calculated under the supposition that homoscedastic and heteroskedastic values increment random walk.

The Chow-Denning Max |Z| or Studentized Max |Z| joint test statistics under homoscedastic and heteroskedastic test assumption, if the *p-values* of these test statistics are found less than 0.05 which implies that the null hypothesis of random walk cannot be accepted at 5 percent level of significance. Therefore, it can be said that the stock price follows the norms and behaviour of random walk as well as stock market is weak form efficient. Alternatively, if these test statistics p-values are more than 0.05 which implies that the null hypothesis of random walk behaviour cannot be rejected at 5 percent level of significance.

5(B).1.8 Run Test:

A run is defined as a series of aggregating prices or declining values. The number of values (decreasing or increasing) is the length of the run. Within a randomised sample set, the possibility that the $(I+1)^{\text{th}}$ value is larger or smaller than the I^{th} value follows a binomial distribution, this is the basis for the runs test.

The runs test is defined as:

Ho: the sequence was produced in a random manner

Ha: the sequence was not produced in a random manner

The test statistic is:

$$Z = \frac{R - \bar{R}}{S_R}$$

where R is the observed number of runs, $\overline{R}$, is the expected number of runs, and SR is the standard deviation of the number of runs. The values of $\overline{R}$ and S_R are computed as follows:

$$\overline{R} = \frac{2n_1n_2}{n_1+n_2} + 1$$

$$s_R^2 = \frac{2n_1n_2(2n_1n_2 - n_1 - n_2)}{(n_1 + n_2)^2(n_1 + n_2 - 1)}$$

with n1 and n2 denoting the number of positive and negative values in the series.

Significant Level: a = 0.05

Critical Region: The runs test rejects the null hypothesis if

$$\lfloor Z \rfloor > Z_{1-}\, a/2$$

Whether or not sample data derives from random processes can be detected by using the runs test (Bradley, 1968). It is used to examine weak-form efficiency, as it has no requirement for a normal distribution of stock prices. It is an improved substitute for parametric serial correlation tests, wherein there is an assumption of normal distribution. A value variation sequence is what a run is defined as. The examination compares the predicted amount of runs against the actual number, non-randomness is indicated by too few/many runs and if there are two few it shows positive autocorrelation and too many prove negative autocorrelation.

For a large sample runs test (where n1 > 10 and n2 > 10), the test statistic is compared to a standard normal table. That is, at the 5 % significance level, a test statistic with an absolute value greater than 1.96 indicates non-randomness. For a small-sample runs test, there are tables to determine critical values that depend on values of n1 and n2 (Mendenhall, 1982).

Part II
Application of Econometric Tools and Analysis

Chapter 6- Market Efficiency And Stock Price Behaviour: A Comparative Study Between Bangladesh And The UK Stock Exchanges

When it comes to calculating the efficiency of the Bangladesh Stock against that of the UK stock, there are multiple econometric tools that are used for this purpose in the current research. Chapter 6 aims to look into the pricing trends in the aforementioned stock markets, and this will allow for an evaluation of market efficiency[137]. Data regarding these movements can affect stock prices, instantly shifting them up or down based on the data. This quick shift into a changed state of equilibrium when data is found underlines the relationship between stock price and new information. Additional alterations to the stock price occur when there is previously unknown information, and so any movements to stock prices demonstrate unique changes and are based on the new data provided, even though these pieces of information are not related. Every alteration to price is unrelated to other price movements, because of the unique information source, in a concept referred to as the random walk hypothesis.

Essentially, this hypothesis determines that information alterations are instant, and extend to all investors, with an associated movement up or down for the stock price. As a result, stock price shows the available data in its entirety. Also, the RWH assumes that the equity market is competitive and effective enough to bring about an instant price change.

6.1 Application of Runs Test: Evidence of Bangladesh and the UK

For the purpose of appraising the weak-form efficiency, run tests are employed, as there is no necessity for normal distribution, this offers a superior option compared to parametric autocorrelation tests where distributions are considered to be normal. A price change sequence with the same sign is considered to be a run, and the number of runs is contrasted with the predicted figure on the basis of price changes being independent. Non-randomness is highlighted when there are too many runs or too few runs, where the former shows a negative autocorrelation, and the latter shows a positive autocorrelation. This research uses daily, weekly and monthly stock indexes from the two stock markets in question; namely, the DSE and the FTSE 100 from the UK Stock market in the run tests. Table 6.1 shows the predictions for the DGEN run tests using daily, weekly and monthly data, based on the null hypothesis that specific data sets present random properties, which means that the run test must offer one half the runs of the total amount of the sample data. In the cases of daily data, the table displays that the number of runs is significantly less than the overall amount of sample data, it also shows that the Z-value is negative and the p-value is under 0.05. These facts evidence that the test discards the null hypothesis of random characteristics in the data (Roy, 2018). The same

[137] Researchers widely agree that stock price movements occur due to alterations to the economy and the specific industry or the firm at hand.

outcomes were achieved for weekly and monthly data sets, and thus it is concluded that the outcome of the run tests brings about the specific result that the DSE Gen index is not a random variable. These results are consistent with those of Bruno (1973).

Table 6.1: Estimates of Run Test for Daily, Weekly and Monthly DSE Gen Index

Lag	Daily log DSE Gen Index	Weekly log DSE Gen Index	Monthly log DSE Gen Index
K=Mean	2816	2464.483901	1667.6
Cases <K	3004	579	147
Cases ≥K	2189	470	76
Total cases	5193	1049	223
No. of Runs	37	15	8
% of Runs	0.71%	1.43%	3.59%
Z-value	-53.472	-21.564	-13.928
p-value	0.000	0.000	0.000

Note: Author's own calculation estimates

In Table 6.2, the run tests estimates for the FTSE 100 of the UK Stock Exchange are presented, with daily, weekly and monthly data series employed by virtue of the same null hypothesis of random characteristics in the set of data. As pertains to the daily statistics, the number of runs is far lower than half of the overall daily data (72<5558). The Z-value is negative (-72,616) and the p-value is under 0.05, meaning that the run test denies the null hypothesis of random characteristics within the case of the daily FTSE100 data set (Bruno, 1973). The weekly and monthly data sets (Fadda, 2019) had the same outcome (Sharma and Robert, 1977).

Table 6.2: Estimates of Run Test for Daily, Weekly and Monthly FTSE 100 Index

Lag	Daily log FTSE 100 Index	Weekly log FTSE 100 Index	Monthly log FTSE 100 Index
K=Mean	5087	5097.7	5103.5
Cases <K	2392	489	113
Cases ≥K	3166	648	149
Total cases	5558	1137	262
No. of Runs	72	454	18
% of Runs	1.3%	39.93%	6.87%
Z-value	-72,616	-6.318	-14.073
p-value	0.000	0.000	0.000

Note: Author's own calculation estimates

It is easy to see that the run test for the UK and Dhaka Stock Exchange showed that there was non-randomness in the data series, so it is considered that the FTSE-100 for the UK and the DSE Gen for the Dhaka Stock Exchange did not have the common properties of randomness. However, it should be noted that the number of runs for the set of daily, weekly and monthly data set in the UK stock market was larger than those of the Dhaka in Bangladesh, which also denotes that even though these markets were non-random, the FTSE 100 index in the UK had even less randomness than the DSE Gen index in the Dhaka Stock Exchange (DSE).

Lastly, the run test displayed negligible disparities for the amount of successive price changes when contrasted with the overall observation sets, bringing about random walk price movement. However, the relative amount of runs highlights that there are differences between the Bangladesh and UK Stock Markets.

6.2 Application of Ljung-Box and Q-Test: Evidence of Bangladesh and the UK

The L-B test was created in 1978, and was a substantial progression from the Box-Pierce Q 1970 statistics. This investigation attempts to ascertain if a group of link equations estimated at different lags for return, Gujarati (1995) mentioned that historical data can be considered to be null. On the basis of autocorrelation coefficients, the L-B statistic is calculated and when it is past the critical level from the χ^2 table at a specific significant level, then the H_0 every correlation co-efficient were null aren't accepted, as one or more are clearly non-zero.

Table 6.3 shows the calculations of autocorrelation coefficients with the L-B Q-statistics at their corresponding p-values of 16 different lags for daily, weekly and monthly DSE Gen index. When it comes to the daily data, lag 2, 3, 5, 6, 7, 11, 13 showed there was a negative autocorrelation and p-values related with every single Q-statistic were under 0.05, underlining the fact that the no autocorrelation H_0 is denied at 5% significance (Bruno, 1973).

In the case of weekly figures, the sample statistics provide positive autocorrelation coefficients, with the exception of the lag levels 4, 7, 9, 11. The L-B Q-statistics p-values show that H_a (auto-correlation) is accepted, and therefore the weekly data show that all the data is impacted by its own lag data at various levels. However, in the case of monthly data, the results were not in line with those of the daily or weekly data sets, as autocorrelation coefficients were shown to be positive apart from lag 8 and 10 to 16. The p-values linked to every L-B Q-statistic were shown to be over 0.05, which denotes that the H_0 (no autocorrelation) is accepted at the 5 % significant level (Bruno, 1973).

Table 6.3: Estimates of Ljung-Box Q-Test for Daily, Weekly and Monthly DSE Gen Index

Lag	Order of Estimates	Daily Log DSE Gen Index	Weekly Log DSE Gen Index	Monthly Log DSE Gen Index
1	AC Q-Stat Prob.	0.021 1.3036 0.000	0.211 21.280 0.000	0.050 0.2729 0.601
2	AC Q-Stat Prob.	-0.064 13.172 0.001	0.036 22.280 0.000	0.104 1.4529 0.484
3	AC Q-Stat Prob.	-0.045 19.134 0.000	0.018 22.443 0.000	0.137 3.5105 0.319
4	AC Q-Stat Prob.	0.018 20.118 0.000	-0.013 22.523 0.000	0.083 4.2779 0.370
5	AC Q-Stat Prob.	-0.001 20.120 0.001	0.099 27.302 0.000	0.146 6.6812 0.245
6	AC Q-Stat Prob.	-0.017 20.992 0.002	0.029 27.712 0.000	0.103 7.8890 0.246
7	AC Q-Stat Prob.	-0.020 22.213 0.002	-0.028 28.108 0.000	0.015 7.9142 0.340
8	AC Q-Stat Prob.	0.031 25.104 0.001	0.063 30.096 0.000	-0.205 12.804 0.119
9	AC Q-Stat Prob.	0.096 52.453 0.000	-0.075 32.855 0.000	0.120 14.482 0.106
10	AC Q-Stat Prob.	0.019 53.549 0.000	-0.038 33.579 0.000	-0.050 14.776 0.140
11	AC Q-Stat Prob.	-0.042 58.635 0.000	-0.040 34.364 0.000	-0.006 14.780 0.193
12	AC Q-Stat Prob.	0.012 59.058 0.000	0.015 34.479 0.001	-0.093 15.832 0.199
13	AC Q-Stat Prob.	-0.777 76.324 0.000	0.060 36.251 0.001	-0.164 19.128 0.119
14	AC Q-Stat Prob.	0.010 76.599 0.000	0.039 37.020 0.001	-0.035 19.277 0.155
15	AC Q-Stat Prob.	0.042 81.813 0.000	0.075 39.819 0.000	-0.156 22.310 0.100
16	AC Q-Stat Prob.	0.041 86.751 0.000	0.054 41.305 0.001	-0.141 24.824 0.073

Note: Author's own calculation estimates

As a result, in cases where daily and weekly DSE Gen index offers proof that there is autocorrelation across various lags, the monthly data for the same index showed that there was no autocorrelation. Also, autocorrelation is closely tied with instances of non-randomness, and vice versa. With this in mind, daily and weekly DGEN are shown to be not random, whereas monthly data is random (Sharma and Robert, 1977).

Conversely, Table 6.4 shows the autocorrelation statistics for the FTSE 100 Index through L-B Q-statistics along with its *p*-values for daily, weekly and monthly data. For daily data, autocorrelation coefficients were shown to be positive for lag 4, 7, 8, 9, 12, 15 and 16, while they were negative at 1, 2, 3, 5, 6, 10, 11 and 14. However, the *p*-values for all L-B Q- statistics were under 0.05, showing that no autocorrelation H_0 is denied at 5% significance. For weekly data, the autocorrelation calculations, together with *p*-values of L-B Q-statistics, show an outcome similar to that of the daily data, which is that there is autocorrelation (Bruno, 1973). However, with regards to the monthly time series, L-B Q-statistics and *p*-values at each lag were shown to exceed 0.05, denoting that the H_0 of randomness can't be rejected at 5% significance. As a result, daily and weekly FTSE 100 index data were unable to show any random characteristics, whereas monthly data displayed random characteristics (Sharma and Robert, 1977).

To conclude, daily and weekly DSE Gen index and FTSE 100 index data offer findings which suggest that there is no randomness in its data set (Fadda, 2019; Roy, 2018), whereas there was randomness evident in monthly DSE Gen and FTSE 100 Index data. Thus, when the time horizon is short, both the Dhaka and UK stock indexes are non-random, whereas for long horizon data, there is randomness. This research underlined the stock price trends for the Dhaka and UK Stock Exchanges and this matter is explored in greater detail at the end of the current chapter.

Table 6.4: Estimates of Ljung-Box Q-Test for Daily, Weekly and Monthly FTSE 100 Index

Lag	Order of Estimates	Daily Log FTSE 100 Index	Weekly Log FTSE 100 Index	Monthly Log FTSE 100 Index
1	AC Q-Stat Prob.	-0.024 3.3194 0.068	-0.581 384.46 0.000	-0.022 0.1268 0.722
2	AC Q-Stat Prob.	-0.041 12.707 0.000	0.005 384.50 0.000	-0.016 0.1962 0.907
3	AC Q-Stat Prob.	-0.062 33.839 0.000	0.147 409.13 0.000	-0.012 0.2371 0.971
4	AC Q-Stat Prob.	0.020 36.098 0.000	-0.110 422.85 0.000	0.146 5.9291 0.205
5	AC Q-Stat Prob.	-0.020 38.330 0.000	0.101 434.57 0.000	-0.015 5.9864 0.308
6	AC Q-Stat Prob.	-0.041 47.793 0.000	-0.117 450.33 0.000	-0.027 6.1764 0.404
7	AC Q-Stat Prob.	0.004 47.887 0.000	0.044 452.52 0.000	0.003 6.1792 0.519
8	AC Q-Stat Prob.	0.030 52.750 0.000	0.086 461.05 0.000	0.081 7.9720 0.519
9	AC Q-Stat Prob.	0.005 52.910 0.000	-0.148 486.22 0.000	0.015 8.0374 0.530
10	AC Q-Stat Prob.	-0.003 52.962 0.000	0.096 496.69 0.000	0.005 8.0450 0.624
11	AC Q-Stat Prob.	-0.000 52.963 0.000	-0.041 498.58 0.000	-0.040 8.4843 0.669
12	AC Q-Stat Prob.	0.006 53.141 0.000	0.020 499.04 0.000	0.072 9.9296 0.622
13	AC Q-Stat Prob.	-0.004 53.225 0.000	0.022 499.59 0.000	0.045 10.785 0.654
14	AC Q-Stat Prob.	-0.025 56.714 0.000	-0.031 500.70 0.000	-0.050 11.170 0.673
15	AC Q-Stat Prob.	0.002 56.728 0.000	0.040 502.57 0.000	0.008 11.186 0.739
16	AC Q-Stat Prob.	0.023 59.650 0.000	-0.058 506.48 0.000	0.067 12.462 0.712

Note: Author's own calculation estimates

6.3 Application of Lo-Mackinlay Individual Variance Ratio Test: Evidence of Bangladesh and the UK

Under the scope of investigating the random properties of stock prices, this research uses monthly, weekly and diurnal share index information from Bangladesh and UK shares and it implements numerous econometric tools. To evaluate the data's level of randomness, a Lo-Mackinlay test was used, this works on the basis that the RWH increment. The Lo-Mackinlay test estimates for monthly, weekly and daily DGEN data from January 1998 to June 2018 are shown in Table 6.5. For each individual lag (2, 4, 8, 16) a variance ratio test was calculated through the homoscedasticity increments random walk and heteroskedasticity increments random walk. This test, based on the null hypothesis, works on the basis that the price behaviour adheres to random characteristics, where *p*-values related to test statistics through homoscedastic and heteroskedastic increments test assumptions offer proof regarding the price trend being in line with random walk theory.

Table 6.5: Lo-Mackinlay Individual Lag Variance Ratio Test on DSE Gen Index (January 1998 and June 2018)

Stock Indexes	Test Estimates	Homoskedastic Test Assumption				Heteroskedastic Test Assumption			
		2	4	8	16	2	4	8	16
Daily DSE General Index	Var. Ratio	1.091	1.100	1.207	1.363	1.091	1.100	1.206	1.363
	Z-Statistic	4.3082	2.540	3.300	3.893	2.873	1.721	2.366	3.042
	Prob.	0.00	0.01	0.00	0.00	0.00	0.085	0.018	0.00
Weekly DSE General Index	Var. Ratio	1.144	1.314	1.546	1.912	1.144	1.314	1.5464	1.912
	Z-Statistic	2.891	3.362	3.70	4.149	2.219	2.7961	3.335	3.889
	Prob.	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00
Monthly DSE General Index	Var. Ratio	1.049	1.231	1.623	1.384	1.049	1.2314	1.623	1.384
	Z-Statistic	0.5067	1.268	2.158	0.8949	0.501	1.2108	2.088	0.893
	Prob.	0.612	0.205	0.031	0.3708	0.616	0.2259	0.0368	0.372

Note: Author's own calculation estimates

In Table 6.5, it is clear that through the homoscedastic test assumption, the *p*-values related to all of the analysis results at lag 2, 4, 8, and 16, were below 0.05, which is also the case for the heteroskedastic examination hypothesis for lag 2, 4, 8, and 16. In these instances, *p*-values under 0.05 show that the test overruled H_0 RW in the daily data (Bruno, 1973). For the weekly data set, the DSE Gen index showed that through homoscedastic and heteroskedastic test assumptions, the *p*-values were below 0.05, denoting that the analysis discarded the RWH null theory for the data set (Bruno, 1973). However, when it comes to monthly data series, *p*-values are shown to be 0.612, 0.205, 0.031 and 0.3708 for lag 2, 4, 8, and 16, respectively. The monthly data series shows all the lag data (outside of 8), and the test does accept the null hypothesis of random behaviour (Sharma and Robert, 1977). Thus, monthly data from the Bangladeshi Stock Market displays random properties for the data series.

In Table 6.6, the Lo-Mackinlay Individual Lag Variance Ratio Test on the FTSE 100 Index can be seen. In this test, the same processes were undertaken to estimate the test statistics at lag 2, 4, 8, and 16 with the homoscedastic and heteroskedastic test assumptions. For the daily FTSE 100 index series, the test statistics denoted that there was randomness at lag 2, and this was the case for homoscedastic and heteroskedastic test assumptions. The test statistics for other lag data do not show any proof of randomness for the daily data series (Bruno, 1973; Fadda, 2019), which is also the case for weekly data sets through homoscedastic and heteroskedastic test assumptions alike (Bruno, 1973). However, monthly data sets display different results, and through the homoscedastic test assumption, the *p*-values of all test statistics were shown to exceed 0.05. As for the heteroskedastic test assumption, the test statistics offered similar results, and thus it is summarised that while daily and weekly statistics do not agree with the null theory of randomness, the monthly data accepts the same null hypothesis. This denotes that the FTSE 100 has random trends in its monthly data sets (Sharma and Robert, 1977).

Table 6.6: Lo-Mackinlay Individual Lag Variance Ratio Test on FTSE 100 Index (January 1998 and June 2018)

Stock Indexes	Test Estimates	Homoskedastic Test Assumption				Heteroskedastic Test Assumption			
		2	4	8	16	2	4	8	16
Daily FTSE 100	Var. Ratio	0.975	0.892	0.81	0.767	0.975	0.891	0.804	0.77
	Z-Statistic	-1.80	-4.29	-4.89	-3.93	-1.18	-2.77	-3.10	-2.52
	Prob.	0.072	0.00	0.00	0.00	0.236	0.00	0.001	0.011
Weekly FTSE 100	Var. Ratio	0.419	0.2079	0.093	0.054	0.419	0.207	0.09	0.054
	Z-Statistic	-19.5	-14.2	-10.3	-7.23	-13.6	-10.9	-8.49	-5.98
	Prob.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Monthly FTSE 100	Var. Ratio	0.986	0.96	1.10	1.332	0.98	0.95	1.075	1.075
	Z-Statistic	-0.22	-0.27	0.57	1.220	-0.23	-0.31	0.355	0.824
	Prob.	0.827	0.787	0.566	0.22	0.81	0.75	0.72	0.409

Note: Author's own Calculation estimates

6.4 Application of Chow-Denning Multiple Variance Ratio Test: Evidence of Bangladesh and the UK

The Chow-Denning multiple analysis is a way of establishing data series randomness, and this tool was used to evaluate the random properties for the UK Stock Exchange and DSE stock price data. Table 9.7 displays the Chow-Denning (1993) analysis outcomes for monthly, weekly and daily DSE Gen Index data inputs. The results were found on the basis of homoskedasticity increments RWH and heteroskedasticity increments RWH. Through the homoskedasticity assumption, the Chow-Denning Max |Z| joint test statistics were shown as 4.308242 alongside a *p*-value of 0.0001 for the daily data set, denoting that the null theory of RWH was rejected (Bruno, 1973). Additionally, for the heteroskedasticity test assumption, the

Chow-Denning Max |Z| joint test statistics value was 3.042146 with a p-value equal to 0.0094, showing that the aforementioned theory was discarded at a 5% level of significance for the daily data sets. When it comes to the weekly data series, the homoscedastic and heteroskedastic test assumptions were taken into account, and the joint test statistics with their p-values showed that weekly DSE Gen index data was not in accordance with the commonly seen properties of the RWH (Bruno, 1973). For the homoscedastic and heteroskedastic assumptions, the Chow-Denning Max |Z| joint test statistics were 4.149049 and 3,889733, respectively and their p-values were under 0.05. However, the joint variance ratio test for monthly DSE Gen Index provides clear evidence of random walk at the 5% significance level, for both assumptions. When it comes to the monthly data, the Chow-Denning Max |Z| joint test statistics values were 4.465103 and 22.088001, respectively, and the p-values exceeded 0.05, denoting that the heteroskedasticity characteristics null theory wasn't unacceptable at the 5% level of significance (Sharma and Robert, 1977), so it is considered that monthly DSE Gen index data adhere to the random walk properties.

Table 6.7: Chow-Denning Multiple Variance Ratio Test on DSE, Total Period (January 1998 and June 2018)

Stock Indexes	Test Estimates	Homoskedastic Assumption	Heteroskedastic Assumption
Daily DSE General Index	Studentized Max |z| Statistic @ 5 percent level	4.308242	3.042146
	Prob.	0.0001	0.0094
Weekly DSE General Index	Studentized Max |z| Statistic @ 5 percent level	4.149049	3.889733
	Prob.	0.0001	0.0004
Monthly DSE General Index	Studentized Max |z| Statistic @ 5 percent level	4.465103	2.088001
	Prob.	0.1181	0.1393

Note: Author's own calculation estimates

Conversely, these tests were applied to daily, weekly and monthly FTSE 100 index information from the UK Stock market, through the same processes, and had different outcomes. Table 9.8 illustrates the Chow-Denning (1993) test estimates through homoscedastic and heteroskedastic test assumptions. When it comes to daily data, the studentised Max |Z| Statistics value, through homoscedastic assumptions, was 4.896315, while it was 3.103197 through heteroskedastic assumption. P-values for both analysis results were under 0.05, showing that the heteroskedasticity null theory is disregarded at 5% significance (Bruno, 1973). For weekly data series, the same test estimates as no random walk in the FTSE 100 data set were shown (Bruno, 1973), while the estimate for monthly FTSE 100 index data was different. In this case, the studentised Max |z| Statistics value under the homoscedastic assumption was 1.220551, and

0.824548 under the heteroskedastic assumption; the related *p*-values exceeded 0.05, denoting that the null theory of RW was established at 5% significance (Sharma and Robert, 1977). As a result, the finding showed that the Bangladesh DSE Gen Index data and the FTSE 100 Index data in the UK offer the same exact Chow-Denning (1993) test results, while the FTSE 100 data offers test estimates which have a greater probability of presenting random walk norms and properties compared to the DSE Gen Index data.

Table 6.8: Chow-Denning Multiple Variance Ratio Test for UK Total Period (January 1998 and June 2018)

Stock Indexes	**Test Estimates**	**Homoskedastic Assumption**	**Heteroskedastic Assumption**
Daily FTSE 100	Studentized Max |z| Statistic @ 5 percent level	4.896315	3.103197
	Prob.	0.0000	0.0076
Weekly FTSE 100	Studentized Max |z| Statistic @ 5 percent level	19.56968	13.67466
	Prob.	0.0000	0.0000
Monthly FTSE 100	Studentized Max |z| Statistic @ 5 percent level	1.220551	0.824548
	Prob.	0.6341	0.8785

Note: Author's own calculation estimates

Stock index data was predicted to have a certain level of randomness in an efficient market, which in turn would work on the basis that every market player has the same information available and equal expectations for their trading moves. On the other hand, when the assumption of the equal spread of data and common predictions are not able to be followed, all market players become more dependent on the rest of the participants in their daily activities in trading, which is evident in the non-random behaviour of daily stock indexes in the cases of the Bangladesh and UK Stock Exchanges (Bruno, 1973). However, this co-dependence is limited when the information was investigated, and parties made changes to their trading movements. This is the reason for longer period data, such as monthly DSE Gen Index data for the DSE and FTSE 100 Index data for the UK Stock market, and the associated test predictions were more unique and random (Sharma and Robert, 1977). These results are echoed by other empirical research papers, such as those of Roy (2018); Fadda (2019) for both developed and developing countries; Fama (1965b) for developed markets; Osborne (1962), Cootner (1962), Kendall (1943, 1953), Working (1934), and Fama (1965b) for industrialised exchanges; Dasgupta and Glen (1995), Harvey (1994), Roux and Gilbertson (1978), Claessens, Poshakwale (1996) and Khababa (1998) for emerging countries; as well as Urrutia (1995), Dickinson and Muragu (1994), Ojah and Karemera (1999) for developing and less-developed countries, the conclusion of the research was that there was a random walk in the market only if the prices were unperturbed. This is in addition to the research studies of Godwin (2010) for Nigeria, Worthington and Higgs (2006) for Japan, New Zealand and Australia, Cooray (2004) for Japan, Germany, Australia, the U.S, Hong Kong, and the U.K, Chen (2008) for the USA and the UK, Borges (2008) for France, Germany, the U.K, Greece and Spain, Alam et al. (1999), Lim and Brooks (2009) for Shanghai and Shenzhen, Cheung and Coutts (2001) for the Hong Kong Stock Exchange, and Hoque et al. (2007) for Taiwan and Korea, it was found that equities follow RWH particularly owing to company individual variables, aside from financial and economic variables.

Another critical cause of the lack of randomness in short-term data (such as weekly or daily series) is that circuit breaker activities and trading halts by the stock exchanges across various stock movements do not meet upper and lower bounds, which is one of the reasons why the DSE and UK Stock Markets display a level of dependence across the stock exchange indexes.

Additionally, insider trading action in the stock market could have a potential effect in this regard, as this allows trading decisions to be made acting on data that is not widely distributed in the market. Because of this, stock price trends often do not show actual market conditions. Furthermore, noise trading, or making trading decisions due to hearsay, brings about the same trading decisions by the market in the short-term. However, they can take back their decisions over a longer period, meaning that stock prices adhere to random walk (Sharma and Robert, 1977). The financial implications of these findings point attention towards information asymmetry, and establish more flexible attitudes when it comes to the stock exchange to oversee and control daily stock indexes, limit homogenous predictions regarding stock investment, as well as uncommon and non-synchronous trading that comes about in the extreme short-term period (Bruno, 1973).

Chapter 7- (A) Long Run Equilibrium Relationship among Stock Prices and Macroeconomic Variables: A Comparative Study between Bangladesh and the UK Stock Markets.

This section uses a modern approach in econometrics, which is the calculation of a structural equation or VAR involving non-stationary variables. Under univariate models, differencing is used to extract a stochastic trend, and the stationary series remaining can be calculated through univariate Box-Jenkins techniques. In the past, the consensus has been to create this concept and difference all non-stationary variables through a regression analysis[138]. Evidently, in between stationary variables, there can be a linear combination of integration, where there are co-integrated variables and this is often the case when it comes to economic models.

Granger (1981) first created the co-integration theory, and this was developed in Engle and Granger (1987), the latter of which solved the issue pertaining to the integration of short-term dynamics alongside equilibrium in the long-term. It was noted to be possible for a linear assortment of several data sets that are not stationary at second difference to be static, and assuming this, the non-stationary time series are considered as being co-integrated. It is said that the co-integrating relationship is the stationary linear combination, and this could be considered an equilibrium long-term association within variables. When an equilibrium connection is present between factors which are non-static their stochastic tendencies were thought to also have a relation, since the equilibrium relationship signifies the co-dependence of the variables. This connection between stochastic trends requires the co-integration of variables, and this research employs a group object to set up an equilibrium link within specified economic indicators and share values of Bangladesh and the UK. As a result, Soren Johansen's (1995) co-integration methodology, using VAR, was considered to be the most suitable approach. On the other hand, Johansen's co-integration methodology offers two unique advantages when it comes to various non-stationary multivariate studies, which are that it counters the belief that the co-integration equation is distinctive and studies the procedure's short-term dynamics during the co-integration equations' calculation.

7.1(A) Soren Johansen's Co-Integration Test: Evidence of Bangladesh

Soren Johansen's (1995) approach for evaluating co-integration was employed when calculating the equilibrium long-run link of the DSE General Index (DGEN) with specific macro variables. Here, the Balance of Trade (BDBOT), Foreign Exchange Rate (BDEXR), Deposit Interest Rates (BDDIR), Consumer Price Index (BDCPI), International Oil Price (IOP), Broad Money Supply (BDM2), Per Capita GDP (BDPCAPGDP), Foreign Remittances (BDREMIT) and 91-day US Treasury Bill Rate (TBR) were the chosen macro variables.

[138] On the other hand, the modern thinking is that the most suitable way of handling non-stationary variables is complicated when it comes to multivariate contexts.

However, certain stages must be completed for this to be achieved. Firstly, the Co-integration test begins with finding the integration sequence for every endogenous variable through any standard unit roots, such as ADF and P-P tests. Following this, the cruciality of pinpointing the optimal lag length is shown, which is estimated through AIC, SC or HQ. Then, a VAR must be created to establish the rank of π, which is the value of 'r' stating the amount of co-integrated vectors. The vectors are not co-integrating when r = 0, and where variables (g) are within system equations, the most co-integrating vectors that can be present are g-1. The Max-Eigen value and trace statistics must be investigated to discover how many co-integrating vectors are in the system. The theory below was employed to Max-Eigen value and trace statistics.

Hypothesis about Trace Statistics:

H_o: no cointegrating variables e.g., r = 0 or r ≤ 1

H_a: cointegrating variables e.g., r ≥1 or r = 2

Hypothesis about Max-Eigen Value Statistics:

H_o: no cointegrating variables e.g., r = 0 or r = 1

H_a: cointegrating variables e.g., r = 1 or r = 2

When trace and Max-Eigen statistics have an analytical percentage that is greater than 5%, then the test does not accept H_o, and the opposite also applies. When H_o is not accepted, then an equilibrium long-run correlation is considered to be in place amongst the endogenous variables[139].

Table: 7.1(A): Test of Stationarity between Stock Price and Selected Macroeconomic Variables in Bangladesh

Variables	Augmented Dickey Fuller (ADF) Test				Phillips-Perron (P-P) Test				Order of Integration	
	I(0)		I(1)		I(0)		I(1)			
	t-stat	Prob.	t-stat	Prob.	Adj. t stat	Prob.	Adj. t stat	Prob.	ADF	PP
DSE General Index	-2.0250	0.5843	-14.082	0.00	-2.1259	0.5283	-14.060	0.00	I(1)	I(1)
Balance of Trade	-7.4822	0.00	------	-----	-14.01308	0.00	------	------	I(0)	I(0)
Consumer Price Index	0.484969	0.9992	-2.1932	0.4907	0.228077	0.9981	20.78585	0.00	I(2)	I(1)
Deposit Interest Rates	-1.7739	0.7146	-14.943	0.00	-2.1121	0.5361	-15.1060	0.00	I(1)	I(1)
Foreign Exchange Rate	-2.6705	0.2499	-12.7659	0.00	-2.56268	0.2980	-12.7764	0.00	I(1)	I(1)
Per Capita GDP	0.969280	0.9999	-2.66812	0.2510	1.603428	1.00	-14.5737	0.00	I(2)	I(1)
International Oil Price	-3.75179	0.0208	------	-----	-3.39969	0.0537	-11.8913	0.00	I(0)	I(1)
Broad Money Supply	2.342782	1.00	-0.65952	0.9741	8.789214	1.00	20.00861	0.00	I(2)	I(1)
Foreign Remittances	-1.23032	0.9013	-3.52118	0.0394	-2.42750	0.3644	-46.6215	0.00	I(1)	I(1)
Treasury Bill Rate	-2.46271	0.3465	-7.41106	0.00	-2.37764	0.3903	-13.5695	0.00	I(1)	I(1)

Source: Author's own calculation estimates

[139] In cases where the endogenous variables are shown to be part of a co-integrating relationship, then normalised co-integrating equations must be examined in order to pinpoint specific details of the long-term equilibrium connection.

In line with the above, this research attempts to establish the integration order for all endogenous variables through two commonly employed unit root tests, which are the ADF and P-P methods. The unit root calculations are shown in Table 7.1(A), and with specific factors, it may be seen that, similarly to the DSE General Index (DGEN), Deposit Interest Rates (BDDIR), Foreign Exchange Rates (BDEXR), Broad Money Supply (BDM2), Foreign Remittances (BDREMIT) and 91-day US. Treasury Bill Rates (USTBR), the ADF and P-P tests offer exactly the same estimations of order for integration one. When it comes to the Consumer Price Index (BDCPI) and Per Capita GDP (BDPCAPGDP), the orders of integration are shown to differ under the aforementioned tests. Conversely, the Balance of Trade (BDBOT) was shown to have an order of integration at zero, and so in this unit root test, apart from BDBOT, endogenous variables exclusively have an order of integration that is greater than one, showing that the majority of endogenous variables are trending.

Table: 7.2(A): VAR Lag Order Selection Criteria between Stock Price and Macroeconomic Variables in Bangladesh

Endogenous variables: **DSE General Index, Consumer Price Index, Deposit Interest Rates, Foreign Exchange Rate, International Oil Price, Broad Money Supply, Per Capita GDP, Foreign Remittances, Treasury Bill Rate.**						
Exogenous variables: C						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	-11866.21	NA	6.31e+32	101.0656	101.1981	101.1190
1	-8693.095	6076.178	2.35e+21	74.74975	76.07470*	75.28391
2	-8526.458	306.3288	1.14e+21	74.02092	76.53832	75.03582*
3	-8441.249	150.1141	1.11e+21	73.98509	77.69495	75.48074
4	-8355.403	144.6585	1.08e+21	73.94386	78.84616	75.92024
5	-8267.093	142.0482	1.03e+21	73.88164	79.97640	76.33877
6	-8149.409	180.2822	7.82e+20	73.56944	80.85665	76.50730
7	-8030.487	173.0693	5.94e+20	73.24670	81.72636	76.66531
8	-7925.728	144.4328	5.17e+20	73.04450	82.71662	76.94385
9	-7772.125	200.0112	3.03e+20	72.42660	83.29117	76.80669
10	-7668.385	127.1362	2.78e+20	72.23307	84.29009	77.09391
11	-7557.294	127.6368	2.47e+20	71.97697	85.22645	77.31855
12	-7373.313	**197.2903***	**1.22e+20***	**71.10054***	85.54247	76.92286
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Note: Author's own calculation estimates

Following the first step, the VAR's optimal lag length has to be discovered, and here various information criteria were used, showing that that LR, FPE and AIC offered the exact same optimal length of lag of 12. As a result, this research sets the optimal lag length to 12 for use in the VAR model. However, in line with the Eviews end-users' recommendations, which are offered on the Eviews Forum, the most suitable lag length is in fact one less than the optimal lag length given by the Information Criterion. As a result, the lag length was set to 11 for the co-integration test.

Table: 7.3(A): Unrestricted Cointegration Rank Test (Trace) between Stock Price and Macro Variables in Bangladesh

Hypothesized No. of CE(s)	Trace Statistic	Critical Value(0.05)	Prob.**
None *	447.8734	197.3709	0.0000
At most 1*	302.4772	159.5297	0.0000
At most 2*	211.7319	125.6154	0.0000
At most 3*	147.8559	95.75366	0.0000
At most 4*	98.07868	69.81889	0.0001
At most 5*	59.05095	47.85613	0.0032
At most 6	29.18394	29.79707	0.0587
At most 7	9.886820	15.49471	0.2895
At most 8	0.771791	3.841466	0.3797

Note: Author's own calculation estimates

Through the outcomes of the optimal lag-length and co-integration order, the co-integration was completed. The Johansen's Co-integration results are shown in the table, where the Max-Eigen value and trace statistics were investigated so that the status of equilibrium long-term correlation between the Bangladeshi macro variables and stock prices could be appraised. Table 7.3(A) displays the trace statistics from the unrestricted co-integration rank test. Since there were no co-integrating variables ($r = 0$ or $r \leq 1$), instead of having co-integrating variables ($r \geq 1$ or $r = 2$), the null hypothesis was set. On the topic of *p*-values of trace statistics, MacKinnon-Haug-Michelis (1999) showed that six (6) co-integrating equations are included within the model with statistical importance at 5%.

Table: 7.4(A): Unrestricted Cointegration Rank Test (Maximum Eigenvalue) between Stock Price and Macro Variables in Bangladesh

Hypothesized No. of CE(s)	Max-Eigen Statistic	Critical Value (0.05)	Prob.**
None *	145.3961	58.43354	0.0000
At most 1*	90.74537	52.36261	0.0000
At most 2*	63.87599	46.23142	0.0003
At most 3*	49.77721	40.07757	0.0030
At most 4*	39.02773	33.87687	0.0111
At most 5*	29.86701	27.58434	0.0250
At most 6	19.29712	21.13162	0.0886
At most 7	9.115030	14.26460	0.2767
At most 8	0.771791	3.841466	0.3797

Note: Author's own calculation estimates

Through Johansen's co-integration test, there must also be a thorough exploration of the Max-Eigen value statistics. Table 7.4 (A) shows the Max-Eigen statistics via the rank test. H_0 was set as there being no co-integrating variables (e.g., $r = 0$ or $r = 1$) instead of co-integrating variables (e.g., $r = 2$ or $r = 1$). The Max-Eigen result shows that H_0 (no co-integration equations) is unacceptable up to six (6), highlighting the fact that there are a minimum of two co-integrating vectors throughout the DSE, and specifically macro variables, significant at 5%. It ought to be underlined that the amounts of co-integrating vectors are extremely similar in the trace and Max-Eigen value results. It is suggested that any disparity of these two tests when it comes to the amount of co-integrating vectors should point towards adhering to the Max-Eigen value test. When bearing the Max-Eigen and trace values in mind, it is clear that the endogenous variables examined are co-integrated and an equilibrium long-term link is present throughout the variables.

Table: 7.5(A): Cointegrating Equation(s) among Stock Price and Macro Variables in Bangladesh

Normalized cointegrating coefficients (standard errors in the parentheses)									
Equation(s)	**DSE General Index**	**Consumer Price Index**	**Deposit Interest Rates**	**Foreign Exchange Rate**	**International Oil Price**	**Broad Money Supply**	**Per Capita GDP**	**Foreign Remittances**	Treasury Bill Rate
1	1.000	-27.378	-207.25	46.835	21.225	0.0013	-0.842423	-1.1927	47.061
		(63.68)	(537.23)	(99.50)	(27.59)	(0.024)	(0.2266)	(0.803)	(258.1)
2	1.0000	0.0000	-409.87	-12.5927	27.795	-0.02033	- 0.424009	-0.74179	49.33950
			(488.59)	(59.824)	(25.016)	(0.0215)	(0.18746)	(0.7159)	(234.77)
3	1.0000	0.0000	0.0000	13.18066	43.041	0.01844	-0.113858	-0.66751	3.340381
				(72.14)	(29.65)	(0.0255)	(0.21487)	(0.8633)	(260.706)

Note: Author's own calculation estimates

In Table 7.5(A), the normalised co-integrating coefficients and associated equations are seen. Consumer price index, DIR, GDPCAP and REMIT exhibit an adverse link between Bangladeshi share values, in co-integrating equation -1. However, there are certain variables with an affirmative link amongst share values. When it comes to co-integrating equation: 2, deposit interest rates, foreign EXR, GDPCAP and REMIT are shown to have a negative link with stock price, while co-integrating equation: 3 shows that after removing the effect of CPI and DIR, all other variables show a non-negative link against share values of Bangladesh, except for per capita GDP and foreign remittances. Of the co-integrating equations, equation: 1 is thought to be the most closely tied to this research study's outcomes.

CPI was shown to have an adverse link with DSE Gen, from co-integrating equation: 1. This coincides with the null hypothesis of an opposing association for stock price against consumer price index (Fabio and Claudio, (2009); Rudra, Mak and Atanu (2015); Baillie; Humpe and Macmillan (2009); Camilleri, Scicluna and Bai (2019); Urich and Wachtel (1981); Camilleri, Scicluna and Bai (2019); Peiró (2016); Solnik (1983); Asprem (1989); Lescaroux and Mignon (2008). However, research has offered varying results when it comes to the connection of CPI and share values. Specifically for the current research, CPI was implemented to examine inflation. A significant number of studies held the belief that the link between stock price and CPI was negative. The current analysis showed a negative co-integrating regression coefficient (-27.378) against stock price, which could be because of a rising inflation rate, which often brings about stricter economic policies, hence resulting in an increase of DR and extra nominal risk-free rates for valuation models. In turn, this causes a drop in the stock price. However, Eita (2011) studied Namibia; Maysami and Koh (2000) studied Singapore; and Osei (2006) studied Ghana in search of an affiliation between inflation and share values. A negative relation was discovered between stocks and inflation for the researched countries. Additionally, Chatrath et al. (1997) studied India; Geske and Roll (1983) studied the USA and was positive in relation to economic activities that are real; Achsani and Strohe (2002) studied Sri Lanka; Crosby (2000) studied the Australian market; Yu Hsing et al. (2012) studied the UK and the USA; Siaw (2011) studied Ghana; Chung and Tieslau (1996); Olsen (2014); Yartey (2010), they found An adverse relation between stock prices and inflation in their investigation[140]. All the above mentioned researchers postulated that the negative result of inflation was a consequence of an actual regular change of commerce, variations in money availability or because of both, as well as ordinary stock effectiveness, which can be described as the degree to which investors cushion themselves from loss of investment in the stocks due to the doubt caused by inflation on the expected price of the products in the future (Bodie, 1976).

When the proportion of sovereign debt to GDP increases, there is a prediction of a negative effect on shares, which means that shares are dented through currency depreciation. This study's findings are in line with those of the experts that are discussed earlier.

In addition, this thesis showed a negative link between stock price and deposit interest rates in Bangladesh, which was a finding in line with the study's null hypothesis (Fabio and Claudio, (2009); Camilleri, Scicluna and Bai (2019); Rudra, Mak and Atanu (2015); Peiró (2016); Peiró (2016); Urich and Wachtel (1981); Camilleri, Scicluna and Bai (2019); Bakaert and Hodrick (1992); Solnik (1983); Siddiki (2000); Olsen (2014); Asprem (1989). DIR has been described as the rate of return offered to various savings units within an economy for the quantity deposited in their bank account. The current study showed that the representative of deposit interest rate is the monthly weighted average deposit interest rates for deposits from 3 to less than 6 months. The findings show a contrary correlation between stock and DIR, as presented by the cointegrating equation with the normalised cointegrating coefficient -207.25. The

[140] Additionally, the results of studies also found and supported the studies by Fama and Schwert (1977), (1976) which showed an undesirable association between stock and inflation. This is in addition to the studies of Najand and Noronha (1998) who studied Japan; Chatrath et al. (1997) who studied India as well as the Mexican and Korean markets; Nelson (1976) who examined the United States of America, Sharma (2002) who studied Malaysia, Singapore, the Philippines, Thailand, and Indonesia, as well as Nelson (1976) who studied the United States of America.

financial impact of this relationship can be explained with regards to predictions of current and future investors, through various investment opportunities. In the majority of cases, investors look at all their options and decide which opportunity will offer the greatest rate of return. Here, investment in stocks and through bank deposit accounts are two widely used alternative investment options. Investors often appraise these two options with other sources prior to making any further decisions. When it comes to this type of mutually exclusive situation, investors usually prefer the options that give the greatest return. When stock returns appear to be superior to the other options, investors start to invest more in stocks, by moving investments currently existing in other sources. Similarly, when bank deposit returns appear superior to investment returns from stocks, investors move their funds from one to the other. In all cases, an undesirable correlation has been observed between the various available security projects, so DIR and stock appear to exhibit a short-run non-positive affiliation in the current study, which is a finding in line with those of Demir (2019) for Borsa Istanbul; Ditimi, et al. (2018) for Nigeria; Alam and Uddin (2009) for Bangladesh; and Huizinga and Mishkin (1986)[141].

The current thesis shows that the EXR is non-negatively correlated between Bangladeshi stocks (Rudra et al. (2015); Bakaert and Hodrick (1992); Bruce (1997); Bakaert and Hodrick (1992). However, the hypothesis predicted the opposite. EXR is the cost of an exchange swapped with another. This research employs exchange rate data of 1 USD against BDT at various time periods, without taking into account fluctuations. This research shows a positive co-integrating coefficient (46.835) for the foreign exchange rate in Bangladesh, which is not in accordance with the theory of this study. The positive relationship found, linking stock price with foreign exchange rate, could be made clear through the goods market model. Dornbusch and Fischer (1980) concentrated on the relationship between EXR and current account, and created a model for establishing EXR which involves assets markets, expectations and relative prices, while underlining the correlation of Current account and EXR behaviour. Dornbusch and Fischer (1980) stated that current account is clearly linked with exchange rate behaviour, and that EXR is considered to predominantly be established by a nation's BOT or current account behaviour. The models put forward the notion that alterations to exchange rates impact worldwide competition and trade balance, and therefore impact macroeconomic factors including real output and income. Put simply, the “goods market” model shows that movements within EXR change how competitive a firm is (positive or negative effect), and this brings about changes

[141] As well as, Premawardhana (1997) for Sri Lanka; Hamao (1988) for Japan; and Kim (2003) for the USA; for instance, the Philippines, Thailand and Singapore, showed a non-positive link in the long-term.

to the company's income or expenditure, and subsequently shares. From a macro-economic perspective, the EXR's effect on the movements of equities is based on how open the domestic economy is, and how imbalanced trade is. As a result, the goods market models provide a positive link for stock price against exchange rate, with the causality's direction extending from stock to EXR. An affirmative link can be taken from an EXR quote (Stavárek, 2004), and this can be seen through other empirical studies, for example those of Giri and Joshi (2017) for India; Yu Hsing et al. (2012) for the USA and the UK; Indonesia and the Philippines; and Siaw (2011) for Ghana, in addition to Gan et al. (2006) for New-Zealand in the long-term; Siaw (2011) for Ghana; Roll (1992); Miao (2010); Siddiki (2000) for BD; Morley; and Khan and Yousuf (2013) for Bangladesh[142].

In addition, co-integration equation: 1 offers a positive normalised co-integrating coefficient (21.225) for worldwide oil prices, and the positive link existing for stock price in Bangladesh against international oil cost is not in line with the negative relation null hypothesis (Rudra, Mak and Atanu (2015); Jones and Kaul (1996). As a result, it is considered that when oil price goes down, Bangladesh share price goes up. This inverse correlation is primarily due to the fact that Bangladesh imports oil, as a necessary part of daily life for businesses and non-business organizations. In cases where oil price drops in the global market, then the import prices will also go down for countries to buy in, which, in turn, means that the input costs of goods and service production are also reduced. Furthermore, oil acts as feedstock for many industries, such as for petrochemicals, paper, and aluminium, and any fall in price has a direct effect on many processed or semi-processed goods. The transportation, petrochemicals, and agricultural sectors receive great benefits from smaller costs, as is the case with certain manufacturing sectors. As a result, the company's profits go up, meaning that share prices will go up in the stock market. This finding was aided by evidence from existing empirical research studies, such as those of Demir (2019) for Borsa Istanbul; Olayungbo (2019) for Nigeria; Gan et al. (2006) for New Zealand; Kalyanaraman and Al-Tuwajri (2014) for Saudi and the S&P 500; and Khan and Yousuf (2013) for Bangladesh, all of whom found positive relation between stock price and oil price[143].

[142] In addition to the studies of Abdalla and Murinde (1997) for India; Ibrahim and Yosoff (1999) for KLSE; Maysami et al. (1992) for the S&P 500 index; Tsoukalas (2003) for the Cypriot equity market; they provide a positive link for stock price against exchange rate.
[143] This is in addition to the studies of Hamao (1988) for Japan, Italy, Ghana, Germany, Switzerland, the Netherlands, the UK, as well as Nasseh and Strauss (2000) for France, they discovered a favourable relation between IOP and stock.

This research proved that there was a non-adverse association between the Bangladesh stock and broad M2, with a positive normalised co-integrating coefficient (0.0013), which is a result in line with the null hypothesis. M2 is an important macro factor, which is commonly employed in other research studies in order to establish stock prices (Humpe and Macmillan (2009); Urich and Wachtel (1981); Camilleri, Scicluna and Bai (2019); Urich and Wachtel (1981); Rogalski and Vinso (1977); Camilleri, Scicluna and Bai (2019); Siddiki (2000). Even though there has been an in-depth examination on the matter, the relationship between stock and M2 remains vague. The economy is affected by "Monetary policy", with a "transmission mechanism", and an expansionary or a restricting monetary policy can be impacted on two-sides. In the latter instance, the administration provides excess liquidity through more open market operations, bringing about greater bond prices and lower interest rates, and these interest rates mean that there is a less necessary rate of return and subsequently a greater stock price.

Furthermore, when there is greater monetary growth, then there is excess liquidity provided to purchase stocks, meaning that there will be higher stock prices through greater demand, this occurs in common stocks as well as in the real good markets. On the other hand, monetary growth can also bring about larger rates of inflation, meaning nominal interest rates also go up, in line with the Fisher equation. When interest rates are higher, there is a greater necessary rate of return, meaning a lower stock price.

The constructive connection that is existent with Bangladesh stock and M2, in financial terms, can be considered to be due to the use of a monetary authority, such as the Bangladesh Bank, to control credit and loans in Bangladesh. This authority often undertakes open market operations, with a discount window policy or reserve rate variation policy in order to set the economy's available credit and money supply, which has an indirect impact on interest rate levels. In instances where monetary authority causes the interest rate to go down, there is also a drop in company capital costs. Here, firms could have the opportunity to make expansion decisions more easily, leading to greater expected earnings, productivity and predicted stock market share prices.

This research's findings are in line with this belief, and the notion that broad M2 is substantially affirmatively related with stock price in the long-term. This is further supported by Demir (2019) for Borsa Istambul; Ditimi et al. (2018) for Nigeria; Jahfer and Inoue (2017) for Sri Lanka; Chen et al. (2005) for Taiwan; Naik and Padhi (2012) for India; Ahmed and Imam (2007) for Bangladesh; Yalama and Çelik (2008) for Istanbul; Humpe and Macmillan (2007) for Japan, Singapore and the USA[144]; they revealed a non-contrary link between M2 and stock price.

For Bangladesh, the per capita GDP was seen to be negatively correlated with stock price, as shown with the negative normalised co-integrating coefficient (-0.842423). The negative link between the two met the null hypothesis of this study (Lescaroux and Mignon (2008). Per capita gross domestic product is a calculation of a country's overall output, which uses the GDP and divides it by the nation's population. The per capita GDP is particularly beneficial when it comes to contrasting the performance of two nations, and it is a major crucial standard of a nation's financial power. When per capita GDP increases, then economic growth is signified, this is usually supplemented with an increase of productivity. Conversely, GDPCAP is occasionally employed to show the standard of living, and when it is higher than the country is suggested to have a greater standard of living. The basis for negative correlations existing for stock price against per capita GDP in developing nations has been discussed by Krugman (1994) and Young (1995), who believe that real economic expansion with regards to GDP in emerging nations occurs due to greater savings rates and when labour is used more effectively. These two aspects do not have a direct correlation with profits for firm shareholders, however. Siegel (2002) posited that investors care about earnings per share (EPS) increasing above all else. Financial expansion necessitates greater capital costs, which means that re-investment is more necessary than before, thus more individuals' savings are capitalised in companies which provide stakes or give less profit in the short-run. As a result, long-term earnings through more investment are swapped for smaller, but more short-term dividends, or they are transferred to other shareholders, thus providing no advantage for existing shareholders. Furthermore, Buffet (1999) and Siegel (1999, 2000) stated that when there is intense competition in an economy, technological advances provide benefits to consumers via standard of living, instead of benefitting capital owners. In cases where individuals save to a greater extent and invest these funds, then the greater capital for each worker means that the wage rate is higher, which, in turn, is not beneficial to current company shareholders. These findings underline the notion that economic expansion brings about improvements in the consumer standard of living, without necessarily offering a greater current value of dividends for each share for those holding current capital stock. As a result, future economic expansion in a nation is not based on future equity returns and this finding is echoed in numerous studies.

[144] In addition to the studies of Bulmash and Trivoli (1991) for India; Rogalski and Vinso (1977), Homa and Jaffe (1971) for the USA; Ibrahim and Yusoff (1999), and Muzafar (1998) for Kuala Lampur.

Foreign remittances (BDREMIT) are shown to produce a wide-ranging effect on emerging economies, and this was particularly the case in Bangladesh. However, this research used the basis of a constructive link between stock and REMIT in this instance. Clearly, the foreign remittances field encourages economic growth at the intended level, and is able to limit poverty, boost foreign currency reserve, bring about a rise in import financing, limit unemployment problems and increase consumption, savings and investment at the as well as macro level. However, the current study showed a negative normalised co-integrating coefficient (-1.1927) when it came to foreign remittances. “The Uses of Remittances in Bangladesh: Some Future Directions” is a report that shows that beneficiary families employ foreign remittances across various other investment opportunities in Bangladesh. The results showed that the beneficiary families used foreign remittances in multiple ways inBangladesh. Table 7.5(A) shows the various uses, and it is noteworthy that 8% of families received foreign remittances from overseas investments in Bangladesh's capital market. This small amount could be because of risk aversion, and the belief that shares are unstable as an investment. Also, the table shows that most receivers of foreign remittances employ their funds primarily in more consistent investments, such as land or property purchases, or investments in FDR or building houses. Importantly, the expansion rate for foreign remittances occurs at a greater rate than that of foreign remittance investments in the stock market. Because of this, an increase in foreign remittances brings about negative coefficients in short- and long-term forecasts. A substantially adverse connection is existent between REMIT and DSE in this study, which is a finding supported by further empirical studies such as the work of Ali (2011a) and Ali (2011b) for Bangladesh.

Table: 7.6(A): Diversified Use of Foreign Remittances in Bangladesh

Classified Investment	Users of Foreign Remittances (%)
Purchase of land/ Flat	42
Purchase of Savings Certificate	13
FDR of different maturity in different financial institutions and purchase of insurance policy	21
Personal lending with interest	1
Starting sole proprietorship business	12
Starting partnership business	2
Sending other family members to abroad	18
Establishing or repairing of houses	39
Purchase of car/motor cycle	5
Investment in capital market	8
Use the amount to provide other family members a job in home country	3

Note: Collected from a Study Report Titled **“The Uses of Remittances in Bangladesh: Some Future Directions”**, published by Bangladesh Bank.

The results show that the rise in foreign remittance brings about a fall in stock prices indirectly. Even though foreign remittances cause greater liquidity in the economy, this is employed more for investments in real sectors, including construction and property buying, and less so for the share market. Consequently, the share prices do not show the actual impact of foreign exchange reserves in the economy going up.

Lastly, Bangladesh stock prices were shown to have a positive correlation with the 91-day US Treasury bill rates (Humpe and Macmillan, 2009). When the share price increases, then experienced investors invest more in less risky sectors, such as T-bill, instead of corporate security. This positive link has a high standard error, highlighting that there is less correlation with Bangladesh stock prices and worldwide risk-free rate. A significant number of Bangladeshi investors do not have strong desires to invest in foreign securities, and they would sooner choose to invest in domestic equivalents. Limited available information regarding overseas investment opportunities is a key reason for this trend. Because of this, even if the T-bill rate in the US economy is on the rise, there are limited effects on investment choices made by Bangladeshi investors**.** This outcome is in accordance with the findings of the studies of Nasseh and Strauss (2000) for Ghana; Karamustafa and Kucukkale (2003) and Gunasekarage et al. (2004) for Sri Lanka; as they revealed that the 91-day US. Treasury bill rates and stock price have been positively related.

7.2 (A) Soren Johansen's Co-Integration Test: Evidence of the UK

In order to examine the equilibrium relationship in the long-term, for stock against specific macroeconomic variables, Soren Johansen's Co-integration test is employed to a great degree. This chapter involves the use of this test through stock and specific macro for the UK. As a result, an attempt is made to pinpoint whether there is an equilibrium link in the long-term for the UK stock price with UK real economic factors. In implementing Johansen's Co-integration, the same methodologies employed for Bangladesh will be used in this context. Table 7.7(A) displays the test outcomes for the popular unit root (i.e., ADF and P-P Test) in the FTSE 100 Macro and stock for the economy in question. Overall, it is seen that the economic indicators and stock prices show that they come under the order of integration one [*I(1)*] and no variables offer another integration order through the ADF or P-P. The same unit-roots equalled a decisive requirement for using all the necessary variables in the co-integration test.

Table: 7.7(A): Test of Stationarity between Stock Price and Selected Macro Variables in United Kingdom

Variables	Augmented Dickey Fuller (ADF) Test				Phillips-Perron (PP) Test				Order of Integration	
	I(0)		I(1)		I(0)		I(1)			
	t-stat	Prob.	t-stat	Prob.	Adj. t stat	Prob.	Adj. t stat	Prob.	ADF	PP
FTSE-100	-1.997290	0.5996	-15.79014	0.00	-2.1010	0.5423	-15.798	0.00	I(1)	I(1)
Balance of Trade	-0.002396	0.9945	-12.32341	0.00	-0.07626	0.9950	-16.721	0.00	I(1)	I(1)
Consumer Price Index	-0.111400	0.9945	-3.184683	0.090	0.766577	0.9997	-17.212	0.00	I(1)	I(1)
Deposit Interest Rates	-2.211967	0.4804	-10.95081	0.00	-2.1780	0.4993	-11.3367	0.00	I(1)	I(1)
Foreign Exchange Rate	-2.148191	0.5159	-15.03370	0.00	-2.3631	0.3980	-15.041	0.00	I(1)	I(1)
Per Capita GDP	-0.894927	0.9538	-16.28594	0.00	-0.7244	0.9696	-16.403	0.00	I(1)	I(1)
International Oil Price	-3.786332	0.0188	------	-----	-3.37010	0.0578	-11.995	0.00	I(0)	I(1)
Broad Money Supply	-2.392187	0.3827	-6.750822	0.00	-1.96742	0.6158	-16.351	0.00	I(1)	I(1)
Foreign Remittances	-2.057348	0.5666	-15.75315	0.00	-2.07441	0.5571	-15.753	0.00	I(1)	I(1)
Treasury Bill Rate	-2.492176	0.3318	-7.478436	0.00	-2.40809	0.3744	-13.699	0.00	I(1)	I(1)

Source: Author's own calculation estimates

The second stage is to pinpoint what the optimal lag length is for VAR. Table 7.8(A) displays the analysis predictions for various information criteria used on the UK data set. In this context, various information criterion tests are used on the UK variables, and LR and AIC offered the same exact optimal lag length of 12. As a result, this thesis firstly finds the optimal lag length to use for VAR. Contrarily, Eviews end-user guidelines, provided on the Eviews Forum, state that the most suitable lag length is one minus the optimal lag length given by a certain Information Criterion. Henceforth, the lag was set as 11 for the co-integration test.

Table: 7.8(A): VAR Lag Order Selection Criteria between Stock Price and Macro Variables in UK

Endogenous variables: FTSE 100 Consumer Price Index, Deposit Interest Rates, Foreign Exchange Rate, International Oil Price, Broad Money Supply, Per Capita GDP, Foreign Remittances, Treasury Bill Rate.						
Exogenous variables: C						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	-11361.84	NA	1.98e+31	97.60377	97.73707	97.65752
1	-8143.179	6161.040	3.98e+19	70.67106	72.00408*	71.20859
2	-7949.273	356.1878	1.72e+19	69.70191	72.23465	70.72322*
3	-7882.124	118.1587	1.51e+19*	69.82081	73.55326	71.32590
4	-7811.085	119.5162	1.90e+19	69.90631	74.83848	71.89518
5	-7732.843	125.5903	1.99e+19	69.92998	76.06187	72.40263
6	-7656.311	116.9334	2.14e+19	69.96833	77.29994	72.92476
7	-7570.350	124.6986	2.15e+19	69.92575	78.45707	73.36596
8	-7504.347	90.64832	2.61e+19	70.05448	79.78552	73.97846
9	-7416.282	114.1437	2.68e+19	69.99384	80.92459	74.40160
10	-7351.653	78.77534	3.45e+19	70.13436	82.26483	75.02591
11	-7269.429	93.86968	3.93e+19	70.12385	83.45404	75.49918
12	-7137.346	**140.5858***	3.02e+19	**69.68537***	84.21528	75.54448
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Note: Author's own calculation estimates

The findings for the optimal lag and sequence of co-integration allow for co-integration tests for the UK data set. The Johansen analysis outcome is shown in Table 7.9(A). Additionally, two test statistics, namely the trace and Max-Eigen value tests, were investigated to appraise the co-integrating vectors position in the specific data set. Table 7.8(A) also displays the trace statistics taken via the unrestricted co-integration rank test. In this case, the null hypothesis has been taken as being no co-integrating variables, thus r = 0 or r ≤ 1, instead of co-integrating variables standing at r = 2 or r ≥1. For *p*-values of trace results, eight (8) co-integrating vectors in the system were shown to have significance at 5%.

Table: 7.9(A): Unrestricted Cointegration Rank Test (Trace) between Stock Price and Macro Variables in UK

Hypothesized No. of CE(s)	Trace Statistic	Critical Value(0.05)	Prob. **
None *	525.0136	239.2354	0.0000
At most 1*	369.6404	197.3709	0.0000
At most 2*	285.3417	159.5297	0.0000
At most 3*	207.0942	125.6154	0.0000
At most 4*	144.4172	95.75366	0.0000
At most 5*	91.71611	69.81889	0.0004
At most 6*	59.34152	47.85613	0.0029
At most 7*	30.94773	29.79707	0.0367
At most 8	11.06620	15.49471	0.2075
At most 9	0.156025	3.841466	0.6928

Note: Author's own calculation estimates

In Table: 7.10(A), the Max-Eigen outcomes from the rank analysis are shown in the context of the UK data set. The null hypothesis in this case was decided as there being no co-integrating variables, so r = 0 or r = 1, instead of co-integrating variables, through r=1/r=2. The Max-Eigen value shows that the null theory of no co-integrating vectors is rejected up to 7, highlighting that there is a minimum of seven co-integrating vectors throughout the FTSE 100 and specific macro variables are significant at the 5% level. It is of significance to note that the numbers of co-integrating equations are the same in Max -Eigen and trace value analyses. In cases where there were clashes in trace with Max-Eigen outcomes, in predicting the number of co-integrating equations, the common research advice is to adhere to the Max-Eigen value test.

Table: 7.10(A): Unrestricted Cointegration Rank Test (Maximum Eigenvalue) between Stock Price and Macro Variables in United Kingdom

Hypothesized No. of CE(s)	Max-Eigen Statistic	Critical Value (0.05)	Prob.**
None *	155.3731	64.50472	0.0000
At most 1*	84.29869	58.43354	0.0000
At most 2*	78.24748	52.36261	0.0000
At most 3*	62.67703	46.23142	0.0004
At most 4*	52.70110	40.07757	0.0012
At most 5*	33.87687	32.37460	0.0247
At most 6*	28.39379	27.58434	0.0393
At most 7	19.88153	21.13162	0.0740
At most 8	10.91017	14.26460	0.1588
At most 9	0.156025	3.841466	0.6928

Note: Author's own calculation estimates

Table: 7.11(A): Cointegrating Equation(s) among Stock Price and Macro Variables in UK

Normalized cointegrating coefficients (standard errors in the parentheses)										
Equation	**FTSE 100**	**Balance of Trade**	**Consumer Price Index**	**Deposit Interest Rates**	**Foreign Exchange Rate**	**Per Capita GDP**	**International Oil Price**	**Broad Money Supply**	**Foreign Remittances**	**Treasury Bill Rate**
1	1.00	-2.6290	910.57	-34926.6	316061.3	-154.3091	-211.41	-41.022	28.651	13690.4
		(3.62)	(1198.4)	(4240.4)	(40878.2)	(70.8354)	(282.7)	(16.89)	(47.505)	(2978.5)
2	1.00	0.000	-151.08	-8696.7	74937.9	-30.13622	33.972	-9.4957	13.151	3105.5
			(264.7)	(998.6)	(9771.5)	(10.8981)	(67.23)	(3.990)	(11.30)	(704.9)

Note: Author's own calculation estimates

With regards to the UK data set, Table: 7.11(A) shows the two co-integrating equations alongside the normalised co-integrating coefficients. For co-integrating equation -1, the balance of trade, deposit interest rates, per capita GDP, international oil price, and broad money supply were shown to have a negative correlation with UK stock price, whereas certain other macro variables, REMIT, USTBR, CPI and EXR had a positive correlation. In the case of co-integrating equation -2, once the balance of trade impact was removed, M2, GDPCAP, DIR and CPI were shown to hold a negative correlation with UK stock price, whereas the other variables showed a positive link. Notably, the normalised co-integrating coefficients linked with consumer price index and international oil price had a different respective relationship with stock price. After taking the above into consideration, equation -1 was thought to be the most suitable result for this research's examination of the UK data set.

The balance of trade in the UK is shown in Table 7.11(A), holding a negative normalised co-integrating coefficient against UK stock price. Trade Balance is a critical macro variable, described as the disparity of a nation's export against its import. Foreign aid, importations, domestic cost and investment abroad are commonly found debit items in a trade balance account, while exports, foreign investments and spending within economies come under loan objects. An exchange shortage is in place whenever an economy imports greater volume than it exports, and when exports outweigh imports then this stands as a trade surplus. Since the UK is seen as an import-focused nation (ONS, 2017), trade balance needs to create a deficit balance for the national economy. Where there is a negative normalised co-integrating coefficient in the UK trade balance, one can see that when the trade deficit balance goes up, then the balance of trade goes down.

The consumer price index in the UK produces a positive normalised co-integrating coefficient (i.e., 910.5) against its corresponding stock prices (Baillie, Chung, and Tieslau (1996); Olsen (2014); Yartey (2010). Even though there is significant research stating that a negative link of stock price against consumer price index exists, this researches' outcomes show the opposite to be true. The potential financial reasoning for this is thought to be the greater discount rates occurring because of rising inflation. The effect of greater discount rates should be restricted through greater cash flows existing because of inflation, mostly due to the fact that cash flows often expand simultaneously with inflation. Firth (1979) stated that a way to hedge potential inflation impact would be to invest in stocks, where the "Fisher Effect" could give a reason why stock price is positively correlated with inflation. When demand goes up, then stock prices also rise, and any upwards trends in predicted inflation can mean there is also an expected rise in real productive activity and between stock and inflation has also been reinforced by the results of the studies by Ali (2011) for Bangladesh; Yu Hsing et al. (2012) for the UK and the USA; Araújo (2009) for the USA; and Syriopoulos (2004) for Argentian[145].

On the other hand, equities are adversely correlated with DIR, in the case of the UK. As mentioned, a converse liaison is existent between DIR and share price, primarily due to investors finding these two to be mutually exclusive when it comes to investment returns. Moreover, where there is a rise in one variable, there is a predicted drop in the other (Fabio and Claudio, (2009); Camilleri, Scicluna and Bai (2019); Rudra, Mak and Atanu (2015); Peiró (2016); Peiró (2016); Urich and Wachtel (1981); Camilleri, Scicluna and Bai (2019); Bakaert and Hodrick (1992); Solnik (1983); Siddiki (2000) – N for BD; Olsen (2014) – N granger Uni; Asprem (1989). Investors will have greater incentive to hold UK stock market investments instead of putting their money in bank accounts when stock prices are displaying an upward trend. This is one of the reasons behind the short-run negative correlation between the deposit interest rate and equities, as shown in this study. This outcome is also supported by other empirical evidence, such as that from the work of Demir (2019) for the Borsa Istanbul 100; Alam and Uddin (2009) for Bangladesh; Huizinga and Mishkin (1986), and Premawardhana (1997) for Sri Lanka; Hamao (1988) for Japan; and Kim (2003) in the USA; and it was shown that the Philippines, Thailand and Singapore, displayed a negative relationship in the long-term.

Furthermore, Foreign EXR has been shown to be positively correlated with UK stock price, and the positive normalised co-integrating coefficient here denotes that when the exchange rate rises, then so does the UK stock price (Rudra, Mak and Atanu (2015); Bakaert and Hodrick (1992); Bruce (1997); Bakaert and Hodrick (1992); Smith (1992); Roll (1992); Miao (2010);

[145] This is in addition to the studies of Nasseh and Straus, (2000) for the UK and the USA; Sosvilla-Rivero (2003) and Spyrou, (2004) for Chile, Venezuela, Argentina and DJI; Chen et al. (1986) for the USA; and Hamao (1988) for Japan.

Siddiki (2000). The Goods Market Model provides an explanation for this. Dornbusch and Fischer (1980) concentrated on the correlation between EXR and current account, as well as creating an EXR model which involves prices, expectations, and the assets markets and their relevant positions of importance, while underlining the link between current account and performance of EXR. Dornbusch and Fischer (1980) believe there to be a correlation for current account against exchange rate behaviour, and it is considered that EXR is primarily decided through the BOT behaviour/a nation's current account. The analyses put forward the notion that alterations to exchange rates impact the global competitive position and trade balance, which, in turn, impacts macro including real output and income. Specifically, the Keynesian analysis posits that any EXR movement affects a company's progress, thus impacting the business's income or the price of its reserves, along with the share. From a real economic perspective, the EXR effect changes the equities price, based on how open the national economy is and the level of trade imbalance. As a result, goods market models show an affirmative correlation for the shares against EXR, with the causality extending through EXR to equity. In short, the favourable link begins with the basis of employing the EXR quote (Stavárek, 2004). The decision of a fruitful link originates from the postulation of utilising the EXR quote (Stavárek, 2004) which supported the present research from empirical studies, such as the studies of Giri and Joshi (2017) for India; Yu Hsing et al. (2012) for the USA and the UK; Siaw (2011) for Ghana; Khan and Yousuf (2013) for Bangladesh; and Acikalin et al. (2008) for Turkey, which found a causal relationship[146].

It can be seen that there is a positive link between normalised co-integrating coefficients for GDP per capita against stock price in the UK (Peiró, 2016); Yartey, 2010). This negative relationship is because, within a diligent nation, technological advances provide advantages to the consumer with a greater standard of living, to a greater extent than it benefits capital owners, as explained by Buffet (1999) and Siegel (1999, 2000). In situations where people give more attention to saving and investing these funds, the greater capital per worker would bring about a greater real wage rate, which has no advantage for current company share owners. It is considered that economic advancement brings about a higher standard of living for consumers, without any impact on current dividend value for each share in current capital stock. As a result, whether economic expansion is prominent or not in a specific country does not affect future equity returns substantially. This finding has been supported by various researchers, such

[146] This is in addition to the studies of Abdalla and Murinde (1997) for India; Ibrahim and Yusoff (1999) for KLSE; Maysami, Gan et al. (2006) for New-Zealand in the long-term; Cooper and Koh (2000) for Japan, Singapore and the USA; and Bahmani and Sohrabian (1992) for the S&P 500 index.

as Yu Hsing et al. (2012) for the USA and the UK; Gan et al. (2006) for New Zealand (Long-term); Chandra (2002); and Acikalin et al. (2008), which found a causal relationship; in addition to Ahmed and Imam (2007) for India.

Table: 7.11(A) shows that overseas oil price in the UK has a negative normalised co-integrating coefficient against UK stock price, and a drop in IOP is predicted to affirmatively effect the latter through greater economic activity in general through lower production costs (2019) and Lescaroux and Mignon (2008). This is particularly the case for firms that have a higher dependency on oil imports, denoting an adverse link between IOP and UK equity prices. Even though oil and gas extraction industries are negatively impacted by lower oil prices, other areas such as oil-concentrated areas, agriculture, coke and refined petroleum, as well as air transport industrial divisions see clear advantages when this important input becomes cheaper. In addition, water transport and other services receive a minor benefit from this. On the other hand, industries that heavily involve oil can be in an advantageous position through capital and resources being used to a greater degree in some aspects, to the detriment of sectors that do not require as much oil. Upcoming oil price trends are difficult to predict. Where oil price drops are consistent, the UK economy has been shown to grow by roughly 1% on average compared to the baseline in 2015-2020, with employment also going up by approximately 90,000 by 2020 (PWC, 2015). Real household incomes show a clear increase, leading to greater user expenditure. Greater financial movement causes tax income to go up while taxes for individuals and business tax surpass the losses incurred from the North Sea gas and oil yields. To conclude, when oil prices are lower, there are positive impacts across the majority of the UK stock market, as well as householders and the government. On the other hand, the level of benefit varies, based on the way in which oil prices move thereafter. This result has been supported by the various empirical research studies, such as those of Demir (2019); Giri and Joshi (2017); Ray (2012), Park and Ratti (2008).

An additional critical macro variable is broad M2, which is suggested to hold a bilateral connection with share price across any nation's economy. Under the Co-integrating Equation 1, broad money supply (M2) is shown to negatively correlate (-41.022) with UK stock price. The *'Portfolio Theory'* shows that when money supply goes up, portfolios might change to equity assets from non-interest-bearing assets, i.e., shares. Conversely, where greater money supply brings about increased inflation, then money supply increases result in the discount rate going up and subsequently lower stock price. This finding is echoed in many empirical research papers, such as that of Siaw (2011) for Ghana, which showed a negative correlation for stock price against broad money supply.

In addition, it is seen that UK foreign remittances have a positive correlation against the FTSE 100 stock price index, and the positive normalised co-integrating coefficient for foreign remittance denotes this. Since the UK is a developed economy, there is a strong chance of a non-adverse link between REMIT and share prices. Since the UK has a reliable and efficient stock market, it is thought to be a wise location for investment. Stock investments are considered a wise choice, and so the beneficiaries of foreign remittance in the UK put their capital into the stock market, a finding which is seen in the work of Ali (2011b) also.

Table 7.11(A) shows the impact of the US Treasury bill on the UK, which involves a positive normalised co-integrating coefficient with the stock price (Humpe and Macmillan (2009). In the last couple of decades, the investor has been experiencing several financial crises. Particularly, the financial crunch which first hit developed countries, for instance the UK and the USA, and it impacts the stock markets instantly. This surged in the European Sovereign debt disaster and the universal monetary crisis. They link to when there was great volatility and financial crisis in the equity market universally, for example, Gulko (2002) found proof that within 1987 and 2000, treasury bills and stock relationships usually exchanged to positive from negative succeeding stock market crises. There are two more advances that are expected to have caused this curiously elevated level of correlations between treasury bills and stock. Firstly, there are signs that the expression "premium" has developed to be extremely responsive regarding the indecision of development (Dick et al., 2013), inferring that matching hesitation of real activity guided a tougher affirmative link, because treasury bills became increasingly susceptible to the position of progression. Another reason for the abnormally obstinate positive association between treasury bills and stock is related to the rise of assessments for the "equity risk premium" (Duarte and Rosa, 2013). Alongside a decrease of rates in the short-term, the above probably guided equity risk premium to have a proportionately greater impact on discount rates for equities. This is a result which is seen in the works of Muthike and Sakwa (2011), and Mazuruse (2014).

7.3(A) Comparative Analysis between Bangladesh and the UK Evidence

Johansen's Co-integration test is considered to be most appropriate when investigating equilibrium long-term links within variables. Where there is a co-integrating vector, then it is revealed that an equilibrium long-term relationship is existent within each variable in question. A key target for the current research has been researching whether a substantial long-term link is present between specific variables for Bangladesh and the United Kingdom. With regards to Bangladesh, this research uses the Dhaka Stock Exchange General Index, IOP, CPI, EXR, DIR, broad money supply, per capita GDP, foreign remittance, and the US Treasury bill rate with the aim of looking into long-term link amongst the above. These outcomes show that specific variables hold an equilibrium relationship in the long-run [Olayungbo (2019); Jahfer and Inoue (2017); Umer (2016); Hussain, et al. (2012)]. Conversely, the FTSE 100 Index was used for the UK, with the same macroeconomic variables to investigate their equilibrium long-term connection. It appears that, for specific UK factors, an equilibrium link is existent for the long-term. With regards to a generalised relationship, these two tests provide the same links for Bangladesh (Ali, 2011) as well as the UK; Paul Ndubuisi (2017); Zarafat and Vejzagic (2013); Yu Hsing et al. (2012)]. However, the normalised co-integrating coefficients do not offer similar findings, and it is necessary to examine the cases in which the Bangladeshi and the UK findings have the same outcomes, and those that have different results.

When it comes to the consumer price index, the negative normalised co-integrating coefficient was clearly shown for Bangladesh [Camilleri, Scicluna and Bai (2019); Rudra, Mak and Atanu (2015); Eita (2011); Siaw (2011)]. Nonetheless, for the UK, this variable is positive [Yartey (2010); Olsen (2014); Umer (2016); Yu Hsing et al.(2012); Nasseh and Strauss (2000)]. Consumer price index was implemented in this research to ascertain inflation in Bangladesh and the UK. Specifically, the relationship between consumer price index and stock price is mixed. On the other hand, when consumer price index goes up, it is considered that inflation will go up, and this, in turn, boosts the nominal risk-free rate. These greater risk-free rates bring down asset prices for the valuation model. As a result, the boost to the consumer price index causes a drop in stock price for the Bangladesh share. Contrarily, when CPI goes up, then bank rate and inflation go up within the valuation analysis. However, the impact of greater discount rates is predicted to be countered through the associated rise in cash flow. The greater cash flows bring about more stock demand in the market, facilitating greater share values. Thus, UK shares hold true to the positive correlation between the consumer price index and UK stock price (Fabio and Claudio, 2009).

DIR hold an adverse correlation between share price in the Bangladesh stock market [Camilleri, Scicluna and Bai (2019); Alam & Uddin (2009)] as well as the UK stock market. These common findings could be because of investment in stocks and deposits in bank accounts being mutually exclusive ways of investing, for the most part. When it comes to risk and return, where one option seems suitable, the other will suffer a negative effect. Thus, the Bangladesh and UK stock markets show analogous links between the price of stocks and deposit interest rates (Bakaert and Hodrick (1992); Demir, (2019).

With regards to EXR against USD, Bangladesh and the UK offer positive co-integrating coefficients, which could potentially be because all changes to the foreign exchange rate impact how competitive the global market is, as well as bringing changes to trade balance and macroeconomic variables, like real output and income. Because of this, organisations' earnings and cost of capital undergo alterations, impacting stock price as well. As a result, positive exposure was noted for the exchange rate against stock price for Bangladesh as well as the UK (Siddiki (2000); Bruce (1997); Giri and Joshi, 2017).

As for the international oil price, the normalised co-integrating coefficient for Bangladesh and the UK was shown to be inversed, so when a positive co-integrating outcome was shown for Bangladesh (Balcilar, et. al. (2019); Lescaroux and Mignon (2008); Olayungbo, 2019 for Nigeria; Umer, 2016 for Pakistan; Khan and Yousuf, 2013), then negative co-integrating evidence was shown for the UK (Demir, 2019; Giri and Joshi, 2017). This disparity can potentially be attributed to Bangladesh being an oil importing nation, compared to the UK which is an oil exporting country. Once oil price falls in the global market, then productive activity costs go down in Bangladesh, but rise in the UK (Jones and Kaul (1996). This is described with the inverse co-integrating link between Bangladesh and the UK.

Bangladesh and the UK offer inverse co-integrating data for broad money supply against stock price as Money supply for Bangladesh is negatively impacted (Demir, 2019; Ditimi et al., 2018; Umer, 2016; Ahmed and Imam, 2007; and Humpe and Macmillan, 2007). In addition, empirical evidence shows that when money supply goes up, there is a varied impact on the economy. Firstly, monetary increases cause greater levels of liquidity when it comes to purchasing goods and services, leading to greater demands for stock, subsequently causing higher stock prices in the market. Secondly, a rise in money supply boosts discount rates for valuing assets, bringing about a lower stock value. As a result, it is considered that inverse cointegrating findings are likely for Bangladesh and the UK (Rogalski and Vinso (1977).

For per capita GDP, Bangladesh and the UK are in line with the null hypothesis of negative correlation against stock price. (Lescaroux and Mignon (2008); Ahmed and Imam (2007); Yu Hsing et al., 2012). When per capita GDP goes up, it is considered that a nation's economic performance has improved, leading to greater productivity and a higher standard of living. However, this increased standard of living does not have an impact on how much current or predicted dividend there is for stocks. As a result, stock prices do not have a correlation with actual economic growth, and therefore whether financial expansion is at a higher or lower level in a specific nation does not have much effect on its future equity returns.

Foreign remittances show a negative co-integrating coefficient for Bangladesh (Bruce (1997); Ali M.B., 2011a and Ali, 2011b); whereas, for the UK, there is a positive co-integrating coefficient (Bakaert and Hodrick (1992); Nasseh and Strauss, 2000). In Bangladesh, stock prices have much greater levels of volatility and risk, and so beneficiary families of foreign remittances are disinclined to put capital in the stock market. Thus, foreign remittance growth for Bangladesh is forecasted to exhibit either a destructive or negligible impact upon stock within share markets. Conversely, UK equity markets are well-organised, consistent and have low volatility, so they represent an attractive investment prospect. Thus, foreign remittances flow more easily, establishing a positive correlation between stock price and foreign remittances in the UK.

Johansen's Co-integrating test supports the long-run equilibrium relationship in instances of co-integrating vectors for specific variables (Rudra et al. (2015); Olayungbo, 2019; Lee and Brahmasrene, 2018; Jahfer and Inoue; 2017; Paul Ndubuisi, 2017; Umer, 2016). This test was used for both the Bangladesh and UK economies, showing that there are co-integrating vectors. As a result, it is considered that Bangladesh and UK stock prices hold a long-term equilibrium link against the real economic factors within their economies.

Chapter 7- (B) Estimates of Short Run Disequilibrium Adjustment: A Study between Bangladesh and the UK Stock Markets

When it comes to calculating short-run disequilibrium adjustment in VAR models, the VECM is commonly considered to be suitable. To summarise, this is a restricted VAR aimed to be utilised in conjunction with non-stationary, which have proven co-integration.

7.1(B) Application of Vector Error Correction Model (VECM): Evidence of Bangladesh

The co-integration analysis of the DSE General Index (DSE Gen) against specific macroeconomic variables from Bangladesh, which are consumer price index, foreign exchange rate, GDP per capita, balance of trade, DIR, IOP, REMIT, M2 and the U.S. 91- day treasury bill rate, shows that three co-integrating equations exist for the variables in question. The above outcomes are displayed in Table 6. 3 and Table 6.4. As a result, it is considered that there are three potential approaches for DSE Gen Index and the macro variables examined in Bangladesh to move closer to equilibrium in the long-run. (Olayungbo, 2019; Jahfer and Inoue, 2017; Paul Ndubuisi, 2017; Umer, 2016; Ali, 2011b; Arjoon, et al. 2010[147]). It also explains that there must have been a different error correction term associated with each of the co-integrating equations.

Table 7.1(B): First Cointegrating Equation among Stock Price and Macro Variables: Bangladesh Evidence

Normalized cointegrating coefficients (standard errors in the parentheses)										
Equation	DSE General Index	Consumer Price Index	Deposit Interest Rates	Foreign Exchange Rate	International Oil Price	Broad Money Supply	Per Capita GDP	Foreign Remittances	Treasury Bill Rate
1	1.000	-27.378	-207.25	46.835	21.225	0.0013	-0.842423	-1.1927	47.061
		(63.68)	(537.23)	(99.50)	(27.59)	(0.024)	(0.2266)	(0.803)	(258.1)

Note: Author's own calculation estimates

Table 7.1(B) and Table 7.2 (B) present the first co-integrating equation and its associated error correction estimates between the DSE Gen Index and the selected macro variables. The first co-integrating equation shows that the stock price of Bangladesh has a positive association with the **exchange rate** (Giri and Joshi, 2017; where they discovered that shares are positively related with EXR, although weakly so. This is in addition to, Yu Hsing et al., 2012 for Argentina, and BE et al., 2013 for Bangladesh). The stock price of DSE has a positive association with **International oil price** (This result has been supported by empirical research, such as the results of the studies by Balcilar et al. (2019); Lescaroux and Mignon (2008); Demir, 2019; Olayungbo, 2019; Gan, et al., 2006; Kalyanaraman and Al-Tuwajri, 2014 and the S&P 500; and Khan and Yousuf, 2013 for Bangladesh, who found an

[147] Chong and Goh's (2003) research for interest rates; Kramustafa and Kucukkale's (2003) study on the exchange rate of the US dollar, and M2, BOT and IPI for Turkey)

affirmative link between IOP and equity price[148]) The stock price of DSE has a positive connection with the **US treasury bill rate**. The share price of DSE has a constructive connection with M2 (Humpe and Macmillan, 2009; Demir, 2019 for Borsa Istanbul; Ditimi et al., 2018; Ahmed and Imam, 2007 for Bangladesh; Khan and Yousuf, 2013 for Bangladesh; Humpe and Macmillan, 2007[149], they discovered a favourable link within M2 and shares).

Contrarily, stock price has a negative association with the **consumer price index (CPI)** (Fabio and Claudio, 2009; Peiró (2016); Eita, 2011; Osei, 2006[150]).

Moreover, stock price has a negative association with **deposit interest rates** (Siddiki, 2000); Alam et al., 2009 for Bangladesh; Olsen, 2014; Kim (2003) who examined BE[151], they found that emerging market, such as the Philippines, Thailand and Singapore, showed a negative relationship in the long-run between **per capita GDP** (Lescaroux and Mignon (2008)) and **Foreign Remittances** (Ali M.B., 2011a and Ali M.B., 2011b for Bangladesh).

Table 7.2(B): Adjustment coefficients with the First Cointegrating Equation: Bangladesh Evidence

Cointegrating Equation 1	***-0.12821*** ***(0.00325)***
D(Consumer Price Index)	-4.77E-05 (4.0E-05)
D(Deposit Interest Rates)	3.12E-08 (2.0E-06)
D(Foreign Exchange Rate)	-1.04E-05 (6.5E-06)
D(International Oil Price)	-4.90E-06 (6.0E-05)
D(Broad Money Supply)	0.419652 (0.02484)
D(Per Capita GDP)	-0.007549 (0.01173)
D(Foreign Remittances)	0.013514 (0.00446)
D(Treasury Bill Rate)	-1.54E-06 (2.5E-06)

Note: standard error in parentheses

148 Hamao (1988) for Japan; Ghana, Switzerland, Germany, Italy, the Netherlands, the UK, and France was studied by Nasseh and Strauss (2000) who found a non-contrary link between IOP and stock.
149 India was studied by Bulmash and Trivoli (1991) for India; Rogalski and Vinso (1977), Homa and Jaffe (1971) for the USA; Ibrahim and Yusoff (1999), and Muzafar (1998) for Kuala Lampur.
150 Additionally, Ahmed and Imam (2007) for Bangladesh, Yalama and between M2 and equity.

151 Furthermore, Huizinga and Mishkin (1986); Premawardhana (1997) for Sri Lanka; and Hamao (1988) for Japan.

Using the first co-integrating equation with its normalised co-integrating coefficients, the error correction term creates a value of -0.12821 (as seen in Table 7.2(B). This error correction estimate, linked to the first co-integrating equation, can be a reason behind the DSE General index's (DSE Gen) drop by roughly 12.821% monthly so as to establish long-term equilibrium in the future. In addition, this error correction term has a small standard error, and this is characteristic of the statistical reliability of these figures. In addition, this outcome shows that in instances where the chosen macro factors are considered with VAR, stock price needs roughly 7.80 months to reach a state of equilibrium.

7.2(B) Application of Vector Error Correction Model (VECM): Evidence of the UK

Clearly, the UK FTSE 100 share prices are tied in an equilibrium long-term link with specific macros. Co-integration test estimates for UK equity price and specific real economic factors are shown in Table 7.8(B) and Table 7.9(B), and it is evident that there are a minimum of 2 co-integrating vectors in the model, which puts forward the notion that they have a long-run equilibrium relation. This is also seen in Olayungbo (2019) for oil price; Jahfer and Inoue (2017) for money supply and treasury bill rate; Paul Ndubuisi (2017) for money supply; Umer (2016) who's work shows this on CPI, IOP and money supply; Nasseh and Strauss (2000) for local and global macroeconomic variables for the UK, France, the Netherlands, Italy, Germany and Switzerland; as well as Alshogeathri (2011) on CPI, IR (short-run), bank credit, IOP in the world, M1 and M2 and stock, and inflation and IR applied in the US share market. To predict short-run disequilibrium under VAR, VECM was applied for the UK economy, where the FTSE 100 Index was used for the stock price together with 9 real economic factors, including CPI, BOT, deposit interest rates, exchange rates against USD, GDP per capita, international oil price, M2, REMIT and USTBR.

Table 7.3(B): First Cointegrating Equation among Stock Price and Macro Variables: UK Evidence

Normalized cointegrating coefficients (standard errors in the parentheses)										
Equation	**FTSE 100**	**Balance of Trade**	**Consumer Price Index**	**Deposit Interest Rates**	**Foreign Exchange Rate**	**Per Capita GDP**	**International Oil Price**	**Broad Money Supply**	**Foreign Remittances**	**Treasury Bill Rate**
1	1.00	-2.6290	910.57	-34926.6	316061.3	-154.3091	-211.41	-41.022	28.651	13690.4
		(3.62)	(1198.4)	(4240.4)	(40878.2)	(70.8354)	(282.7)	(16.89)	(47.505)	(2978.5)

Note: Author's own calculation estimates

In Table 7.3(B) and Table 7.4(B), the first co-integrating equation is shown, together with its related error correction estimates for the UK economy. Here, it is seen through the normalised co-integrating coefficient that the UK stock price holds a positive correlation with the **consumer**

price index (CPI). (Fabio and Claudio, 2009 for the UK; Olsen, 2014; Ali, 2011 for Bangladesh; Araújo, 2009 for the USA; and Zarafat and Vejzagic, 2013 for Malaysia[152]). The UK share values have a progressive association against **EXR** where an affirmative relation was discovered with that of the share prices and the EXR, although it was a weak one. Khan and Yousuf, 2013 for Bangladesh; Siddiki, 2000; Bruce, 1997; Gunasekarage[153]). The UK stock price clasps a positive relationship with **foreign remittances** and the **US Treasury Bill** rate (Yu Hsing et al., 2012 for the UK; Gunasekarage et al. (2004); Humpe and Macmillan 2009). Contrarily, share values have been found to have a negative association with the **balance of trade** (Alam and Uddin, 2009 for Bangladesh; Huizinga and Mishkin, 1986 for the USA; Hamao, 1988 for Japan). Additionally, the stock prices are found to have a negative connection with **GDP per capita** (Lescaroux and Mignon, 2008; Gan et al., 2006 for New Zealand - long-term[154]). Furthermore, the stock prices of the United Kingdom have been revealed to have a negative link with **IOP** (Mainul and Al- Refai, 2010; Balcilar et al., 2019). Moreover, the stock prices are found to have negative link with **broad money supply** (Siaw, 2011 for Ghana, found an adverse connection between M2 and share prices.

Table 7.4(B): Adjustment coefficients with the First Cointegrating Equation: UK Evidence

Cointegrating Equation 1	***-0.23697*** ***(0.00052)***
D(Balance of Trade)	0.000138
	(0.00121)
D(Consumer Price Index)	-1.10E-06
	(9.3E-07)
D(Deposit Interest Rates)	3.31E-06
	(4.8E-07)
D(Foreign Exchange Rate)	-1.56E-08
	(6.1E-08)
D(Per Capita GDP)	9.32E-05
	(3.5E-05)
D(International Oil Price)	2.06E-06
	(1.2E-05)
D(Broad Money Supply	0.000255
	(0.00016)
D(Foreign Remittances)	-6.78E-05
	(6.1E-05)
D(Treasury Bill Rate)	2.18E-06
	(5.3E-07)

Note: standard error in parentheses

152 This is in addition to Hamao (1988) for Japan and Spyrou (2004) for the USA, Chile, Venezuela, Argentina and DJI, they found that stock price holds a positive correlation with consumer price index.
153 In addition to the investigation by Tsoukalas (2003) for the Cypriot equity market; they all concluded that equity price holds a favourable correlation with EXR.

Through the first co-integrating equation with its normalised co-integrating coefficients, the error correction term shows a of -0.23697, which shows that the FTSE 100 Index (FTSE 100) can drop by roughly 23.697% monthly in order to reach a state of long-run equilibrium (Bruce, 1997). In addition, this error correction term holds an extremely small standard error, and this is characteristic of the validity of the results. This is also shown in all of the specified macro factors that are being accounted for in the VAR model, and stock price needs roughly 4.22 months to reach equilibrium.

7.3(B) Comparative Analysis between Bangladesh and the UK Evidence

This section aims to research the short-term dynamics changes across share prices and various macro factors for Bangladesh and the UK. Chapter 6 proved that there is a long-term equilibrium link for stock price against specific macroeconomic variables for the Bangladesh Stock Market (Camilleri et al., 2019; Olayungbo, 2019; Jahfer and Inoue, 2017; Paul Ndubuisi, 2017; Umer, 2016; Khan and Yousuf, 2013; Ali, 2011b; and Arjoon, et al., 2010), which is not in place for the short-run. Potentially, because of the contrasting dynamic and contingent elements, this equilibrium relationship is not always in place, and it is necessary to look into the level that variables are outside of this equilibrium and the amount of time necessary for them to move to equilibrium in the future. The VECM is used to calculate the scope of the short-run disequilibrium link between stock prices and the particular macroeconomic variables in Bangladesh and the UK. The short-run disequilibrium changes for stock price against specific macro variables in Bangladesh can be observed in Table 7.2, where the short-term adjustment coefficient is shown to be -0.12821 at a standard error of 0.00325 - an outcome that denotes that the DSE Gen Index stock price drops by roughly 12.821% reach month in order to meet equilibrium conditions in the future. The residual term has a limited standard error, and this is characteristic of how reliable these calculations are. In addition, this finding highlights that when all specific macro factors are considered with VAR, the stock price needs roughly 7.80 months to reach equilibrium condition. Conversely, the short-run adjustment coefficient (i.e., -0.23697) with the standard error (0.00052) for the UK is shown in Table 7.4, which denotes that the FTSE 100 stock price drops by 23.697% monthly to reach equilibrium long-term in the future (Bruce, 1997). Furthermore, this finding shows that when all specific macroeconomic factors considered with VAR, the stock price necessitates roughly 4.22 months to reach equilibrium.

When contrasting the UK with Bangladesh, it is seen that the former can fix disequilibrium conditions more efficiently than the latter can. Financially, Bangladesh is considered to be in a developing stage, where macroeconomic growth indicators are predicted as being satisfactory (Ahmed, 2000a), however, the UK is a developed economy, and in turn there is a greater chance that it will be quick and efficient in macroeconomic growth aspects (Urich and Wachtel, 1981; Krishnamurti and Vishwanath, 2009). Therefore, the results propose rational indicators for the rate of run disequilibrium changes for both the UK and Bangladesh.

Chapter 8-Estimates of Long Run Dynamic Causal Relationship between Stock Prices and Macroeconomic Variables: A Study between Bangladesh and the UK Stock Markets

Due to the potential downsides of specification bias and spurious regression, this study will not use the commonly used Granger-Causality process to evaluate the link of more than two variables, but rather the improved Granger Causality (T-Y) procedure has been implemented instead.

8.1 Application of Toda-Yamamoto (T-Y) Granger Causality Test: Evidence of Bangladesh:

To analyse the dynamic long-term causative link of DGEN against 9 macro variables under the specific sample period, a T-Y Test was utilised. In line with T-Y, the factors must have undergone examination for maximum integration order (d_{max}) and optimal lag-length of VAR (~) without exception. For the current application, the ADF and P-P unit roots were employed to pinpoint the maximum integration order, and showed that for all variables it was one , so (d_{max}) =1, as shown in Table 8.1.

Table: 8.1: Test of Stationary between Stock Price and Selected Macroeconomic Variables in Bangladesh

Variables	Augmented Dickey Fuller (ADF) Test				Phillips-Perron (P-P) Test				Order of Integration	
	I(0)		I(1)		I(0)		I(1)			
	t-stat	Prob.	t-stat	Prob.	Adj. t stat	Prob.	Adj. t stat	Prob.	ADF	PP
DSE General Index	-2.0250	0.5843	-14.082	0.00	-2.1259	0.5283	-14.060	0.00	I(1)	I(1)
Balance of Trade	-7.4822	0.00	------	-----	-14.01308	0.00	------	------	I(0)	I(0)
Consumer Price Index	0.484969	0.9992	-2.1932	0.4907	0.228077	0.9981	20.78585	0.00	I(2)	I(1)
Deposit Interest Rates	-1.7739	0.7146	-14.943	0.00	-2.1121	0.5361	-15.1060	0.00	I(1)	I(1)
Foreign Exchange Rate	-2.6705	0.2499	-12.7659	0.00	-2.56268	0.2980	-12.7764	0.00	I(1)	I(1)
Per Capita GDP	0.969280	0.9999	-2.66812	0.2510	1.603428	1.00	-14.5737	0.00	I(2)	I(1)
International Oil Price	-3.75179	0.0208	------	-----	-3.39969	0.0537	-11.8913	0.00	I(0)	I(1)
Broad Money Supply	2.342782	1.00	-0.65952	0.9741	8.789214	1.00	20.00861	0.00	I(2)	I(1)
Foreign Remittances	-1.23032	0.9013	-3.52118	0.0394	-2.42750	0.3644	-46.6215	0.00	I(1)	I(1)
Treasury Bill Rate	-2.46271	0.3465	-7.41106	0.00	-2.37764	0.3903	-13.5695	0.00	I(1)	I(1)

Source: Author's own calculation estimates

Conversely, the IC was utilised to find that the optimal lag of VAR was not the same, and in line with Akaike information criterion (AIC), the lag length was shown to be 12. This optimal lag length coincided with the findings of the LR and FPR method as shown in Table 8.2.

Table: 8.2: VAR Lag Order Selection Criteria between Stock Price and Macroeconomic Variables in Bangladesh

Lag	LogL	LR	FPE	AIC	SC	HQ
Endogenous variables: DSE General Index, Consumer Price Index, Deposit Interest Rates, Foreign Exchange Rate, International Oil Price, Broad Money Supply, Per Capita GDP, Foreign Remittances, Treasury Bill Rate.						
Exogenous variables: C						
0	-11866.21	NA	6.31e+32	101.0656	101.1981	101.1190
1	-8693.095	6076.178	2.35e+21	74.74975	76.07470*	75.28391
2	-8526.458	306.3288	1.14e+21	74.02092	76.53832	75.03582*
3	-8441.249	150.1141	1.11e+21	73.98509	77.69495	75.48074
4	-8355.403	144.6585	1.08e+21	73.94386	78.84616	75.92024
5	-8267.093	142.0482	1.03e+21	73.88164	79.97640	76.33877
6	-8149.409	180.2822	7.82e+20	73.56944	80.85665	76.50730
7	-8030.487	173.0693	5.94e+20	73.24670	81.72636	76.66531
8	-7925.728	144.4328	5.17e+20	73.04450	82.71662	76.94385
9	-7772.125	200.0112	3.03e+20	72.42660	83.29117	76.80669
10	-7668.385	127.1362	2.78e+20	72.23307	84.29009	77.09391
11	-7557.294	127.6368	2.47e+20	71.97697	85.22645	77.31855
12	-7373.313	**197.2903***	**1.22e+20***	**71.10054***	85.54247	76.92286
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Note: Author's own calculation estimates

Once the optimal lag length was found to be 12, the VAR model at lag 12 was looked into in order to pinpoint any residuals' serial correlation. For this scenario, the LM Test was used, which states that the null hypothesis indicates no random series at lag h. It was shown that the VAR model at lag 12 had no serial correlation for the residuals because of its *p*-value in the LM-statistic being below 0.05. Table 8.3 displays this finding, and it is shown that H_0 (no autocorrelation) at lag 12 cannot be overruled at 5% significance, also the VAR at lag 12 indicates dynamic stability.

Table 8.3: Estimates of Serial Correlation in the VAR Model between Stock Price and Macro Variables

Lags	LM-Stat	Prob
VAR Residual Serial Correlation LM Tests		
Null Hypothesis: no serial correlation at lag order h		
1	386.4772	0.0000
2	269.3332	0.0229
3	293.3061	0.0015
4	221.1716	0.5596
5	239.9557	0.2354
6	251.0504	0.1122
7	233.0220	0.3427
8	195.0513	0.9262
9	240.3527	0.2299
10	231.0866	0.3761
11	158.9402	0.9997
12	***284.4529***	***0.0044***
13	236.7071	0.2830
14	83.66934	0.8803

Source: Author's own calculation estimates

Lastly, a specific VAR model has been created at lag order 12, allowing the researcher to gather VAR "Granger Causality/Block Exogeneity Wald" Test outcomes. Following that, test outcomes are categorised to produce the Toda-Yamamoto (T-Y) Granger calculations. These are shown in Table 8.4, which displays the chi-square statistics at 12 degrees of freedom together with the associated *p*-values.

The T-Y Causation test uses basis that, under the null hypothesis, no correlation exists for stock price against any of the specific Bangladesh macro variables, and where the Chi-square *p*-value statistics are under 0.05, the test can then discard the above null hypothesis. Whenever, H_0 is denied, it is shown that a causal relation linking equity price and specific real economic factors exists.

Table 8.4: T-Y Granger Causality Test between Stock Price and Selected Macro Variables in Bangladesh

Direction of Causality			df.	Chi-sq.	Prob.
DSE General Index	→	Balance of Trade	12	20.34181	0.0609***
Balance of Trade	→	DSE General Index		26.09144	0.0104
DSE General Index	~	Consumer Price Index	12	15.50778	0.2767
Consumer Price Index	→	DSE General Index		23.06561	0.0409
DSE General Index	~	Deposit Interest Rates	12	8.778399	0.7217
Deposit Interest Rates	→	DSE General Index		22.06647	0.0368
DSE General Index	~	Foreign Exchange Rate	12	9.362594	0.6717
Foreign Exchange Rate	~	DSE General Index		13.38631	0.3416
DSE General Index	~	International Oil Price	12	13.79341	0.1217
International Oil Price	→	DSE General Index		18.77310	0.0942***
DSE General Index	~	Broad Money Supply	12	14.75739	0.2550
Broad Money Supply	→	DSE General Index		36.99641	0.0002*
DSE General Index	~	Per Capita GDP	12	17.37431	0.1828
Per Capita GDP	→	DSE General Index		25.90888	0.0175
DSE General Index	~	Foreign Remittances	12	18.15441	0.1111
Foreign Remittances	→	DSE General Index		27.35213	0.0069*
DSE General Index	~	Treasury Bill Rate	12	12.00262	0.4455
Treasury Bill Rate	~	DSE General Index		18.24320	0.1085

Note: → shows direction of causal relationship and ~ signifies lack of any causal relationship
* sig. @ 1 percent level
** sig. @ 5percent level
*** sig. @ 10 percent level

Source: Author's own calculation estimates

In Table 8.4, the T-Y causation calculations for share values (DGEN) against specific economic indicators in Bangladesh have been shown. In order to investigate whether the T-Y granger causality chi-sq. exists, the statistics were estimated, as well as their corresponding *p*-values. In this instance, the balance of trade was seen to show a bi-directional correlation against stock price for Bangladesh. Stock prices granger establishes balance of trade at the 10% level, and balance of trade granger establishes stock price at the 5% level. Overall, it is seen that stock prices go up, and this highlights stockholder wealth, which in turn allows these individuals to uphold a higher standard of living[155]. Conversely, in instances where balance of trade rises, stock prices can also go up, and this is particularly the case for import-focused listed companies.

For Bangladesh, the consumer price index (BDCPI) is seen to hold a unidirectional correlation against stock price (DGEN) at 5% significance. Granger causes consumer price index (BDCPI) at the 1% level, whilst BDCPI does not hold a granger causal link with DGEN. This long-run causal evidence shows that when there is a consistent increase of price for goods and services, then there are related stock price increases. Also, an analogous causal link is seen in the work of Camilleri et al. (2019); Fabio and Claudio (2009); Sangeeta (2006); Siaw (2011); Mazuruse (2014), and this evidence shows that consumer price index (CPI) has a constructive correlation alongside share prices in the short-run, it also affects stock price this way in the DSE for the long-run (Umer, 2016).

In addition, the table shows a unilateral causativeness for DIR with equity in Bangladesh significant at 5% (Siddiki, 2000); Demir, 2019; Amarasinghe, 2015; and Naik, 2013). Contrarily, share values are not shown to hold a causal relationship with deposit interest rates.

It is seen that foreign exchange rate with USD does not hold a unidirectional or bi-directional causal link with Bangladeshi stock price, which is a finding as per Gan et al. (2006); Naik and Padhi (2012); Miao (2010); and Siddiki (2000).

International oil price (IOP) is shown to hold a unidirectional correlation with stock price in Bangladesh, and the international oil price granger causes stock price at the 10% level. It is considered that oil is a crucial commodity for all economies, and when its price goes up, the majority of other product prices also rise. When productive activity is more costly than stock price increases as well. These findings are also seen in the work of Umer (2016); Balcilar et al. (2019) and Gay (2008).

Broad money supply (BDM2) for Bangladesh was shown to granger cause stock price at 1% significance; whereas equity doesn’t cause M2. When M2 rises, then there is a strong chance that inflation is brought with it, thus causing a drop in that economy's discount rate. Because of this, goods and services prices go up, together with financial products including stocks and

[155] To keep their living standards at the same level, the consumers could be required to purchase imported goods, bringing about a rise in the balance of trade.

bonds[156]. These findings are echoed in the work of Naik (2013), Mazuruse (2014), Hussain and Ahmad (2015), Muhanamani and Sivagnanasithi (2014), and Mangala and Rani (2015).

Unidirectional causality was shown to exist between share price and GDPCAP in Bangladesh, at 5% significance, and this proves that when per capita GDP goes up (such as with economic expansion bringing about greater average demand for goods and services), there is greater stock market investment which necessitates greater stock market movements, which in turn brings about greater stock market activity, more liquidity and profitable market capitalisation. As a result, when there are alterations to the per capita GDP, the stock price in Bangladesh is also changed, which is a finding that is shown in the research of Paul Ndubuisi (2017); Lescaroux and Mignon (2008); and Olweny and Kimani (2011).

In the T-Y Granger causality test, it has been proven that unilateral causality is existent between foreign remittances and stock price for Bangladesh. This is an outcome highlighting the fact that foreign remittance has an indirect effect of causing stock price drops. Similarly, even though foreign remittances bring about greater liquidity in an economy, this greater stream of liquidity was employed to invest in real sectors, for example construction or the buying of homes, but there was no such effect for the equity market. Therefore, share market doesn't show the real impact which foreign exchange reserve increases have on an economy. However, uni-directional causality has been shown through Ali (2011b) for Bangladesh.

The US Treasury bill rate has been shown to not hold a correlation with Bangladeshi stock price, which could be potentially because of the narrow market depth and poor stock market openness for Bangladesh. Because of the lack of political stability, and the unaccommodating investment environment existing in Bangladesh and in Bangladeshi equities, they are not impacted by changes to the US Treasury bill. These findings were similar to those of Rani (2015).

8.2 Application of Toda-Yamamoto (T-Y) Granger Causality Test: Evidence of the UK

This was employed to analyse the dynamic long-run causative link that exists between the FTSE 100 and a collection of 9 macro variables throughout the sample period. The procedure states that every factor had their maximum order of integration(d_{max}) and the optimal lag of VAR was found. The current research uses the ADF test, while the P-P is utilised to pinpoint the greatest integration order. The results show that ADF establishes the maximum integration order for all variables, which is one. i.e., (d_{max}) =1, apart from international oil price (IOP).

[156] However, when M2 falls in a nation, the outcome is the inverse of the above (Naik, 2013).

Whilst the P-P test states that all variables being examined come under the order of integration one, as shown in Table. 8.5.

Table: 8.5: Test of Stationary between Stock Price and Selected Macro Variables in the UK

Variables	Augmented Dickey Fuller (ADF) Test				Phillips-Perron (PP) Test				Order of Integration	
	I(0)		I(1)		I(0)		I(1)			
	t-stat	Prob.	t-stat	Prob.	Adj. t stat	Prob.	Adj. t stat	Prob.	ADF	PP
FTSE-100	-1.997290	0.5996	-15.79014	0.00	-2.1010	0.5423	-15.798	0.00	I(1)	I(1)
Balance of Trade	-0.002396	0.9945	-12.32341	0.00	-0.07626	0.9950	-16.721	0.00	I(1)	I(1)
Consumer Price Index	-0.111400	0.9945	-3.184683	0.090	0.766577	0.9997	-17.212	0.00	I(1)	I(1)
Deposit Interest Rates	-2.211967	0.4804	-10.95081	0.00	-2.1780	0.4993	-11.3367	0.00	I(1)	I(1)
Foreign Exchange Rate	-2.148191	0.5159	-15.03370	0.00	-2.3631	0.3980	-15.041	0.00	I(1)	I(1)
Per Capita GDP	-0.894927	0.9538	-16.28594	0.00	-0.7244	0.9696	-16.403	0.00	I(1)	I(1)
International Oil Price	-3.786332	0.0188	------	-----	-3.37010	0.0578	-11.995	0.00	I(0)	I(1)
Broad Money Supply	-2.392187	0.3827	-6.750822	0.00	-1.96742	0.6158	-16.351	0.00	I(1)	I(1)
Foreign Remittances	-2.057348	0.5666	-15.75315	0.00	-2.07441	0.5571	-15.753	0.00	I(1)	I(1)
Treasury Bill Rate	-2.492176	0.3318	-7.478436	0.00	-2.40809	0.3744	-13.699	0.00	I(1)	I(1)

Source: Author's own calculation estimates

Table: 8.6: VAR Lag Order Selection Criteria between Stock Price and Macro Variables in the UK

Endogenous variables: FTSE 100 Consumer Price Index, Deposit Interest Rates, Foreign Exchange Rate, International Oil Price, Broad Money Supply, Per Capita GDP, Foreign Remittances, Treasury Bill Rate.						
Exogenous variables: C						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	-11361.84	NA	1.98e+31	97.60377	97.73707	97.65752
1	-8143.179	6161.040	3.98e+19	70.67106	72.00408*	71.20859
2	-7949.273	356.1878	1.72e+19	69.70191	72.23465	70.72322*
3	-7882.124	118.1587	1.51e+19*	69.82081	73.55326	71.32590
4	-7811.085	119.5162	1.90e+19	69.90631	74.83848	71.89518
5	-7732.843	125.5903	1.99e+19	69.92998	76.06187	72.40263
6	-7656.311	116.9334	2.14e+19	69.96833	77.29994	72.92476
7	-7570.350	124.6986	2.15e+19	69.92575	78.45707	73.36596
8	-7504.347	90.64832	2.61e+19	70.05448	79.78552	73.97846
9	-7416.282	114.1437	2.68e+19	69.99384	80.92459	74.40160
10	-7351.653	78.77534	3.45e+19	70.13436	82.26483	75.02591
11	-7269.429	93.86968	3.93e+19	70.12385	83.45404	75.49918
12	-7137.346	**140.5858***	3.02e+19	**69.68537***	84.21528	75.54448
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Note: Author's own calculation estimates

Conversely, various IC are utilised to pinpoint optimal lag-length in VAR, which is in line with the Akaike information criterion (AIC), and lag length was shown to be 12.

This optimal lag was chosen by the FPE and HQ IC method as well, as shown in Table 8.6. Following this, the VAR model at lag 12 was investigated to see if there are serial correlations in the residuals. Here, the LM Test was used, which takes into account that under the null hypothesis, there is no autocorrelation at lag 12. This test showed that the VAR model at lag 12 was proven to have no serial-correlation for the residual, as the *p*-value of the LM-statistic is under 0.05. The outcome is shown in Table 8.7, and it is considered that the null hypothesis of no autocorrelation at lag 12 is not overruled at the 5% level. Also, the VAR model at lag 12 was evidenced to be dynamically stable. As a result, an optimal lag of 12 was selected for use in T-Y test.

Table 8.7: Estimates of Serial Correlation in the VAR Model between Stock Price and Macro Variables in United Kingdom

VAR Residual Serial Correlation LM Tests		
Null Hypothesis: no serial correlation at lag order h		
Lags	**LM-Stat**	**Prob**
1	226.5072	0.0000
2	152.7568	0.0005
3	158.2663	0.0002
4	114.7574	0.1485
5	129.9812	0.0236
6	111.8067	0.1974
7	127.0122	0.0354
8	96.64538	0.5764
9	105.0481	0.3453
10	122.0035	0.0667
11	108.3351	0.2674
12	***131.6191***	***0.0187***
13	94.69796	0.6310
14	108.3221	0.2677

Source: Author's own calculation estimates

Table 8.8: T-Y Granger Causality Test between Stock Price and Selected Macro Variables in UK

Direction of Causality			df.	Chi-sq.	Prob.
FTSE100	~	Balance of Trade	12	9.001562	0.7028
Balance of Trade	~	FTSE100		7.999800	0.7851
FTSE100	~	Consumer Price Index	12	4.416939	0.9747
Consumer Price Index	→	FTSE100		21.24981	0.0468
FTSE100	~	Deposit Interest Rates	12	12.82778	0.3817
Deposit Interest Rates	~	FTSE100		10.44404	0.5771
FTSE100	~	Foreign Exchange Rate	12	8.108273	0.7766
Foreign Exchange Rate	~	FTSE100		9.950139	0.6203
FTSE100	~	Per Capita GDP	12	9.482448	0.6613
Per Capita GDP	~	FTSE100		10.09764	0.6074
FTSE100	→	International Oil Price	12	21.41463	0.0446
International Oil Price	~	FTSE100		16.82811	0.1562
FTSE100	~	Broad Money Supply	12	12.46812	0.4089
Broad Money Supply	~	FTSE100		13.78180	0.3149
FTSE100	~	Foreign Remittances	12	15.23606	0.2288
Foreign Remittances	~	FTSE100		10.31656	0.5882
FTSE100	~	Treasury Bill Rate	12	9.239012	0.6824
Treasury Bill Rate	~	FTSE100		17.58410	0.1289
Note: → shows direction of causal relationship and ~ signifies lack of any causal relationship * sig. @ 1 percent level ** sig. @ 5percent level *** sig. @ 10 percent level					

Source: Author's own calculation estimates

In Table 8.8, the T-Y causation estimates for stock prices (FTSE 100) against specific macro variables in the UK economy are shown. In order to investigate whether T-Y granger causality exists, chi-square statistics are calculated, along with their related *p*-values. According to the null hypothesis, it is stated that specific factors are not correlated with each other. A *p*-value under 0.05 indicates that the test doesn't accept the null hypothesis above, which would denote a causal relation between share values and macro factors. The FTSE 100 share values are shown to not have a correlation with the balance of trade in the UK, and the -values are over 0.05, indicating that the results do not discard the null hypothesis of no causal relation between stock price and the balance of trade in the UK economy.

Test figures show that a unidirectional causality exists between equities and CPI in the UK at the 5% significance level. It is widely considered that when the price of services and goods goes up in the market, a favourable impact is apparent on the share market and equity stock prices rise. On that note, analogous causal relations are found in the work of Fabio and Claudio (2009); Umer for Pakistan; Chakravarty (2006); Siaw (2011); and Solnik (1983).

Similarly, unidirectional causality exists between international oil price and stock prices (Umer, 2016) in the UK and a drop in IOP is predicted to have a substantial constructive effect on the latter through greater economic activity in general as a result of lower production costs. This is particularly the case for firms that have a higher dependency on oil imports. Even though oil and gas extraction industries are negatively impacted by lower oil prices (PWC, 2015, p.7), other areas, including refined petroleum manufacturing, coke, agriculture and oil-intensive manufacturing sectors and air transport see clear advantages when this important input becomes cheaper. In addition, water transport and other services receive a minor benefit from this.

On the other hand, industries that heavily involve oil can be in an advantageous position through capital and resources being used to a greater degree in some aspects, to the detriment of sectors that do not require as much oil. Upcoming oil price trends are difficult to predict. Where oil price drops are consistent, the UK economy has been shown to grow by roughly 1% on average compared to the baseline 2015-2020, with employment also going up by approximately 90,000 by 2020 (PWC, 2015). Real household incomes show a clear increase, leading to greater consumer spending. Because of greater nationwide movement, fiscal tax income goes up as tax for companies and private revenue taxes surpass the losses incurred from the oil profits and North Sea gas. To conclude, when international oil prices are lower, there are positive impacts across the majority of the UK stock market, as well as householders and the government. On the other hand, the level of benefit varies, based on the way in which oil prices move thereafter. This result was reinforced by the various empirical research studies, such as those of Kaul (1996); Park and Ratti (2008) for the U.S.A. and 13 European nations including UK.

Deposit interest rate (UKDIR) is shown to not hold a correlation with UK stock price. The test results and related *p*-values offer data indicating that there is no causal link connecting them. Deposit interest rate is considerably less attractive in the UK economy, and this does not display them as a viable investment option in the same way as stocks[157]. There is limited causal evidence for deposit interest rate against UK stock prices. Similar findings are shown in the work of Naik and Padhi (2012) and Ray (2012), Hussain (2012), and Olsen (2014).

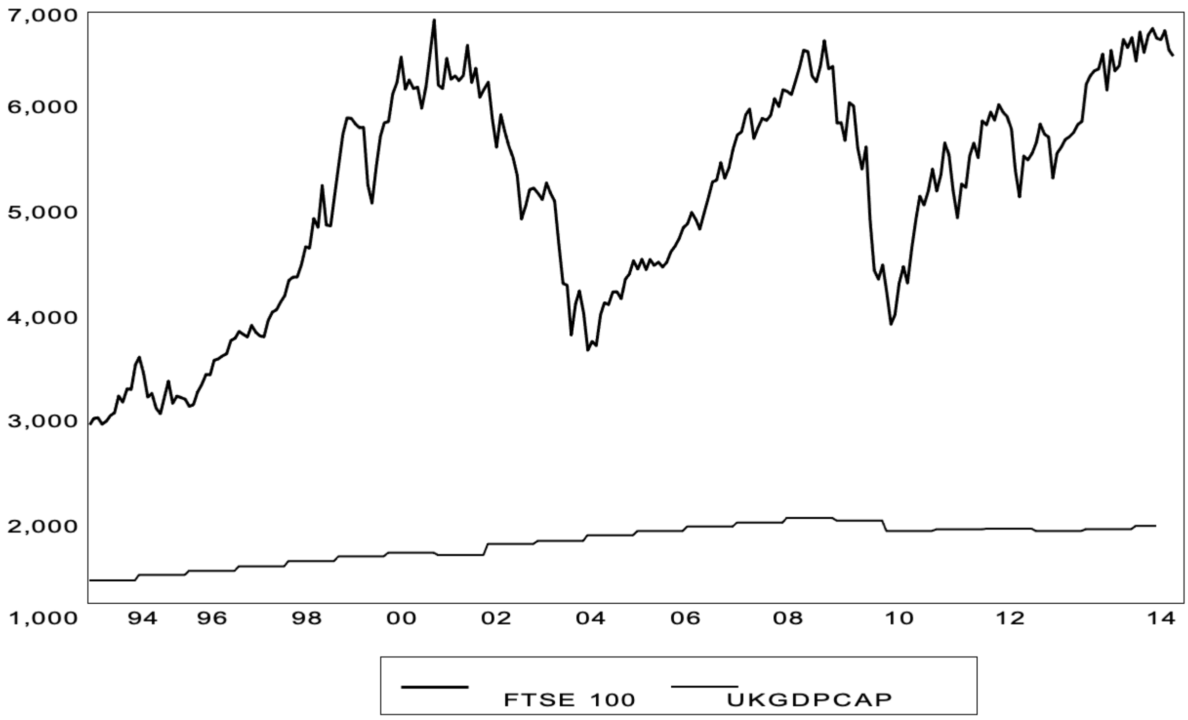
In addition, no causal proof has been discovered to show the relation between EXR and USD (UKEXR) and FTSE 100 stock prices under the UK economy. Since the UK is a developed

[157] However, the UK government could potentially not have as much incentive to promote private savings.

economy, the exchange rate is mostly stable in the context of the USD. Therefore, share prices aren't sensitive to the exchange rate in the UK context. These findings echoed those of Gay (2008); Gan et al. (2006); Naik and Padhi (2012); Vuyyuri (2005); Morley and Pentecost (2000); and Bruce (1997).

The results show that per capita GDP has no causal relation against stock price in the UK. The test statistics related *p*-values denote that there is no confirmed correlation between them. The times pattern of the variable shows that there are fluctuations in UK share values; however, that isn't the circumstance for per capita GDP in the UK (Lescaroux and Mignon, 2008). These disparities in the trend pattern denote that there is no causal relation in place, and outcomes are similar to those of Gan et al. (2006).

Figure 8.1: Trend of FTSE 100 and Per Capita GDP of the UK Economy



When it comes to money supply (M2) in the UK, there is no correlation against stock price in the same context. Test statistics resultant *p*-values offer no proof for a causal relation existing. Bernanke and Kuttner (2005) stated that forecasted movements to money supply do not impact the progression of financial asset prices, such as shares, as investors took it into account in their decisions and asset prices were discounted[158]. The notion of differing impacts for anticipative and non-anticipative money supply on stock price movements is supported by Maskay (2007),

[158] It is considered that non-anticipative change in the money supply can potentially affect securities' pricing (Chioma and Chukwuma, 2009).

Habibullah and Baharumshah (2012), Kraft and Kraft (1977b), Bianying (2004), and Kimura and Koruzomi (2004).

Foreign remittance has no correlation with the FTSE 100 stock price. In this instance, the test statistics the related *p*-values offer findings supporting a lack of existence of acausal relation in this context, which is a finding that is also echoed by Chioma and Chukwuma (2009). This is most likely because there is extremely limited data available regarding the properties of remitters in the UK context, including income levels and welfare program participation[159]. Remittances are widely considered to be a crucial element of economic development in receiving countries (House of Commons, 2004), but there are varying beliefs regarding the effect of these inputs when it comes to financial development and poverty. The World Bank (2011) has most commonly shared this belief when it comes to macroeconomic level work on remittances. When it comes to worker remittances, these remain unpublished by the UK Office for National Statistics (ONS) and HM Revenue and Customs (2014). For the UK Balance of Payments (i.e., the Pink Book), "other payments by households" cover worker REMITs and relocations towards UK state firms, but workers' remittances cannot be disconnected entirely out of movements towards state companies involved in estates (The UK Parliament, 2011b and Office for National Statistics, 2015).

8.3 A Comparative Analysis between Bangladesh and the UK Evidence

The T-Y causative analysis is considered suitable when it comes to investigating long-run multivariate dynamic causal evidence between numerous variables concurrently. This study used the above test to look into the causal evidence presented regarding equity and a specific real economic stimulus for Bangladesh and the UK. Table 8.4 and Table 8.8 illustrate the estimates for Bangladesh and the UK, respectively. When it comes to the macroeconomic development and growth for these two locations, it is clear that there will be differing results as pertains to the causal evidence amongst the stock price and the macro stimulus. For Bangladesh*,* a substantial amount of unidirectional and bi-directional causal evidence was shown for the stock price of Bangladesh (DSE GEN) against the specific macroeconomic variables (Ali, 2011). An example of this is where the bi-directional causal relationship was shown between BOT and stock. This indicates that stock price brings about balance of trade, which cause*s* stock price change on the other. Similarly, unidirectional causal evidence was

[159] In addition, current research concentrates on specific ethnic groups for a specific time frame, meaning that there is limited available information regarding how remitting behaviour changes through time (The migration Observatory, 2015).

seen through the consumer price index against stock price (Fabio and Claudio, 2009; Umer, 2016; Mazuruse, 2014), deposit interest rates against stock price (Amarasinghe, 2015; Siddiki, 2000); broad money supply against stock price (Hussain and Ahmad, 2015); Per capita GDP against stock price and foreign remittance against stock (Paul Ndubuisi, 2017; Peiró, 2016; Olweny and Kimani, 2011). Conversely, there was limited evidence regarding the UK economy, as it was noted that the consumer price index (Umer, 2016 for Pakistan; Yartey, 2010; Siaw, 2011; Rafay et al., 2014) and international oil price (Mainul and Al- Refai, 2010; Park and Ratti, 2008; Jones and Kaul, 1996) granger causes stock price changes (FTSE 100) in the UK stock market, nonetheless there was no uni-directional or bi-directional causal evidence presented for the UK financial environment. Obviously, Bangladeshi stock prices are impacted by numerous macroeconomic variables, which is in contrast with the UK as the latter is affected by macroeconomic variables to a much smaller degree. This disparity affects stock prices accordingly, and could be because of differences in macroeconomic stability for Bangladesh and the UK. Bangladesh is a developing economy with numerous financial, environmental and administrative issues (Ahmed, 1998). In addition, there is limited expertise, market inefficiency, political unrest and clashes, which in addition to natural disasters, impede the steady progress of the economy (Ahmed, 2002). Similarly, investors in Bangladesh are not eager to put the assets into shares, and these decisions are strongly impacted by rumours and noise trading, meaning that the stock market is less efficient. Thus, problematic situations in macroeconomic aspects have a deep effect on the share prices of Bangladesh for a substantial period of time (Ahmed, 2000b). Conversely, the UK is a developed nation with a more genial business environment, and financial, political and institutional growth maintains macroeconomic stability. The UK has a historically robust market, which can counter negative events in a short time with stable stock markets. Because of this, when these problematic instances occur, stock prices are affected less and for a smaller period of time, so stock prices in the UK are seen to be more insensitive to macroeconomic performance changes. Also, the UK stock markets have solid ties with the US stock markets, so whenever any substantial change is present within the US stock, then UK stock market has an appropriate reaction. Thus, the UK stock markets are even less related to UK macroeconomic performance than they otherwise would be.

Results Summary

Results Summary Table

Estimates of Run Test for Daily, Weekly and Monthly for Dhaka Stock Exchange (DSE) and FTS100 Index

Lag	Daily log DSE Gen Index	Daily log FTSE 100 Index	Weekly log DSE Gen Index	Weekly log FTSE 100 Index	Monthly log DSE Gen Index	Monthly log FTSE 100 Index
K=Mean	2816	5087	2464.4	5097.7	1667.6	5103.5
Cases <K	3004	2392	579	489	147	113
Cases ≥K	2189	3166	470	648	76	149
Total cases	5193	5558	1049	1137	223	262
No. of Runs	37	72	15	454	8	18
% of Runs	0.71%	1.3%	1.43%	39.93%	3.59%	6.87%
Z-value	-53.472	-72,616	-21.564	-6.318	-13.928	-14.073
p-value	0.000	0.000	0.000	0.000	0.000	0.000

Estimates of Ljung-Box Q-Test of Daily, Weekly and Monthly Daily for Dhaka Stock Exchange (DSE) and FTS100 Index

Lag	Order of Estimates	Daily Log DSE Gen Index	Daily Log FTSE 100 Index	Weekly Log DSE Gen Index	Weekly Log FTSE 100 Index	Monthly Log DSE Gen Index	Monthly Log FTSE 100 Index
1	AC	0.021	-0.024	0.211	-0.581	0.050	-0.022
	Q-Stat	1.3036	3.3194	21.280	384.46	0.2729	0.1268
	Prob.	0.000	0.068	0.000	0.000	0.601	0.722
2	AC	-0.064	-0.041	0.036	0.005	0.104	-0.016
	Q-Stat	13.172	12.707	22.280	384.50	1.4529	0.1962
	Prob.	0.001	0.000	0.000	0.000	0.484	0.907
3	AC	-0.045	-0.062	0.018	0.147	0.137	-0.012
	Q-Stat	19.134	33.839	22.443	409.13	3.5105	0.2371
	Prob.	0.000	0.000	0.000	0.000	0.319	0.971
4	AC	0.018	0.020	-0.013	-0.110	0.083	0.146
	Q-Stat	20.118	36.098	22.523	422.85	4.2779	5.9291
	Prob.	0.000	0.000	0.000	0.000	0.370	0.205
5	AC	-0.001	-0.020	0.099	0.101	0.146	-0.015
	Q-Stat	20.120	38.330	27.302	434.57	6.6812	5.9864

		Prob.	0.001	0.000	0.000	0.000	0.245	0.308
	6	AC	-0.017	-0.041	0.029	-0.117	0.103	-0.027
		Q-Stat	20.992	47.793	27.712	450.33	7.8890	6.1764
		Prob.	0.002	0.000	0.000	0.000	0.246	0.404
	7	AC	-0.020	0.004	-0.028	0.044	0.015	0.003
		Q-Stat	22.213	47.887	28.108	452.52	7.9142	6.1792
		Prob.	0.002	0.000	0.000	0.000	0.340	0.519
	8	AC	0.031	0.030	0.063	0.086	-0.205	0.081
		Q-Stat	25.104	52.750	30.096	461.05	12.804	7.9720
		Prob.	0.001	0.000	0.000	0.000	0.119	0.519
	9	AC	0.096	0.005	-0.075	-0.148	0.120	0.015
		Q-Stat	52.453	52.910	32.855	486.22	14.482	8.0374
		Prob.	0.000	0.000	0.000	0.000	0.106	0.530
	10	AC	0.019	-0.003	-0.038	0.096	-0.050	0.005
		Q-Stat	53.549	52.962	33.579	496.69	14.776	8.0450
		Prob.	0.000	0.000	0.000	0.000	0.140	0.624
	11	AC	-0.042	-0.000	-0.040	-0.041	-0.006	-0.040
		Q-Stat	58.635	52.963	34.364	498.58	14.780	8.4843
		Prob.	0.000	0.000	0.000	0.000	0.193	0.669
	12	AC	0.012	0.006	0.015	0.020	-0.093	0.072
		Q-Stat	59.058	53.141	34.479	499.04	15.832	9.9296
		Prob.	0.000	0.000	0.001	0.000	0.199	0.622
	13	AC	-0.777	-0.004	0.060	0.022	-0.164	0.045

		Q-Stat	76.324	53.225	36.251	499.59	19.128	10.785
		Prob.	0.000	0.000	0.001	0.000	0.119	0.654
	14	AC	0.010	-0.025	0.039	-0.031	-0.035	-0.050
		Q-Stat	76.599	56.714	37.020	500.70	19.277	11.170
		Prob.	0.000	0.000	0.001	0.000	0.155	0.673
	15	AC	0.042	0.002	0.075	0.040	-0.156	0.008
		Q-Stat	81.813	56.728	39.819	502.57	22.310	11.186
		Prob.	0.000	0.000	0.000	0.000	0.100	0.739
	16	AC	0.041	0.023	0.054	-0.058	-0.141	0.067
		Q-Stat	86.751	59.650	41.305	506.48	24.824	12.462
		Prob.	0.000	0.000	0.001	0.000	0.073	0.712

Mackinlay Individual Lag Variance Ratio Test of Daily, Weekly and Monthly for Dhaka Stock Exchange (DSE) and FTS100 Index (January 1998 and June 2018)

	Lag	Test Estimates	Daily DSE Gen Index	Daily FTSE 100 Index	Weekly DSE Gen Index	Weekly FTSE 100 Index	Monthly DSE Gen Index	Monthly FTSE 100 Index
Homoscedastic Test Assumption	2	Var. Ratio	1.091	0.975	1.144	0.419	1.049	0.986
		Z-Statistic	4.3082	-1.80	2.891	-19.5	0.5067	-0.22
		Prob.	0.00	0.072	0.00	0.000	0.612	0.827
	4	Var. Ratio	1.100	0.892	1.314	0.2079	1.231	0.96
		Z-Statistic	2.540	-4.29	3.362	-14.2	1.268	-0.27
		Prob.	0.01	0.00	0.00	0.000	0.205	0.787
	8	Var. Ratio	1.207	0.81	1.546	0.093	1.623	1.10
		Z-Statistic	3.300	-4.89	3.70	-10.3	2.158	0.57
		Prob.	0.00	0.00	0.00	0.000	0.031	0.566
	16	Var. Ratio	1.363	0.767	1.912	0.054	1.384	1.332

			Z-Statistic	3.893	-3.93	4.149	-7.23	0.8949	1.220
			Prob.	0.00	0.00	0.00	0.000	0.3708	0.22
	Heteroscedastic Test Assumption	2	Var. Ratio	1.091	0.975	1.144	0.419	1.049	0.98
			Z-Statistic	2.873	-1.18	2.219	-13.6	0.501	-0.23
			Prob.	0.00	0.236	0.03	0.000	0.616	0.81
		4	Var. Ratio	1.100	0.891	1.314	0.207	1.2314	0.95
			Z-Statistic	1.721	-2.77	2.7961	-10.9	1.2108	-0.31
			Prob.	0.085	0.00	0.00	0.000	0.2259	0.75
		8	Var. Ratio	1.206	0.804	1.5464	0.09	1.623	1.075
			Z-Statistic	2.366	-3.10	3.335	-8.49	2.088	0.355
			Prob.	0.018	0.001	0.00	0.000	0.0368	0.72
		16	Var. Ratio	1.363	0.77	1.912	0.054	1.384	1.075
			Z-Statistic	3.042	-2.52	3.889	-5.98	0.893	0.824
			Prob.	0.00	0.011	0.00	0.000	0.372	0.409

		Test Estimates	Daily DSE Gen Index	Daily FTSE 100 Index	Weekly DSE Gen Index	Weekly FTSE 100 Index	Monthly DSE Gen Index	Monthly FTSE 100 Index
Chow-Denning Multiple Variance Ratio Test on Dhaka Stock Exchange (DSE) and FTS100 Index (January 1998 and June 2018)	Homoscedastic Test Assumption	Studentized Max |z| Statistic @ 5 percent level	4.308242	4.896315	4.149049	19.56968	4.465103	1.220551
		Prob.	0.0001	0.0000	0.0001	0.0000	0.1181	0.6341
	Heteroskedastic Test Assumption	Studentized Max |z| Statistic @ 5 percent level	3.042146	3.103197	3.889733	13.67466	2.088001	0.824548
		Prob.	0.0094	0.0076	0.0004	0.0000	0.1393	0.8785

Cointegrating Equation(s) among Stock Price and Macro Variables in Dhaka Stock Exchange (DSE) and FTS100 (Index (January 1998 and June 2018) Normalized cointegrating coefficients (standard errors in the parentheses)

Equation	DSE Gen Index	FTSE 100 Index	Consumer Price Index		Deposit Interest Rates		Foreign Exchange Rate		International Oil Price		Broad Money Supply		Per Capita GDP		Foreign Remittances		Treasury Bill Rate	
			DSE	FTSE	DSE	FTSE	DSE	FTSE	DSE	FTSE	DSE	FTSE	DSE	FTSE	DSE	FTSE	DSE	FTSE
1	1.000	1.000	-27.378	910.57	-207.25	-34926.6	46.835	316061.3	21.225	-211.41	0.0013	-41.022	-0.842423	-154.3091	-1.1927	28.651	47.061	13690.4
			(63.68)	(1198.4)	(537.23)	(4240.4)	(99.50)	(40878.2)	(27.59)	(282.7)	(0.024)	(16.89)	(0.2266)	(70.8354)	(0.803)	(47.505)	(258.1)	(2978.5)
2	1.0000	1.0000	0.0000	-151.08	-409.87	-8696.7	-12.5927	74937.9	27.795	33.972	-0.02033	-9.4957	- 0.424009	-30.13622	-0.74179	13.151	49.33950	3105.5
				(264.7)	(488.59)	(998.6)	(59.824)	(9771.5)	(25.016)	(67.23)	(0.0215)	(3.990)	(0.18746)	(10.8981)	(0.7159)	(11.30)	(234.77)	(704.9)

Adjustment coefficients with the First Cointegrating Equation: Bangladesh and UK Evidence

Cointegrating Equation 1		D (Consumer Price Index)		D (Deposit Interest Rates)		D (Foreign Exchange Rate)		D (International Oil Price)		D (Broad Money Supply)		D (Per Capita GDP)		D (Foreign Remittances)		D (Treasury Bill Rate)	
DSE	FTSE	DSE	FTSE	DSE	FTSE	DSE	FTSE	DSE	FTSE	DSE	FTSE	DSE	FTSE	DSE	FTSE	DSE	FTSE
-0.12821	-0.23697	-4.77E-05	-1.10E-06	3.12E-08	3.31E-06	-1.04E-05	-1.56E-08	-4.90E-06	2.06E-06	0.419652	0.000255	-0.007549	9.32E-05	0.013514	-6.78E-05	-1.54E-06	2.18E-06
(0.00325)	(0.00052)	(4.0E-05)	(9.3E-07)	(2.0E-06)	(4.8E-07)	(6.5E-06)	(6.1E-08)	(6.0E-05)	(1.2E-05)	(0.02484)	(0.00016)	(0.01173)	(3.5E-05)	(0.00446)	(6.1E-05)	(2.5E-06)	(5.3E-07)

Toda-Yamamoto (T-Y) Granger Causality Test between Stock Price and Selected Macro Variables in Bangladesh and UK

Direction of Causality			Degrees of Freedom	Chi-Square	Probability
DSE General Index	~	Balance of Trade	12	20.34181	0.0609***
FTSE	~	Balance of Trade	12	9.001562	0.7028
Balance of Trade	→	DSE General Index	12	26.09144	0.0104
Balance of Trade	~	FTSE	12	7.999800	0.7851
DSE General Index	~	Consumer Price Index	12	15.50778	0.2767
FTSE	~	Consumer Price Index	12	4.416939	0.9747
Consumer Price Index	→	DSE General Index	12	23.06561	0.0409
Consumer Price Index	→	FTSE	12	21.24981	0.0468

	DSE General Index	~	Deposit Interest Rates	12	8.778399	0.7217
	FTSE	~	Deposit Interest Rates	12	12.82778	0.3817
	Deposit Interest Rates	→	DSE General Index	12	22.06647	0.0368
	Deposit Interest Rates	~	FTSE	12	10.44404	0.5771
	DSE General Index	~	Foreign Exchange Rates	12	9.362594	0.6717
	FTSE	~	Foreign Exchange Rates	12	8.108273	0.7766
	Foreign Exchange Rates	~	DSE General Index	12	13.38631	0.3416
	Foreign Exchange Rates	~	FTSE	12	9.950139	0.6203
	DSE General Index	~	International Oil Price	12	13.79341	0.1217
	FTSE	→	International Oil Price	12	21.41463	0.0446
	International Oil Price	→	DSE General Index	12	18.77310	0.0942***
	International Oil Price	~	FTSE	12	16.82811	0.1562
	DSE General Index	~	Broad Money Supply	12	14.75739	0.2550
	FTSE	~	Broad Money Supply	12	12.4681	0.4089
	Broad Money Supply	→	DSE General Index	12	36.99641	0.0002*
	Broad Money Supply	~	FTSE	12	13.78180	0.3149
	DSE General Index	~	Per Capita GDP	12	17.37431	0.1828
	FTSE	~	Per Capita GDP	12	9.482448	0.6613
	Per Capita GDP	→	DSE General Index	12	25.90888	0.0175
	Per Capita GDP	~	FTSE	12	10.09764	0.6074
	DSE General Index	~	Foreign Remittances	12	18.15441	0.1111
	FTSE	~	Foreign Remittances	12	15.23606	0.2288
	Foreign Remittances	→	DSE General Index	12	27.35213	0.0069*

	Foreign Remittances	~	FTSE	12	10.31656	0.5882
	DSE General Index	~	Treasury Bill Rate	12	12.00262	0.4455
	FTSE	~	Treasury Bill Rate	12	9.239012	0.6824
	Treasury Bill Rate	~	DSE General Index	12	18.24320	0.1085
	Treasury Bill Rate	~	FTSE	12	17.58410	0.1289

Note: → shows direction of causal relationship and ~ signifies lack of any causal relationship

* sig. @ 1 percent level

** sig. @ 5percent level

*** sig. @ 10 percent level

The above table summarises the different facets of an efficient stock market and the effect of macroeconomic variables on Bangladesh economy and comparatively analyse it against the U.K. This will provide the opportunity for a clearer insight of the effectiveness of the economies and suggest enhancements for DSE. Firstly, to identify the efficiency of weak form, the run test is employed, as normal distribution isn't necessary for dividends. H_0 (randomness movement) has been rejected by the investigation over a daily set of (Fadda, 2019), as well as the weekly and monthly data sets. Therefore, run-test analysis results point to an exact decision that FTSE 100 (Chen, 2008) and DSE GEN (Alam, et al., 1999), hold no constitution with random variables. Furthermore, autocorrelation has been proven to exists over a variety of lags, using the Q-Tests and Ljung-Box for weekly and daily samples; however, the alternate is true for monthly data, autocorrelation is equivalent to non-randomness, and the lack randomness. Daily and weekly DSE GEN are, hence, proven to be non-random (Roy, 2018) and monthly to be random. Similar results can be seen with FTSE 100, monthly samples exhibiting randomness, while daily and weekly did not. The results show that in situations where the periods are increased (monthly), UK and Dhaka are random, whereas with a limited period of data (daily and weekly) randomness is not shown (Bruno, 1973).

Moreover, randomness is displayed by monthly data while applying “Lo-Mackinlay Individual Variance Ratio Test” for Bangladesh (Marulkar and Faniband, 2017), but daily and weekly rejects the H_0 of randomness. Once again, these results are echoed by FTSE 100. Consequently, non-randomness was detected for the diurnal samples of Bangladesh, while employing the Chow-Denning Test. Under heteroskedastic and homoscedastic test assumptions, weekly data shows that DGEN is not in line with the properties or norms of RWH. On the other hand, random walk can be seen in DGEN’s monthly samples. Once weekly figure sets are used, randomness is not detected for FTSE 100. Whereas, monthly data has a varying estimate (Sharma and Robert, 1977; Marulkar and Faniband, 2017).

Johansen’s Cointegration test was employed in this research, as it was appropriate for examining long-term relationships within variables. A long-term equilibrium relation is shown by a cointegrating vector. It is one of the main goals to see if within UK and Bangladesh if any substantial long equilibrium connections are existent. An equilibrium link is show by the samples for the long run. Contrarily, evidence is not offered by the normalised cointegrating to the above. DSEGEN index, GDPCAP, IOP, CPI, M2, EXR, DIR, REMIT and USTBR was used to determine links in the case of Bangladesh and a long run relationship was unearthed (Olayungbo, 2019). In the case of UK similar macroeconomic factors and FTSE 100’s Index were used, in order to discern any equilibrium long run connections. Once again, a long run equilibrium association was existent (Lee and Brahmasrene, 2018). For CPI (Camilleri, Scicluna and Bai, 2019; Umer, 2016) and REMIT (Ali, 2011a), a negative normalised cointegrating coefficient for Bangladesh is evident; whereas, these variables are positive in the case of the UK (Yartey, 2010; Adam and Tweneboah, 2008). Likewise, DIR (Siddiki, 2000); and GDPCAP (Jahfer and Inoue, 2017) were found to have a negative association with Bangladesh's (Lescaroux and Mignon (2008) and UK's stock market (Bakaert and Hodrick (1992); Alam and Uddin, 2009). For EXR with the US dollar, both UK and Bangladesh offer positive cointegrating coefficients (Lee and Brahmasrene, 2018). IOP was shown to have a negative cointegrating coefficient with UK (Demir, 2019; Lescaroux and Mignon, 2008) but positive for Bangladesh (Olayungbo, 2019; Jones and Kaul, 1996).

When cointegrating vector's exist throughout the macroeconomic variables, the Johansen Cointegration test can deduce that long-run equilibrium relationships are present (Daniel, 2017; Rudra, Mak and Atanu, 2015). The above examination was employed for both the markets and cointegrating vectors were discovered for both, which lead to the result that UK and Bangladesh hold a long-run equilibrium association with macroeconomic variables.

Short-term disequilibrium adjustment between the same macroeconomic variables and the stock market is the next step, for analysing both the UK and Bangladeshi data. For this the most relevant tool was Vector Error Correction Model (VECM), due to its wide usage of calculating the necessary disequilibrium adjustment in the short term within the VAR model. In both UK (Paul Ndubuisi, 2017) and Bangladesh (Jahfer and Inoue, 2017) the result explanations show an existent equilibrium long-term relationship between the macroeconomic variables and stock prices of both countries. However, it is not clear as to why this relationship exists in the short-term, it could possible due to variance in contingent and dynamic variables. UK has been shown to comparatively correct disequilibrium more efficiently than Bangladesh. The UK needing roughly 4.22 months to readjust to equilibrium (dropping by 23.697% each month) (Bruce, 1997) and Bangladesh 7.80 months (dropping by 12.821% monthly). Therefore, the results clearly show rational indicators pointing towards the rate of disequilibrium short-run adjustments for the UK and Bangladesh.

Finally, to look into long-term multivariate dynamic causality the best suited model is Toda-Yamamoto Causation Analysis. In this research macroeconomic variables and the stock prices for both the UK and Bangladesh were examined. Unlike the previous models, varying outcomes were exhibited by both nations. Between BOT and stock, a bidirectional causal relationship was unearthed (Mishra and Gupta, 2014); a unidirectional relationship within stock market and CPI (Mazuruse, 2014; Camilleri, Scicluna and Bai, 2019); a unidirectional link with DIR against stock (Wasseja et al., 2015), M2 against stock values (Hussain and Ahmad, 2015), GDPCAP against the stock market and REMIT against stock (Ali, 2011). In contrast, IOP (Park and Ratti, 2008; Kaul, 1996) and CPI (Paul Ndubuisi, 2017; Solnik, 1983) where shown to impact FTSE 100. Other than those exception no other causal (uni- or bi- directional) evidence was found for UK. The findings show that UK are less sensitive to most macroeconomic variables than Bangladesh which is impacted by a plethora of macroeconomic variables.

<u>Diagnosis of Residuals and The Fit of the Model:</u>

The researcher has implemented Orthogonalization: Cholesky (Lutkepohl) test to examine VAR Residual Normality Tests where the H_0 is “residuals are multivariate normal”. The researcher reports normality of the residuals (of all selected variables – the Stock Prices and 9 macroeconomic variables for both the UK and Bangladesh) from Skewness, Kurtosis and Jarque-Bera and all *p* values of the results are greater than 0.05; ergo, all residuals of the models follow the normality individually, as well as jointly, (please find the results in appendix Table for normality, p126 for Bangladesh and p127 for the United Kingdom). The findings indicate that it’s a good model fit – the normality of the residuals and times autocorrelations are reported.

Table 1: VAR Residual Normality Tests - Orthogonalization: Cholesky (Lutkepohl) for Bangladesh and the UK

	Component	Skewness	Chi-Square	Probability	Kurtosis	Chi-Square	Probability	Jarque-Bera	Probability
Bangladesh	1	-0.028183	0.030977	0.8603	3.203424	0.403470	0.5253	0.434447	0.8048
	2	0.108761	0.461328	0.4970	3.420733	0.918830	0.3377	0.141531	0.9316
	3	0.253825	1.366976	0.2423	2.972721	2.530886	0.1116	2.153152	0.3407
	4	0.020290	1.766345	0.1838	3.369371	1.560846	0.2115	2.739945	0.2451
	5	0.186628	1.358367	0.2438	2.943311	0.031333	0.8595	1.389700	0.4991
	6	0.262073	1.688447	0.1938	3.160908	1.788750	0.1801	1.848981	0.3967
	7	0.083869	0.274325	0.6004	3.646843	4.079452	0.0434	4.353778	0.1134
	8	0.352068	0.224997	0.6352	3.422897	2.559571	0.1096	3.784811	0.1507
	9	0.236944	2.189548	0.1390	3.076230	0.056657	0.8119	2.246206	0.3253
	10	-0.205973	1.654566	0.1983	2.917517	1.222011	0.2689	3.862474	0.1451
	Joint	-	11.0118	0.3569	-	15.1518	0.1266	18.955	0.5221
United Kingdom	1	0.005817	0.001309	0.9711	3.551586	2.941058	0.0864	2.942366	0.2297
	2	0.243842	2.299078	0.1295	3.688230	1.496112	0.2222	3.795214	0.1503
	3	-0.009589	0.003555	0.9525	3.112699	0.122777	0.7260	0.126333	0.9388
	4	0.386896	2.787955	0.0945	3.963339	1.970881	0.1604	4.758841	0.0903
	5	-0.478432	1.850703	0.1737	3.647855	1.774312	0.1833	4.625015	0.0992
	6	0.291854	2.245251	0.1344	3.799851	2.358351	0.1244	2.603572	0.2725
	7	-0.007176	0.001991	0.9644	2.951997	0.022275	0.8814	0.024266	0.9879
	8	-0.176457	1.203971	0.2725	3.087142	0.073405	0.7864	1.277377	0.5280
	9	0.474920	1.721234	0.1896	2.691269	2.744016	0.9781	2.465232	0.2922
	10	-0.471580	1.599000	0.2060	3.517454	2.259118	0.1345	3.858125	0.1458
	Joint	-	14.71404	0.1431	-	15.762	0.1076	27.476	0.1228

<u>Validity of the model – tests applied on the residuals for Bangladesh and the United Kingdom:</u>

Moreover, in order to test serial correlation, the Lagrange multiplier (LM) test was used to estimate serial correlation in the VAR Model between stock prices and macroeconomic variables (Bangladesh and the United Kingdom), which states that null hypothesis indicates no random series at lag h. It was shown that the VAR model at lag 12 was revealed to have no serial correlation for the residuals because its p-values in the LM-statistic were below 0.05.

Therefore, the H_0 (no autocorrelation) at lag 12 can't be overruled at 5% significance. The results prove the absence of serial correlation up to lag 12, and the VAR at lag 12 indicates dynamic stability (Table:).

Table 2: VAR Residual Serial Correlation LM Tests for Bangladesh and the United Kingdom:

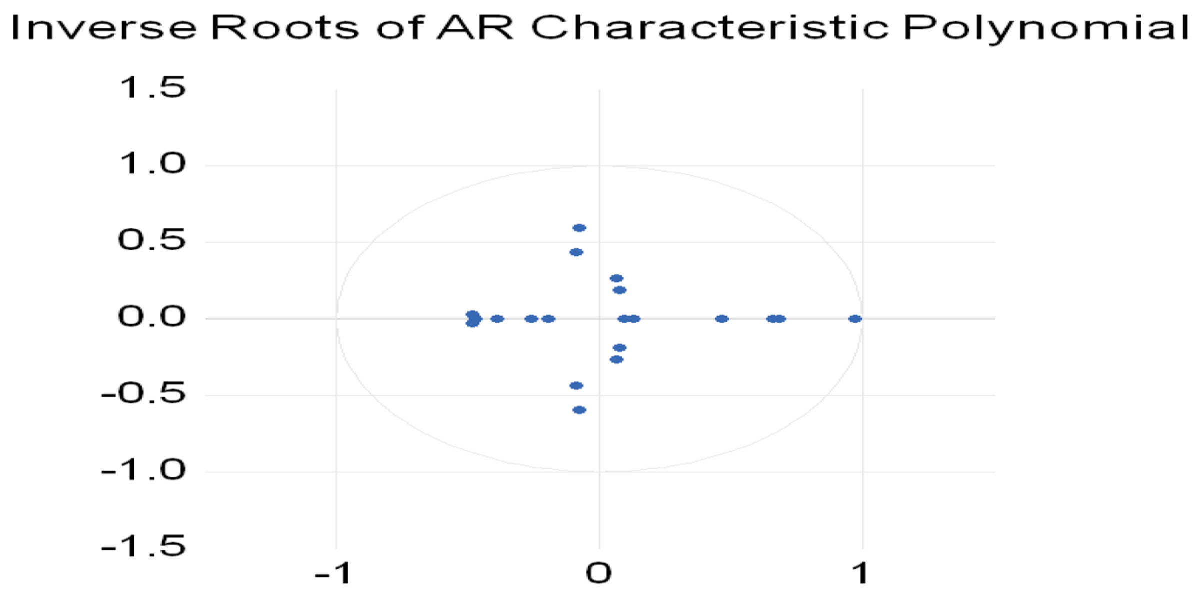
VAR Residual Serial Correlation LM Tests				
Null Hypothesis: No Serial Correlation at Lag Order "h"				
	Bangladesh		United Kingdom	
Lags	LM-Stat	Prob	LM-Stat	Prob
1	386.4772	0.0000	226.5072	0.0000
2	269.3332	0.0229	152.7568	0.0005
3	293.3061	0.0015	158.2663	0.0002
4	221.1716	0.5596	114.7574	0.1485
5	239.9557	0.2354	129.9812	0.0236
6	251.0504	0.1122	111.8067	0.1974
7	233.0220	0.3427	127.0122	0.0354
8	195.0513	0.9262	96.64538	0.5764
9	240.3527	0.2299	105.0481	0.3453
10	231.0866	0.3761	122.0035	0.0667
11	158.9402	0.9997	108.3351	0.2674
12	***284.4529***	***0.0044***	***131.6191***	***0.0187***
13	236.7071	0.2830	94.69796	0.6310
14	83.66934	0.8803	108.3221	0.2677

Inverse Roots of AR Characteristic Polynomial between Stock Price and Macroeconomic Variables in Bangladesh and the United Kingdom:

The researcher also tested stability of the model (Figure 1 & 2 – for Bangladesh and Figure-for the United Kingdom). A model which passes all the tests applied on the residuals, as all the inverse roots lie within the unit circle the process is stationary and dynamically stable while fitting model – meaning it can be used in analysis.

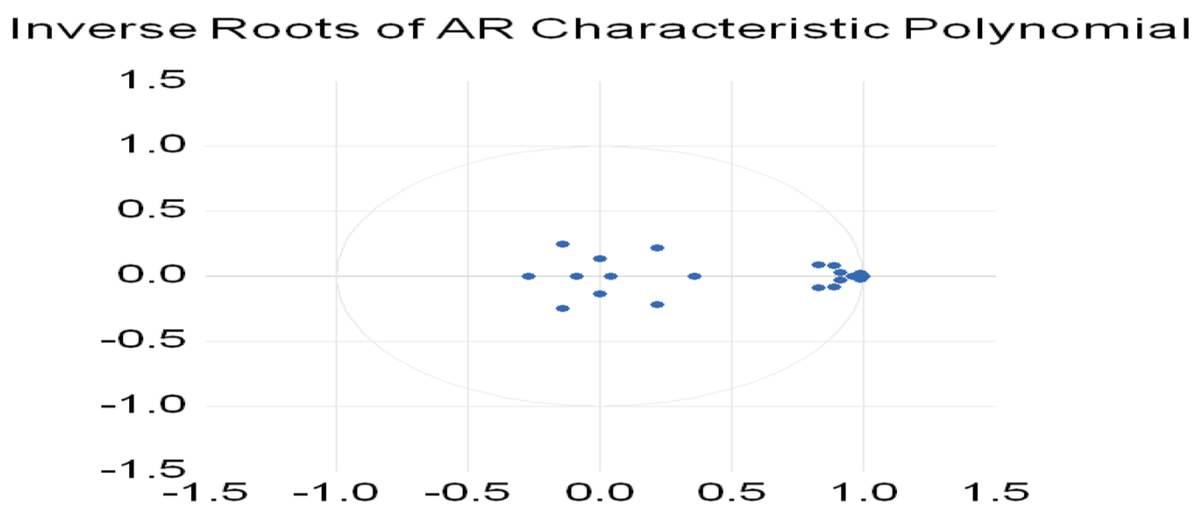
<u>Figure 1:</u>

Inverse Roots of AR Characteristic Polynomial between Stock Price and Macroeconomic Variables in Bangladesh:



<u>Figure 2:</u>

Inverse Roots of AR Characteristic Polynomial between Stock Price and Macroeconomic Variables in the United Kingdom:



Chapter 9-Recommendations For Bangladeshi Stock Market On How To Improve Their Market Efficiency

The London Stock Exchange is an international financial hub which plays a vital role in London's great achievements. More than any other exchange in the world, the LSE meets the various requirements of investors and companies. It outperforms the worldwide competition in appealing to businesses from all over the world, which has made it most prosperous. London Stock Exchange has more equity than every other equity exchange in the world, it is even in excess of NASDAQ and NYSE combined (LSE and distinct exchange information, 12/2006).

Whereas, Bangladesh securities markets has problems from both the supply and demand sides, as well as issues relating to infrastructure, facilities, trust and public confidence. After analysing this research, it is concluded that there are plenty of lessons that can be learned and implemented from LSE to change the development process of Bangladeshi shares. When diagnosis was required regarding the standing and growth process for shares of Bangladesh, more in-depth research needed to be conducted. Some recommendations on how to improve their market efficiency are given below:

Macroeconomic Point of Views

It appeared that relationships of real macroeconomic variables with share price were mixed. After examining the equilibrium long-term connection between macro stimuli and equity prices, the researcher found that when consumer price index goes up, it is considered that inflation will go up, and this, in turn, boosts nominal risk-free rate. These greater risk-free rates bring down asset prices for the valuation model. As a result, the boost to the consumer price index causes a drop in stock price for the Bangladesh market. Expectedly, the rising government debt/GDP ratio is anticipated to do harm to the share values, hence, share market indexes are also hurt by the depreciating value of its currency. If the rate of inflation, debt/GDP ratio can be controlled by the policy maker then the stock price could be kept stable.

Additionally, foreign remittances bring about greater liquidity in an economy, this greater stream of liquidity was employed to invest in real sectors, for example construction or buying of homes, but there was no such effect for the stock market. Moreover, stock prices have much greater levels of volatility and risk, and so beneficiary families of foreign remittances are disinclined to put capital in the stock market. Thus, foreign remittance growth for Bangladesh is projected to either negligibly or adversely impact equity values within the stock market. When we learn from the UK here, the UK stock market is organised well, is consistent and has low volatility, so it is an attractive investment prospect. Thus, foreign remittances flow more easily, establishing a positive correlation of stock price and foreign remittances in the UK.

Hence, the policy maker of the DSE should concentrate to systematise and steady the flow of the stock market.

Moreover, the US Treasury bill rate has been shown to not hold a correlation with Bangladeshi stock price, which could potentially be because of the narrow market depth and poor stock market openness of Bangladesh. Because of the lack of political stability, and the unaccommodating investment environment existing in the Bangladesh equity market, shares are not disturbed from changes to the US Treasury bill.

After analysing Chapter 6, the researcher deduced that the stock index data was predicted to have a certain level of randomness in an efficient market, which, in turn, would work on the basis that every market player has the same information available and equal expectations for their trading moves. However, when the assumption of the equal spread of data and common predictions are not able to be followed, all market players become more dependent on the rest of the participants in their daily activities in trading, which is evident in the non-random behaviour of daily stock indexes, particularly in the case of Bangladesh. Therefore, the authorities of the Bangladeshi stock markets need to confirm the same availability of the information to the investors at the same time.

Another critical cause of the lack of randomness in the short-term data (such as weekly or daily series) is that circuit breaker activities and trading halts by the stock exchanges across various stock movements does not meet upper and lower bounds, which is a reason that the UK Stock Exchange and DSE display an amount of dependence across the stock exchange indexes. Investors should be vigilant with some specific macroeconomic factors, for instance, money supply, exchange rate, interest rate and consumer price index, as they effect shares severely.

Furthermore, some additional recommendations on how to improve their market efficiency are given below:

1) ***Regulatory framework:*** The constitutional body Financial Conduct Authority (FCA) is working with the "Financial Services & Markets Act" 2000 (FSMA) which has complete accountability for imposing the rules and regulation involving the investment business. It has sufficient function and capabilities to supervise the London Stock Exchange. The United Kingdom Regulation department is accountable for imposing all the market functioned by the LSE as a form of Market Supervision.

Especially, for the secondary market of LSE, it is also responsible for supervising Turquoise Global Holdings Limited and LSEDM.

However, the financial market and SEC are feeble. The SEC needs to have enough resources to be utilised for the development of the different functions or sufficient capability to control, check, supervise or enforce laws and regulations effectively. The SEC's authority requires strong power when it tries to bring any structural changes at both the exchanges. The management of the exchange should effectively control the activities and supervise the members. The exchange necessitates the authority to control the brokers so that the exchange can take over the control of the business of the brokers.

Regarding the supervision, The SEC or the exchange (DSE) obviously require effective surveillance systems that can automatically monitor detect and control the malpractices and abuses of the brokers. This obviously boosts up the confidence of interested investors and this would be the way out to the development of the capital market.

2) ***Stock market liquidity:*** By issuing depositary receipts (DRs) or specialist debt securities to specialised investors, LSE facilitates and raises their market capital. The exchange functions under the name of Recognised Investment Exchange and the market had over 350 Medium Term Notes, 32 DRs and 108 Eurobonds in July 2011. The London Stock Exchange devoted market is a Specialist Fund Market which is aimed to receive extra securities, governance models and sophisticated fund vehicles. It is appropriate only for highly knowledgeable, institutional and expertise stockholders. As an EU Regulated Market, the Specialist Fund Market is one where most investors are eligible to order giving a reservoir of cash for the issuers permitted here.

The only biggest combined financial market controller Investment Corporation of Bangladesh (ICB) belonged to the Administration. In FY 2004, the Investment Corporation of Bangladesh and its businesses covered 32% of the cumulative total sales for the DSE. To settle out interest clashes among joint operators, 3 different divisions were established at the Investment Corporation of Bangladesh for the year 2002 (ICB Annual reports, 2002). Nevertheless, the objectives of settling the ICB's operations should be the following:

3) ***Market infrastructures/technologies:*** The key targets of a best organisation are to be more productive, deliver value as well as being innovative and efficient. Improved association with stakeholders, employees and customers, can bring significant improvements in all these areas. With combined communications, the modern technology MillenniumIT creates a solo virtual workplace settled by all collaborators. Document sharing, email and instant messaging put everybody in the same place. An extraordinary ease of collaboration and communication together with storage and powerful processing have been possible due to the new cloud-based solutions. Facilities include auditing, security, optimisation, maintenance, implementation and network design. The Bangladesh Stock Market needs the amenities as those of the LSE, and there is a need to expand the infrastructure and physical facilities for instance, bringing mission-critical solutions in server environment provisioning and data-centre monitoring as well as server virtualisation and administration in cooperation with networking solutions which may include IP TV, VoIP and IP and numerous next-generations technologies. Moreover, to improve DSE business efficiency, it needs enterprise data management, this is in addition to efficient capital market - both operational and informational - which the LSE confirms through their technology and governance structures.

4) ***Dealers and brokers:*** The existence of several strong dealer-broker-members (no specialist/market maker). 'Experience dealers' are among the top significant rudiments of the organization, which is a prerequisite for share growth. The actions of brokers and traders brand the equity as being meaningfully more attractive to companies and investors because they enable the exchange of shares.

5) ***Investors base and institutional investors:*** The market is largely dominated by sophisticated investors. Stock market expansion necessitates a diverse and deep investor base. The stockholder foundation must be composed and diversified of established shareholders (i.e., insurance companies, pension assets and mutual funds), additional financial institutions trade in targeting diverse economic segments and different stages of risk. These institutional stockholders can play a vital role in channeling into the exchange and the building-up of funds.

6) ***Ethical standards:*** The London Stock Exchange delivers the uppermost ethical standards in carrying out its practices, behavior and business activities, these ethical standards are followed by all the staff and even the top officers through their Code of Conduct which carries consequences in disciplinary proceedings which may comprise dismissal. DSE firmly requires ethical orientation, education about capital and securities markets to ensure that directors and staff are compatible with their Code of Conduct. Therefore, the moral principle of every interest unit has to become greater so that everyone comprehends the sacredness of this information founded bonds business.

7) ***Trust and integrity****:* Trust and integrity are the core duties of the London Stock Exchange. That superseding belief is pertinent even currently as a supplier of independent, trustworthy, user neutral, and reliable . The role which the LSE plays is recognised by the international markets. The DSE must reinstate self-esteem and faith amidst interest communities, these are significant requirements for creating an investment-friendly and strong market environment. The DSE should start from the beginning and function under the umbrella of 'my word is my bond'. This part not only summarises environmental, social and governance (ESG) responsibilities, but also commercial and performance objectives.

8) ***Security and surveillance:*** The security of the London Stock Exchange is thought of as if it were insulin- if too much is applied then it will become paralysed, while too little causes it to become vulnerable. The modern technology of LSE helps the exchange in accomplishing the perfect balance of security, which processes and integrates people and technology to concealment the implementation, the complete lifecycle of policy, optimisation and planning. Hence, the Bangladeshi Stock Market needs to build up potential securities and wide options for the investors, in the same way as is in the LSE, so that customers can appreciate the full advantage of steadfast and reliable technology and application security, network security, cloud security, innovation in data security and mobile security as well as risk and compliance, governance, monitoring and the broad areas of security management. The DSE should also confirm the following issues:

i) Confirmation of variety in goods accessibility within the market.
ii) Management and Owners (Councilors) of DSE shouldn’t be entwined.
iii) Rebuilding the image of the presently depressed market.

iv) Prompt explanations for unusual market actions.

v) Swift alteration of Central Depository System, that is predicted to lessen jobs for the physical withdrawing and depositing of bonds.

9) ***Disclosure of information:*** The LSE is dedicated to providing consistent information on their activities, strategy, likely prospects and financial performance in a regular, timely manner. Therefore, DSE needs to ensure that it guarantees transparency of all financial information and accounting records must be disclosed accurately for the financial position of the business, as well as publishing those financial statements precisely. Additionally, The DSE needs to stop businesses from possibly deceptive stockholders using false reporting and forecasting. Moreover, it must confirm adequate disclosure as well as ensuring that the true disclosures appear in the annual reports. The revealing of info to the community is the best potential distribution method that can make the public conscious of recent situations. Thus, corporations involved have to avoid revelations, such as overstated reports of the share market, or predictions that are more than what is necessary to enable the public to make informed investment decisions. The DSE also needs to confirm satisfactory and correct as verifiers for economic declarations as well as land assessors of the concern shouldn't be identical. Hence, producing a clean and impeccable market data distribution method.

10) ***Credit-rating agencies:*** Credit facilities should be adequate and interest rates must not be exorbitant. "Credit Rating Agencies" (CRA) may deliver valued info towards stockholders to allow investors to create concrete and well-versed investment strategies. Nonetheless, the CRA need to be independent, reliable and must be able to gain info if they are to utilise their role appropriately. Furthermore, CRAs similarly need to be lucrative, otherwise they will not last (Árvai and Heenan, 2008).

11) ***Taxation/fiscal policies:*** The LSE's tax efficiency enables traders to keep more of their earnings. This is another component to encouraging shareholders to enthusiastically participate in their public capital markets. The equities of Main Market may be kept in "Personal Equity Plans" (PEP) and "Individual Savings Accounts" (ISA).

The DSE needs to confirm the specified firms which give consistent dividends, and these must be provided with tax breaks and discounts so that smaller rising companies, The DSE could establish a specific market for the purpose of business property respite for legacy tax resolutions; improved capital improvements tax relief and appealing a diversity of tax welfares for retail stockholders. Moreover, tax upsurge can permit a diversity of effectual tax structures which could be formed around portfolios, for instance Enterprise Investment Schemes and Venture Capital Trusts, as the LSE has implemented.

12) ***Institutional investors policy:*** Financial deepening and capital market development are related to each other. These depend on the availability of different types of financial instruments and effective financial intermediation[160]. The actions which may be undertaken to handle the issues faced by merchant banks and to remove them effectively are the following:

a) MBs must have permission to trade within bonds for individuals, which isn't permissible at the moment.

b) MBs must deliver value aid for their under-written IPOs in the direct secondary market. They could have the ability to propose market-making actions in secondary and primary markets to prolong credits to their consumers for margin purchasing of bonds, unless they can obtain monies at easier charges.

c) Capital Market Development reserve ought to be founded at BB. The reserve would oppose economic trading banks using trade banks to fund their clients' capital activities[161].

d) MBs as wholesale banking have been provided with extra actions so as to be maintainable and feasible.

13) ***Legal framework:*** Where any member firm breaches any of the rules, the London Stock Exchange may start punitive steps against such firm. The LSE may release a cautionary warning and/or mention penalising issues to the Disciplinary Committee or

[160] MBs have their role to energise shares.
[161] Otherwise, MBs must have the ability to find refinancing services out of the Bangladesh Banks on specific margin foundations. This will make Merchant Banks lively and add new reserves in bonds.

Executive Panel or place an immovable penalty against them. The DSE should establish a three-layer appeal process, as the LSE does, for instance appropriate cases, which are the Executive Panel, may refer the case to the Disciplinary Committee and/or The Appeals Committee. Additionally, the DSE should focus on an organisation for individual jurisdictional security hearings for handling issues in relation to bonds.

*14) **Market abuse:*** In the United Kingdom, non-public all trading information is, under the title of market abuse, subject to possible criminal penalties and at a minimum to civil penalties. Schedule 1 and the Criminal Justice Act 1993 are related to the Financial Conduct Authority (FCA) which has accountability to inspect and prosecute insider dealing. The European Union Regulation No 596/2014 and the Financial Service and Market Act 2000 define an offence of 'Market Abuse'. The norm is that it is unlawful to trade through inside traders using market sensitive information which is not usually known. By making a concrete law like the LSE, the DSE must confirm that the internals must not trade on the foundation of physical data, which isn't recognised publicly, and each individual, organiser or manager of power from the supporting unit shouldn't engage in the selling/buying of the firm's bonds unless the satisfy the obligation to inform the exchange in writing regarding an aim to sell/buy. Therefore, internals must abstain from principle exchanging after material data releases to the media.

*15) **Professional management:*** Business power support-owners have been handling the business. In the majority of instances, expert organisations should be employed to organise the matters of the specified business, in the same way as the LSE hires worldwide professionals.

*16) **Boost-up heavy industrialisation:*** Approximately 75% of the world's population lives in developing countries (Rahman and Moazzem, 2011). They all need a strong measure to attract technology and capital to improve their standard of living and the entire infrastructure. To enhance growth, these developing economies depend on their capital markets as their growth engines[162]. In Bangladesh, there are still capital markets that need an upward boost to get fruitful results. Without such nurturing, it is not possible to move forward towards heavy industrialisation and other developments that are capital-based. The fact is that it is suffering from a lack of availability of good

[162] This is because capital markets help to mobilise the extra funds to those who are suffering from deficit.

scripts. Among the 3000 public companies, a large number of them had been kept away from the securities market and only 220 companies have issued securities (Rahman and Moazzem, 2011). Thus, the below steps need to be followed:

i) The style of privatisation of businesses can be applied within the open distribution of stocks. This can expand the shares market, make market restraints and disperse possession.

ii) Securities have to emerge. The application of government bonds with medium- and long-term durations can also expand the security market's foundation.

17) ***Public confidence:*** Public self-assurance ought to be reinstated and activities to build this must be conducted via education schemes. There is no substitute for schooling; therefore, learning about bonds and financial markets is among the most significant characteristics that aid stockholders in taking assets[163].

18) ***Education and public awareness:*** Poor understanding about stock markets demotivates potential investors from contribution in share markets. The inclination to participate in stocks increases alongside the amount of schooling. Simply put, a greater amount of data raises self-assurance within equities by contributing to an large amount of available information regarding economic actions. If there is an absence of knowledgeable investors that comprehend the important guidelines, then the possible drawback is that contributions to financial investment and benefits as well as financial markets may not be able to progress (Roc, 1996).

19) ***Governmental issues:*** It has also been observed that the government is still holding a large number of securities of blue chip company shares. All these problems have to be sorted out to make the capital market stronger. Although there are different methods that can be adopted to deal with these issues, the mentality and beliefs of the investors is of prime importance, and this has to be changed for the growth of shares. If the health of equities can be improved and made stronger, only then will it be possible to enjoy all the benefits of a complete nation and financial growth can be achieved thereafter. There is evidence that every division in the government and shares have to take part in their

[163] Training and alignment schemes, in addition to non-bonds and bonds issues within the curriculum of (higher) secondary stages will create consciousness of financial markets and their uses.

individual parts quickly to reinstate the seriousness of shares. The government has to be an organiser, partner in evolution and a fosterer of development in the innovative activity that is wanted to happen.

20) ***Strengthening the market intelligence force:*** Creating the causes of rumours ineffectual on exchange grounds by establishment of share data power. There needs to be a Swift validation of rumours and stories that likely effect the trade of bonds or have an attitude on investment choices.

21) ***Political stability:*** Governmental uncertainty destructively impacts the expansion of Bangladeshi equities. In nations that have disturbed governmental situations like Bangladesh, there are interests in investing in stock because equities are typically a medium to long period investment (Sudweeks, 1989). On the other hand, the UK has the strongest and most steady political history in the world. Political jeopardies effect equity investment in some way, for instance, a fear of expropriation depresses investment and limitations on the repatriation of funds. (Roc, 1996).

22) ***Actions required for restoring investors' confidence in the market:*** Bangladeshi shares have to strengthen the present situation and provide more confidence to the investors, which will improve the competitiveness and the liquidity of the market. The present systems of trade and settlements have to be reformed for better performance. To achieve this end, the points that need to be addressed immediately are the following:

i) The association of shares must include business and organisation sectors that have satisfactory funds. There needs to be an enhancement in data accessibility, a presentation for a program of market maker, as well as a dominant system that is a faster settlement and is order-driven with credibility. The growth of over-the-counter markets (OCT) for giant greenfield schemes along with non-specified bonds are also part of the main requirements (Rahman and Moazzem, 2011).

ii) To recompense the issues of Bangladesh equities, rules must aim to stay in par with favourable atmospheres so that the faults of shares can be lessened, actions of concealed groups can be more ineffectual and the probable contact to many market misuses, inclusive of data maneuvering, have to be cut down.

iii) The rules and regulations that already exist in the DSE should be given due emphasis so that they are implemented properly, as is the case with the LSE, which maintains its legal obligations that are understood and fulfilled through business, strategy and regulatory aspects.

iv) Reinstating community self-confidence using educational schemes such as teachings on bonds and alignment schemes.

v) There should be an adequate number of regulations in the framework to stop un-bridled rumours, market-faking and internal trades so that the decrease in public confidence can be stopped.

vi) Efforts have to be made towards attaining a fool-proof order-driven scheme of mechanisation to remove any chances to influence data.

In summary, the insider trading action in the stock market could have a potential effect in this regard, as this allows trading decisions to be made by acting on data that is not widely distributed in the market. Because of this, stock price often trends to not show actual market conditions. Furthermore, noise trading, or making trading decisions due to hearsay, brings about the same trading decisions by the market in the short-term. Hence, recommendations for the Bangladeshi stock markets on how to improve their market efficiency can include giving greater attention to information asymmetry, establishing more flexible attitudes when it comes to the stock exchange to oversee and control daily stock indexes, as well as limiting homogenous predictions regarding stock investment, uncommon and non-synchronous trading that comes about in the extreme short-term period.

In conclusion, Bangladesh stock prices are clearly impacted by numerous macroeconomic variables, which is in contrast with the UK and the fact that the latter is affected by macroeconomic variables to a much lesser degree. This disparity affects stock prices accordingly, and could be due to differences in macroeconomic stability between Bangladesh and the UK. Bangladesh is a developing economy with numerous financial, environmental and administrative issues (Ahmed, 1998). In addition, there is limited expertise, market inefficiency, political unrest and clashes, which, in addition to natural disasters, impede the steady progress of the economy (Ahmed, 2002b). Similarly, investors in Bangladesh are not eager to put assets into shares, and these decisions are strongly impacted by rumours and noise trading, meaning that the stock market is less efficient. Thus, problematic situations in macroeconomic aspects have a deep influence upon Bangladesh shares for a substantial amount of time (Ahmed, 2000b). Conversely, the UK is a developed nation with a more genial business environment, and financial, political and institutional growth maintains macroeconomic stability. The UK *has* a historically robust market, which can counter negative events in a short time, with stable stock markets. Because of this, when these problematic instances occur, stock prices are affected less and for a shorter period of time, so stock prices in the UK are seen to be more insensitive to macroeconomic performance changes. Also, the UK stock markets have solid ties with the US stock markets, so whenever any substantial change is present within US stock, then UK stock has an appropriate reaction. Thus, the UK stock markets are even less related to UK macroeconomic performance than they otherwise would be.

Part III-Conclusion and Future Research Avenues

Conclusion

This thesis attempts to ascertain the various elements of market efficiency that exist amongst the United Kingdom and Bangladesh stock markets. This area of research was selected following an in-depth examination of the literature, which showed that there was a disparity in knowledge regarding market efficiency and the connection of shares in the exchange. Specifically, empirical research was undertaken for the Bangladesh stock market (emerging) and the United Kingdom market (developed). The current research scrutinises the short and long-run changes to equilibrium, to pinpoint whether there could be a dynamic, causal link between the LSE and DSE. Share price index values were chosen to achieve this, since they are appropriate macroeconomic indicators for Bangladesh as well as for the United Kingdom. For this purpose, Balance of Trade (BDBOT), Consumer Price Index (BDCPI), Deposit Interest Rates (BDDIR), Foreign Exchange Rate (BDEXR), International Oil Price (IOP), Broad Money Supply (BDM2), Per Capita GDP (BDPCAPGDP), Foreign Remittances (BDREMIT) and 91- day US Treasury Bill Rate (TBR) were chosen to be the macro variables used. Quantitative approaches were used against weekly stock price data examining the period of January 1998 to June 2018. Until now, earlier studies on the matter have examined other regions, and especially Southern Asia, while Bangladesh has not been given much attention[164]. Earlier research has investigated a limited number of South-Asian shares, like Pakistan and India, under a wider sample (for instance, Elyasiani and Mansur 1998; Yang et al., 2003).

In addition, earlier research papers have examined the link between economic variables and share price movement in the area, but these concentrated on national standards for evaluating economic performance and did not take into account any worldwide aspects that have been shown to be important for developing (Harvey, 1995) as well as developed markets (Fifield and Power, 2006). As a result, this thesis looks at the link between local and global economic elements for share price movement in the UK and Bangladesh. This study also examines the appraisal of markets with regards to the various elements of market efficiency. To the best of the researcher's knowledge, there is no existing current research that offers a comparison of the United Kingdom and Bangladeshi Stock Markets. This type of investigation has impacts on market efficiency and international investment portfolio within the vicinity.

[164] Furthermore, the limited existing research that looks into South Asia markets is quite old (for example, Narayan and Smyth, 2004) or highlights the nations in the vicinity as they relate to advanced markets (i.e., Lamba, 2005).

Firstly, the researcher aimed to look into the pricing activity of the stock exchanges in Bangladesh and the UK, allowing for a greater perception of the efficiency of these two stock markets. To date, researchers are in consensus that stock price movement occurs due to specific economic changes through the economy, industry or a particular company (Ahmed, 2002). Data regarding these movements have an instant effect on stock prices, and stocks change to previously-unseen levels (up or down), based on the information type offered. This quick change towards a new equilibrium level at the point where new data is provided, clearly shows that all data known is able to be seen through stock prices. The run test is utilised so as to identify the weak-form effectiveness, as there isn't any need for dividends to use a normal distribution. The analysis rejects H_0 (randomness movement) across a diurnal sample set (Fadda, 2019). The same result was seen for the weekly, as well as monthly, data sets. As a result, it is considered that the run test findings point to a very specific decision that the DSE GEN (Alam, et al., 1999) and FTSE 100 indexes (Chen, 2008) do not constitute random variables. It should be noted that the proportion of runs compared to the whole set monthly, weekly and daily data series for the UK shares are larger than that of the DSE in Bangladesh. Furthermore, applications of the Ljung-Box and Q-Tests, daily and weekly DSE GEN indexes offer proof that autocorrelation exists across various lags, and monthly data for the same index offers evidence of there being no autocorrelation, while the existence of autocorrelation is based on non-randomness and the lack of autocorrelation is the cause of randomness. With this in mind, daily and weekly DSE GEN indexes are shown to be non-random (Roy, 2018) and monthly data of the same variable are shown to exhibit randomness. This outcome is echoed with the daily and weekly FTSE 100 index, which did not show random characteristics, while monthly data did in fact exhibit random properties (Sharma and Robert, 1977). Therefore, the explanation is that in situations where the time horizon is limited, the Dhaka and UK Stock indexes are non-random (Bruno, 1973), whereas with the increase in long horizon data (as is the case with monthly data), randomness is shown.

Moreover, the Lo-Mackinlay Individual Variance Ratio Test result also states that monthly data from the Bangladesh stock market displays random properties in the data series (Marulkar and Faniband, 2017), but it is considered that weekly and daily data rejects the H_o of random behaviour (Bruno, 1973). These results also show that the FTSE 100 displays random behaviour in the monthly data set (Sharma and Robert, 1977). Correspondingly, the Chow-Denning Test for Bangladesh summarised that the daily data set rejects the H_o of random walk. When it comes to weekly data sets, under homoscedastic and heteroskedastic test assumptions, the joint analysis data alongside their p-values show why weekly DSE GEN indexes are not in line with the norms and properties of RWH. Contrarily, it is stated that monthly DGEN are in line with the trends and actions of random walk. When it comes to the FTSE, it is obviously stated that the theory of heteroskedasticity is disregarded at the 5% level of significance. Once weekly figure sets are used, the same test predicts that no random walk is in place in the FTSE 100 data set. However, a varying estimate is shown once the monthly FTSE-100 information has been utilised (Marulkar and Faniband, 2017; (Sharma and Robert, 1977). The outcomes displayed in Chapter 6 are in line with the results described in earlier parts of this thesis.

It is crucial to note that when symmetrical distribution of data is not in place, market participants display a clear dependency on one another during their everyday trading actions, and this is clearly displayed in the non-random behaviour of daily stock indexes for the Bangladesh and UK Stock Exchanges. However, these dependencies are shown to go down when data is examined, and trading decisions are changed accordingly. Thus, for larger period data, such as monthly DSE GEN Index for DSE and FTSE 100 Index for the UK Stock market, test estimates display greater independence and randomness.

Another crucial factor behind the lack of randomness in short horizon data (such as daily and weekly data) is the fact that circuit breaker and trading halt actions by the Stock Exchanges in the various transactions are noted to do not adhere to upper and lower bounds. This is the reason behind the daily data, in the two stock markets examined, showing a level of dependency in the stock exchange indexes.

A further reason could be insider trading in the stock, which is when trading choices are completed based on data not widely disclosed in the stock market. Thus, a price trend in stocks does not often show the realistic situation in the market at that time. Moreover, noise trading and trading through rumours brings about the same trading decision by the market participants across the short-term. However, they can make changes to their trading decisions in the longer time horizon bringing about stock price adherence to random walk. The economic explanation of this test finding relates to information asymmetry, the varying attitudes of the stock exchanges when it comes to controlling daily stock indexes, a lack of individuals' symmetrical predictions regarding stock investment, as well as less frequent and non-synchronous trading across the short-term.

Secondly, the empirical study presented in this research was initially conducted through the Johansen's Cointegration test, which was especially appropriate for investigating long equilibrium relationships between variables. The existence of a cointegrating vector indicates an equilibrium long-term connection between the specified factors. A key goal of this research is to see if any substantial long-term links within specific factors are present for Bangladesh and the UK. The data shows that the specified variables for both nations show an equilibrium relationship across the long-term. However, the normalised cointegrating coefficients do not offer evidence to the above. For Bangladesh, the current research used DSE GEN Index, IOP, DIR, EXR, CPI, broad money supply, per capita GDP, foreign remittance, and the US Treasury bill rate to determine the equilibrium long-term links that are in place. The outcomes showed that the selected variables form a long-term equilibrium association (Olayungbo, 2019; Umer, 2016). On the other hand, the FTSE 100 Index was employed for the UK, as well as similar macro-economic stimuli, to examine the existence of equilibrium long-term relationships. The outcomes showed that an equilibrium long-term link existed for the UK's equity as well (Lee and Brahmasrene, 2018). For the consumer price index ((Camilleri, Scicluna and Bai, 2019; Umer, 2016; Eita, 2011) and foreign remittances (Ali, 2011a and Ali, 2011b), it is clear that there is a negative normalised cointegrating coefficient for Bangladesh, while the coefficient for these variables is positive with regards to the UK (Nasseh and Strauss, 2000; Adam and Tweneboah, 2008; (Yartey, 2010). Similarly, deposit interest rates (Siddiki, 2000) and per capita GDP (Jahfer and Inoue, 2017; Lescaroux and Mignon (2008) are negatively linked with stock price in Bangladesh as well as in the UK (Alam and Uddin, 2009). For foreign exchange rates compared with the US dollar, both Bangladesh and UK markets offer positive cointegrating coefficients (Lee and Brahmasrene, 2018; Giri and Joshi, 2017). International oil price has positive cointegrating evidence for Bangladesh (Lescaroux and Mignon, 2008); Olayungbo, 2019), but negative cointegrating evidence is shown for the UK (Demir, 2019).

Johansen's Cointegrating test ascertains that an equilibrium long-term connection is in place where cointegrating vectors exist throughout the specified variables (Rudra, Mak and Atanu, 2015); Daniel, 2017). This test was used for the two markets examined and found the presence of cointegrating vectors. As a result, it is stated that the Bangladesh and UK stock prices hold a long-term equilibrium connection with macro factors within their economies (Bruno, 1973; (Siddiki, 2000). The outcomes shown in Chapter 7(A) are in line with the results described in this thesis in previous sections.

Thirdly, the aim is to look into short-run relationship changes between shares and different macroeconomic variables across Bangladesh and the UK. VECM was considered to be the most suitable tool because it is commonly employed to calculate the short-run disequilibrium changes seen in the VAR model. Clearly in Chapter 6, the data shows that these explanations point towards a long-term equilibrium relationship existing between share price and other macro-economic factors in the case of Bangladesh (Jahfer and Inoue, 2017; Khan and Yousuf, 2013). Similarly, a long-run equilibrium link exists between share value and other specified real economic indicators in the case of the UK (Paul Ndubuisi, 2017). On the other hand, it is not obvious why this equilibrium relationship will exist in the short-run, which is potentially due to the variance in dynamic and contingent factors. When there is a comparison in place for Bangladesh and the UK, this data shows that the UK is able to fix the disequilibrium condition more efficiently than Bangladesh does. In addition, this finding highlights that when all specific macro factors are considered with the VAR model, stock price needs roughly 7.80 months to reach equilibrium condition, as it drops by 12.821% each month. Conversely, the FTSE 100 stock price drops by 23.697% monthly to reach long-run equilibrium in the future. Furthermore, this finding shows that when all specific macroeconomic factors are considered with the VAR model, the stock price necessitates roughly 4.22 months to reach equilibrium (Bruce, 1997). With the economic view in mind, Bangladesh comes under a developing economy where macroeconomic expansion indicators are predicted as being satisfactory (Ahmed, 2000a). Contrarily, the UK has a more developed economy and so macroeconomic growth factors are probably very swift there (Krishnamurti and Vishwanath 2009; (Bruce, 1997). As a result, the data offers rational indicators of the speed of short-run disequilibrium changes in Bangladesh and the UK. The data gathered, through the investigation of the equilibrium of long-term links across macro factors and share values within the comparative study between Bangladesh and the UK's stock markets in Chapter 7(B), follow these views.

Fourth, T-Y Causation analysis is thought of as suitable for looking into the long-run multivariate dynamic causal evidence existing between various variables at the same time. For this research, the test was used to look into the causal evidence existing amongst individual economic pointers and share values for Bangladesh and the UK. When it comes to macroeconomic development and growth for Bangladesh and the UK, the causal evidence between stock price and macroeconomic variable*s* offers varying outcomes for these two nations. For Bangladesh, a causal bi-directional link has been pinpointed between balance of trade and stock price (Mishra and Gupta, 2014). Furthermore, unidirectional causal evidence is discovered between consumer price index and stock price (Camilleri, Scicluna and Bai, 2019; Mazuruse, 2014). Additionally, there is a unidirectional correlation with stock price in Bangladesh with money supply (Umer, 2016; Baillie, Chung, and Tieslau, 1996), as well as with deposit interest rates against stock price (Amarasinghe, 2015; Wasseja et al., 2015), broad money supply against stock price (Hussain and Ahmad, 2015), per capita GDP against stock price and foreign remittance against stock price (Ali, 2011). On other hand, it was shown that consumer price index (Solnik, 1983; Paul Ndubuisi, 2017) and international oil price Granger Impact Stock Prices (FTSE 100) in the UK stock market (Park and Ratti, 2008). With these exceptions, there was no causal evidence (unidirectional or bidirectional) noted for the UK economy (Smith, 1992 and Morley and Pentecost, 2000). Clearly stock prices of Bangladesh are impacted by many macroeconomic variables, as opposed to stock prices in the UK, which are shown to be more or less insensitive to most adjustments in macroeconomic variables. These disparities between the macroeconomic impacts for stock prices can be because of variance in macroeconomic stability between Bangladesh and the UK. Bangladesh is an emerging economy, with a number of financial, environmental and administrative problems that need to be dealt with (Ahmed, 1998). Correspondingly, expertise is not extensive, and there is market inefficiency, political unrest and clashes ongoing, these factors, together with natural disasters, mean that the economy cannot consistently improve (Ahmed, 2002). Furthermore, investors do not have strong motivation to engage in the stock market, and these decisions are affected greatly by rumours and noise trading and thus the market efficiency is lower. As a result, macroeconomic elements have a great effect on Bangladesh stock prices for a large period (Ahmed, 2000b). At the same time, the UK is a more developed country, with a friendlier business environment, together with economic, political and institutional growth allowing for consistency when it comes to macroeconomic stability. In its history, the UK has had a mostly consistent market, which is able to handle negative happenings within a small timeframe, and has stable stock markets. Due to this fact, once these situations arise, stock prices are not impacted as much and are impacted for a shorter period of time, and so the UK equities are considered to not be as sensitive to macroeconomic performance variance. Furthermore, the UK stock markets have strong connections with the US markets, and thus any movement in the US share market has a consequence on the UK stock. Thus, UK stock markets have a weaker link with UK macroeconomic performance than they would have under other circumstances. The outcomes shown in Chapter 8 are in line with the results described in this research's previous sections.

This thesis investigates the LSE and DSE with regards to specific macroeconomic variables that affect how stakeholder groups make effective managerial, operational and sustainable growth decisions. Regulators are able to Investment based upon forecasted share activity. Stakeholders have the ability to utilise data to estimate the dividends possible from the stock market. Lastly, effective trading across the two markets is for the benefit of the entire nation, in both Bangladesh and the United Kingdom.

Future Research Avenues

This section describes the general impact of this current research study's findings. Recommendations for the research design and methods of data analysis are also discussed, and future research recommendations are made, especially when it comes to the Bangladeshi context. It should be stated that proposals for further research are provided throughout the chapter.

This research study aimed at dealing with numerous problems regarding the different elements of market efficiency with a comparison between emerging and developed stock markets, specifically Bangladesh and the United Kingdom, through advanced econometric approaches. The existing literature examining the efficient market and market effectiveness of both equity markets hypotheses have been investigated and evaluated, as well as that which calculated and contrasted the equilibrium long-term connection of certain share values and economic indicators. Furthermore, literary work pinpointed and appraised the rapidity of short-run disequilibrium adjustment between share values and certain real economic factors, and there was an examination of whether a dynamic, causal link is possible between certain macro factors and share values. An evaluation of the degree to which the UK and Bangladeshi Stock Markets exhibit the Random Walk Hypothesis was also conducted, in order to show international growth across the two markets, which is a factor impacting the level of capital resources coming in. Lastly, the researcher created a model for the operation of the London Stock Exchange to find if the model offers any guidance for Bangladesh stock markets in relation to market efficiency.

This research study has attempted to offer a detailed and in-depth examination of these problems, and recommendations can thus be offered.

Firstly, due to the nature of academic studies, recommendations can be made regarding the sample examined. The quantitative part of this research examined stock price information for two stock markets, which are geographically positioned within the European Union and South Asian region. The LSE is more aged and is larger in scale, meaning that data regarding its stock price or macro variables can be found online, Bangladesh, however, is a newer market, meaning that its short history does not allow for methodologically reliable empirical analysis, since data are unlikely to be substantial enough. Also, this thesis employed, monthly, weekly and diurnal data, roughly across 20.5 years. Further data exists from 1988 to 1995, but this is not digitalised. Even though there is a lack of manually distributed data, the thesis offers a crucial step with regards to modelling Bangladeshi shares, while offering a platform from which research can investigate further data as it is created in this developing country.

This study only examines the South Asian country of Bangladesh, and the relationships between the developed United Kingdom markets and Bangladeshi markets. However, although this research study can offer information for investors in developed nations, more detailed research is needed for understanding the links between the markets of Bangladesh and those of the US & Japan, which could be necessary for foreign investors if they were to commit to purchasing Bangladeshi stocks. Investigating the way in which the advanced US markets and Japanese markets impact the emerging markets of Bangladesh could offer important insight.

Further research can look into the reasons behind different domestic and global elements being crucial in certain countries. Potential causes for this could be the disparity improvements in market structures, inconsistencies in the financial liberalisation processes and tax systems occurring in that region. Also, future research can look into the informational content of different macroeconomic variables when finding the reasons for equity returns. Since earlier studies examine other variables, such as fundamental factors like PE ratio, dividend yield, turnover and size, these can be employed to clarify stock return (Fifield and Power, 2006). As a result, forthcoming studies involving financial as well as fundamental factors can be beneficial.

Further research can investigate a greater number of variables in the model which do not need to rely on the assumption that shareholders consistently act in a rational way, this implies including variables that are linked with the behavioural elements of the investors when trading in the stock market. This is linked with the Adaptive Markets Hypothesis and its capacity to define complicated trading environments. In particular, AMH can describe loss aversion, overreaction, and behavioural biases, due to its focus on trading strategies which can change, rather than expecting investors to be entirely rational and make perfect capital allocations. AMH additionally states that rather than offering one outlook on economy functions, finance theory and its application alone, it rather pushes the economy, and where a change in financial theory can impact the economy at large. To provide a deeper explanation of the current research and how it benefits investors, AMH could be a key future research area.

All academic research is incomplete to an extent, and this research is no exception. Through technological, communication and regional and global economic progress, developing nations develop rapidly. Under these circumstances, the trends equities change after a while; hence, to fully analyse these nations is impossible. However, this thesis describes the studying procedure of the academic and increases the available knowledge pool regarding this crucial matter. This ought to become a starting point for forthcoming studies into this research avenue regarding market efficiency as well as international portfolios in developing equity markets on a wider scale, specifically in the South Asian region.

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Appendix

Chapter 7(A)-BD ADF Test

Null Hypothesis: DGEN has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.025036	0.5843
Test critical values:	1% level	-3.995800	
	5% level	-3.428198	
	10% level	-3.137485	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DGEN)
Method: Least Squares
Date: 07/11/18 Time: 14:00
Sample (adjusted): 1998M02 2018M06
Included observations: 246 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DGEN(-1)	-0.031986	0.015795	-2.025036	0.0440
C	-9.568395	37.11706	-0.257790	0.7968
@TREND("1998M01")	0.719090	0.407366	1.765218	0.0788

R-squared	0.016937	Mean dependent var	16.15122
Adjusted R-squared	0.008846	S.D. dependent var	284.3486
S.E. of regression	283.0882	Akaike info criterion	14.14151
Sum squared resid	19473765	Schwarz criterion	14.18426
Log likelihood	-1736.406	Hannan-Quinn criter.	14.15873
F-statistic	2.093248	Durbin-Watson stat	1.774491
Prob(F-statistic)	0.125504		

Null Hypothesis: D(DGEN) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-14.08256	0.0000
Test critical values:	1% level	-3.995956	
	5% level	-3.428273	
	10% level	-3.137529	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DGEN,2)
Method: Least Squares
Date: 07/11/18 Time: 14:03
Sample (adjusted): 1998M03 2018M06
Included observations: 245 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DGEN(-1))	-0.900916	0.063974	-14.08256	0.0000
C	6.431648	36.70803	0.175211	0.8611
@TREND("1998M01")	0.065775	0.257183	0.255751	0.7984

R-squared	0.450399	Mean dependent var	-0.182367
Adjusted R-squared	0.445857	S.D. dependent var	382.3824
S.E. of regression	284.6485	Akaike info criterion	14.15256
Sum squared resid	19607996	Schwarz criterion	14.19543
Log likelihood	-1730.688	Hannan-Quinn criter.	14.16982
F-statistic	99.15963	Durbin-Watson stat	1.992106
Prob(F-statistic)	0.000000		

Null Hypothesis: BDBOT has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.482217	0.0000
Test critical values:	1% level	-3.995956	
	5% level	-3.428273	
	10% level	-3.137529	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(BDBOT)
Method: Least Squares
Date: 07/11/18 Time: 14:07
Sample (adjusted): 1998M03 2018M06
Included observations: 245 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BDBOT(-1)	-0.601461	0.080385	-7.482217	0.0000
D(BDBOT(-1))	-0.277134	0.062226	-4.453628	0.0000
C	-1.454065	26.86577	-0.054123	0.9569
@TREND("1998M01")	-1.405514	0.260385	-5.397829	0.0000

R-squared	0.458327	Mean dependent var	-3.323191
Adjusted R-squared	0.451584	S.D. dependent var	281.2701
S.E. of regression	208.2949	Akaike info criterion	13.53198
Sum squared resid	10456214	Schwarz criterion	13.58914
Log likelihood	-1653.667	Hannan-Quinn criter.	13.55500
F-statistic	67.97256	Durbin-Watson stat	1.979411
Prob(F-statistic)	0.000000		

Null Hypothesis: BDCPI has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 12 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.484969	0.9992
Test critical values:	1% level	-3.997758	
	5% level	-3.429146	
	10% level	-3.138043	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(BDCPI)
Method: Least Squares
Date: 07/11/18 Time: 14:11
Sample (adjusted): 1999M02 2018M06
Included observations: 234 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BDCPI(-1)	0.003255	0.006712	0.484969	0.6282
D(BDCPI(-1))	-0.053696	0.035176	-1.526501	0.1283
D(BDCPI(-2))	-0.053846	0.035068	-1.535462	0.1261
D(BDCPI(-3))	-0.053996	0.034962	-1.544402	0.1239
D(BDCPI(-4))	-0.054146	0.034858	-1.553318	0.1218
D(BDCPI(-5))	-0.054296	0.034756	-1.562209	0.1197
D(BDCPI(-6))	-0.054446	0.034655	-1.571071	0.1176
D(BDCPI(-7))	-0.053498	0.034276	-1.560801	0.1200
D(BDCPI(-8))	-0.053655	0.034186	-1.569522	0.1180
D(BDCPI(-9))	-0.053813	0.034098	-1.578192	0.1160
D(BDCPI(-10))	-0.053971	0.034012	-1.586807	0.1140
D(BDCPI(-11))	-0.054129	0.033929	-1.595367	0.1121
D(BDCPI(-12))	0.975976	0.033847	28.83474	0.0000
C	-0.206124	0.410729	-0.501849	0.6163
@TREND("1998M01")	0.002323	0.004158	0.558571	0.5770

R-squared	0.911672	Mean dependent var	0.910897
Adjusted R-squared	0.906025	S.D. dependent var	3.682234
S.E. of regression	1.128800	Akaike info criterion	3.142144
Sum squared resid	279.0477	Schwarz criterion	3.363639
Log likelihood	-352.6308	Hannan-Quinn criter.	3.231450
F-statistic	161.4563	Durbin-Watson stat	1.955741
Prob(F-statistic)	0.000000		

Null Hypothesis: D(BDCPI) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 11 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.193279	0.4907
Test critical values:	1% level	-3.997758	
	5% level	-3.429146	
	10% level	-3.138043	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(BDCPI,2)
Method: Least Squares
Date: 07/11/18 Time: 14:12
Sample (adjusted): 1999M02 2018M06
Included observations: 234 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BDCPI(-1))	-0.492747	0.224662	-2.193279	0.0293
D(BDCPI(-1),2)	-0.549445	0.207458	-2.648460	0.0087
D(BDCPI(-2),2)	-0.591903	0.190158	-3.112693	0.0021
D(BDCPI(-3),2)	-0.634627	0.172764	-3.673374	0.0003
D(BDCPI(-4),2)	-0.677616	0.155281	-4.363797	0.0000
D(BDCPI(-5),2)	-0.720871	0.137717	-5.234441	0.0000
D(BDCPI(-6),2)	-0.764391	0.120082	-6.365563	0.0000
D(BDCPI(-7),2)	-0.808005	0.102131	-7.911470	0.0000
D(BDCPI(-8),2)	-0.851898	0.084023	-10.13886	0.0000
D(BDCPI(-9),2)	-0.896070	0.065721	-13.63448	0.0000
D(BDCPI(-10),2)	-0.940522	0.047126	-19.95744	0.0000
D(BDCPI(-11),2)	-0.985252	0.027876	-35.34457	0.0000
C	-0.022601	0.159392	-0.141794	0.8874
@TREND("1998M01")	0.004113	0.001912	2.150598	0.0326

R-squared	0.958515	Mean dependent var	-0.022222
Adjusted R-squared	0.956063	S.D. dependent var	5.375858
S.E. of regression	1.126837	Akaike info criterion	3.134670
Sum squared resid	279.3473	Schwarz criterion	3.341399
Log likelihood	-352.7564	Hannan-Quinn criter.	3.218023
F-statistic	391.0075	Durbin-Watson stat	1.969762
Prob(F-statistic)	0.000000		

Null Hypothesis: BDDIR has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.773942	0.7146
Test critical values:	1% level	-3.995800	
	5% level	-3.428198	
	10% level	-3.137485	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(BDDIR)
Method: Least Squares
Date: 07/11/18 Time: 14:14
Sample (adjusted): 1998M02 2018M06
Included observations: 246 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BDDIR(-1)	-0.026100	0.014713	-1.773942	0.0773
C	0.130868	0.089726	1.458525	0.1460
@TREND("1998M01")	0.000392	0.000173	2.264979	0.0244

R-squared	0.022946	Mean dependent var	0.006138
Adjusted R-squared	0.014904	S.D. dependent var	0.169281
S.E. of regression	0.168015	Akaike info criterion	-0.717412
Sum squared resid	6.859622	Schwarz criterion	-0.674664
Log likelihood	91.24166	Hannan-Quinn criter.	-0.700199
F-statistic	2.853361	Durbin-Watson stat	1.894323
Prob(F-statistic)	0.059584		

Null Hypothesis: D(BDDIR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-14.94338	0.0000
Test critical values:	1% level	-3.995956	
	5% level	-3.428273	
	10% level	-3.137529	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(BDDIR,2)
Method: Least Squares
Date: 07/11/18 Time: 14:17
Sample (adjusted): 1998M03 2018M06
Included observations: 245 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BDDIR(-1))	-0.959867	0.064234	-14.94338	0.0000
C	-0.023108	0.021885	-1.055876	0.2921
@TREND("1998M01")	0.000234	0.000154	1.523449	0.1290

R-squared	0.479912	Mean dependent var	0.000286
Adjusted R-squared	0.475614	S.D. dependent var	0.233799
S.E. of regression	0.169305	Akaike info criterion	-0.702064
Sum squared resid	6.936708	Schwarz criterion	-0.659192
Log likelihood	89.00285	Hannan-Quinn criter.	-0.684799
F-statistic	111.6530	Durbin-Watson stat	2.002806
Prob(F-statistic)	0.000000		

Null Hypothesis: BDEXR has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.670549	0.2499
Test critical values:	1% level	-3.995956	
	5% level	-3.428273	
	10% level	-3.137529	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(BDEXR)
Method: Least Squares
Date: 07/11/18 Time: 14:20
Sample (adjusted): 1998M03 2018M06
Included observations: 245 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BDEXR(-1)	-0.045363	0.016986	-2.670549	0.0081
D(BDEXR(-1))	0.216578	0.062781	3.449706	0.0007
C	1.750398	0.614083	2.850424	0.0047
@TREND("1998M01")	0.008132	0.003073	2.646110	0.0087

R-squared	0.065759	Mean dependent var	0.157602
Adjusted R-squared	0.054129	S.D. dependent var	0.578758
S.E. of regression	0.562876	Akaike info criterion	1.704677
Sum squared resid	76.35586	Schwarz criterion	1.761840
Log likelihood	-204.8229	Hannan-Quinn criter.	1.727696
F-statistic	5.654470	Durbin-Watson stat	1.992414
Prob(F-statistic)	0.000927		

Null Hypothesis: D(BDEXR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-12.76596	0.0000
Test critical values:	1% level	-3.995956	
	5% level	-3.428273	
	10% level	-3.137529	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(BDEXR,2)
Method: Least Squares
Date: 07/11/18 Time: 14:21
Sample (adjusted): 1998M03 2018M06
Included observations: 245 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BDEXR(-1))	-0.804881	0.063049	-12.76596	0.0000
C	0.122137	0.074079	1.648747	0.1005
@TREND("1998M01")	3.80E-05	0.000515	0.073837	0.9412

R-squared	0.402430	Mean dependent var	1.63E-06
Adjusted R-squared	0.397491	S.D. dependent var	0.734285
S.E. of regression	0.569962	Akaike info criterion	1.725677
Sum squared resid	78.61543	Schwarz criterion	1.768549
Log likelihood	-208.3954	Hannan-Quinn criter.	1.742941
F-statistic	81.48668	Durbin-Watson stat	1.983488
Prob(F-statistic)	0.000000		

Null Hypothesis: BDPCAPGDP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 12 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.969280	0.9999
Test critical values:	1% level	-3.997758	
	5% level	-3.429146	
	10% level	-3.138043	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(BDPCAPGDP)
Method: Least Squares
Date: 07/11/18 Time: 14:24
Sample (adjusted): 1999M02 2018M06
Included observations: 234 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BDPCAPGDP(-1)	0.012776	0.013181	0.969280	0.3335
D(BDPCAPGDP(-1))	-0.071732	0.058194	-1.232634	0.2190
D(BDPCAPGDP(-2))	-0.087875	0.059203	-1.484299	0.1392
D(BDPCAPGDP(-3))	-0.084961	0.058806	-1.444780	0.1499
D(BDPCAPGDP(-4))	-0.085726	0.058786	-1.458266	0.1462
D(BDPCAPGDP(-5))	-0.085371	0.058496	-1.459437	0.1459
D(BDPCAPGDP(-6))	-0.087481	0.059533	-1.469457	0.1431
D(BDPCAPGDP(-7))	-0.077190	0.059390	-1.299725	0.1951
D(BDPCAPGDP(-8))	-0.080848	0.060600	-1.334121	0.1835
D(BDPCAPGDP(-9))	-0.076099	0.060276	-1.262500	0.2081
D(BDPCAPGDP(-10))	-0.093824	0.060301	-1.555940	0.1212
D(BDPCAPGDP(-11))	-0.022589	0.060041	-0.376226	0.7071
D(BDPCAPGDP(-12))	0.781489	0.060554	12.90558	0.0000
C	-162.0878	122.7586	-1.320379	0.1881
@TREND("1998M01")	0.843559	1.989997	0.423899	0.6721

R-squared	0.606019	Mean dependent var	270.1349
Adjusted R-squared	0.580833	S.D. dependent var	1139.063
S.E. of regression	737.4649	Akaike info criterion	16.10627
Sum squared resid	1.19E+08	Schwarz criterion	16.32776
Log likelihood	-1869.434	Hannan-Quinn criter.	16.19558
F-statistic	24.06174	Durbin-Watson stat	1.874870
Prob(F-statistic)	0.000000		

Null Hypothesis: D(BDPCAPGDP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 11 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.668122	0.2510
Test critical values:	1% level	-3.997758	
	5% level	-3.429146	
	10% level	-3.138043	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(BDPCAPGDP,2)
Method: Least Squares
Date: 07/11/18 Time: 14:26
Sample (adjusted): 1999M02 2018M06
Included observations: 234 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BDPCAPGDP(-1))	-0.696063	0.260881	-2.668122	0.0082
D(BDPCAPGDP(-1),2)	-0.342095	0.244381	-1.399841	0.1630
D(BDPCAPGDP(-2),2)	-0.394672	0.225398	-1.750999	0.0813
D(BDPCAPGDP(-3),2)	-0.444953	0.206805	-2.151559	0.0325
D(BDPCAPGDP(-4),2)	-0.496114	0.188040	-2.638340	0.0089
D(BDPCAPGDP(-5),2)	-0.547448	0.169188	-3.235731	0.0014
D(BDPCAPGDP(-6),2)	-0.599660	0.150635	-3.980868	0.0001
D(BDPCAPGDP(-7),2)	-0.649588	0.131629	-4.934970	0.0000
D(BDPCAPGDP(-8),2)	-0.701515	0.112130	-6.256271	0.0000
D(BDPCAPGDP(-9),2)	-0.749423	0.092438	-8.107337	0.0000
D(BDPCAPGDP(-10),2)	-0.815105	0.071834	-11.34707	0.0000
D(BDPCAPGDP(-11),2)	-0.810162	0.052830	-15.33529	0.0000
C	-111.2023	110.9514	-1.002261	0.3173
@TREND("1998M01")	2.464279	1.078839	2.284195	0.0233

R-squared	0.771200	Mean dependent var	-3.718120
Adjusted R-squared	0.757680	S.D. dependent var	1497.916
S.E. of regression	737.3635	Akaike info criterion	16.10200
Sum squared resid	1.20E+08	Schwarz criterion	16.30873
Log likelihood	-1869.934	Hannan-Quinn criter.	16.18536
F-statistic	57.04157	Durbin-Watson stat	1.904195
Prob(F-statistic)	0.000000		

Null Hypothesis: IOP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.751795	0.0208
Test critical values:	1% level	-3.995956	
	5% level	-3.428273	
	10% level	-3.137529	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(IOP)
Method: Least Squares
Date: 07/11/18 Time: 14:30
Sample (adjusted): 1998M03 2018M06
Included observations: 245 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IOP(-1)	-0.078389	0.020894	-3.751795	0.0002
D(IOP(-1))	0.293295	0.061286	4.785670	0.0000
C	-0.455492	0.681618	-0.668250	0.5046
@TREND("1998M01")	0.035769	0.010153	3.523086	0.0005

R-squared	0.118573	Mean dependent var	0.344898
Adjusted R-squared	0.107601	S.D. dependent var	5.502081
S.E. of regression	5.197644	Akaike info criterion	6.150480
Sum squared resid	6510.736	Schwarz criterion	6.207643
Log likelihood	-749.4338	Hannan-Quinn criter.	6.173499
F-statistic	10.80678	Durbin-Watson stat	2.016347
Prob(F-statistic)	0.000001		

Null Hypothesis: BDM2 has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 12 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		2.342782	1.0000
Test critical values:	1% level	-3.997758	
	5% level	-3.429146	
	10% level	-3.138043	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(BDM2)
Method: Least Squares
Date: 07/11/18 Time: 14:48
Sample (adjusted): 1999M02 2018M06
Included observations: 234 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BDM2(-1)	0.012061	0.005148	2.342782	0.0200
D(BDM2(-1))	-0.252655	0.054996	-4.594052	0.0000
D(BDM2(-2))	0.134883	0.057560	2.343336	0.0200
D(BDM2(-3))	-0.088889	0.057472	-1.546638	0.1234
D(BDM2(-4))	0.056228	0.058862	0.955252	0.3405
D(BDM2(-5))	-0.076966	0.055106	-1.396686	0.1639
D(BDM2(-6))	0.023024	0.055572	0.414304	0.6791
D(BDM2(-7))	-0.010799	0.058585	-0.184326	0.8539
D(BDM2(-8))	-0.264584	0.057987	-4.562779	0.0000
D(BDM2(-9))	0.025444	0.061135	0.416196	0.6777
D(BDM2(-10))	-0.085498	0.060649	-1.409714	0.1600
D(BDM2(-11))	-0.031918	0.061939	-0.515321	0.6068
D(BDM2(-12))	0.716064	0.059946	11.94511	0.0000
C	-338.1308	279.5250	-1.209662	0.2277
@TREND("1998M01")	3.582676	3.679776	0.973612	0.3313

R-squared	0.804058	Mean dependent var	2482.979
Adjusted R-squared	0.791532	S.D. dependent var	3450.425
S.E. of regression	1575.405	Akaike info criterion	17.62437
Sum squared resid	5.44E+08	Schwarz criterion	17.84586
Log likelihood	-2047.051	Hannan-Quinn criter.	17.71367
F-statistic	64.19129	Durbin-Watson stat	2.017556
Prob(F-statistic)	0.000000		

Null Hypothesis: D(BDM2) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 11 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.659525	0.9741
Test critical values:	1% level	-3.997758	
	5% level	-3.429146	
	10% level	-3.138043	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(BDM2,2)
Method: Least Squares
Date: 07/11/18 Time: 14:50
Sample (adjusted): 1999M02 2018M06
Included observations: 234 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BDM2(-1))	-0.073792	0.111887	-0.659525	0.5102
D(BDM2(-1),2)	-1.116297	0.113537	-9.832027	0.0000
D(BDM2(-2),2)	-0.914201	0.119388	-7.657428	0.0000
D(BDM2(-3),2)	-0.943338	0.119580	-7.888760	0.0000
D(BDM2(-4),2)	-0.819511	0.117073	-6.999982	0.0000
D(BDM2(-5),2)	-0.843329	0.117700	-7.165057	0.0000
D(BDM2(-6),2)	-0.764463	0.118070	-6.474656	0.0000
D(BDM2(-7),2)	-0.707151	0.110523	-6.398242	0.0000
D(BDM2(-8),2)	-0.907129	0.101415	-8.944726	0.0000
D(BDM2(-9),2)	-0.807195	0.093862	-8.599774	0.0000
D(BDM2(-10),2)	-0.826977	0.080873	-10.22566	0.0000
D(BDM2(-11),2)	-0.783642	0.053083	-14.76247	0.0000
C	-240.7595	279.2234	-0.862247	0.3895
@TREND("1998M01")	5.826684	3.588990	1.623488	0.1059

R-squared	0.874099	Mean dependent var	44.62436
Adjusted R-squared	0.866660	S.D. dependent var	4358.104
S.E. of regression	1591.395	Akaike info criterion	17.64057
Sum squared resid	5.57E+08	Schwarz criterion	17.84730
Log likelihood	-2049.947	Hannan-Quinn criter.	17.72393
F-statistic	117.4931	Durbin-Watson stat	2.073713
Prob(F-statistic)	0.000000		

Null Hypothesis: BDREMIT has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 14 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.230325	0.9013
Test critical values:	1% level	-3.998104	
	5% level	-3.429313	
	10% level	-3.138142	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(BDREMIT)
Method: Least Squares
Date: 07/11/18 Time: 14:52
Sample (adjusted): 1999M04 2018M06
Included observations: 232 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BDREMIT(-1)	-0.027734	0.022542	-1.230325	0.2199
D(BDREMIT(-1))	-0.479407	0.069930	-6.855551	0.0000
D(BDREMIT(-2))	-0.250207	0.077506	-3.228241	0.0014
D(BDREMIT(-3))	-0.075263	0.083914	-0.896907	0.3708
D(BDREMIT(-4))	-0.167415	0.087354	-1.916508	0.0566
D(BDREMIT(-5))	-0.108698	0.092581	-1.174086	0.2417
D(BDREMIT(-6))	-0.031266	0.099423	-0.314476	0.7535
D(BDREMIT(-7))	-0.104292	0.100915	-1.033461	0.3025
D(BDREMIT(-8))	-0.153190	0.101867	-1.503829	0.1341
D(BDREMIT(-9))	0.105154	0.107480	0.978366	0.3290
D(BDREMIT(-10))	0.013514	0.105526	0.128068	0.8982
D(BDREMIT(-11))	-0.073073	0.102582	-0.712334	0.4770
D(BDREMIT(-12))	0.210640	0.097536	2.159625	0.0319
D(BDREMIT(-13))	-0.182208	0.093387	-1.951106	0.0523
D(BDREMIT(-14))	0.211048	0.083592	2.524747	0.0123
C	-82.07973	67.67998	-1.212762	0.2266
@TREND("1998M01")	1.861350	0.869667	2.140303	0.0335

R-squared	0.524712	Mean dependent var	39.98959
Adjusted R-squared	0.489342	S.D. dependent var	503.8216
S.E. of regression	360.0327	Akaike info criterion	14.68072
Sum squared resid	27869062	Schwarz criterion	14.93328
Log likelihood	-1685.963	Hannan-Quinn criter.	14.78258
F-statistic	14.83484	Durbin-Watson stat	1.986920
Prob(F-statistic)	0.000000		

Null Hypothesis: D(BDREMIT) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 13 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.521181	0.0394
Test critical values:	1% level	-3.998104	
	5% level	-3.429313	
	10% level	-3.138142	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(BDREMIT,2)
Method: Least Squares
Date: 07/11/18 Time: 14:54
Sample (adjusted): 1999M04 2018M06
Included observations: 232 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BDREMIT(-1))	-2.554177	0.725375	-3.521181	0.0005
D(BDREMIT(-1),2)	1.050863	0.707619	1.485069	0.1390
D(BDREMIT(-2),2)	0.779743	0.686062	1.136550	0.2570
D(BDREMIT(-3),2)	0.677694	0.653275	1.037380	0.3007
D(BDREMIT(-4),2)	0.480544	0.616797	0.779096	0.4368
D(BDREMIT(-5),2)	0.337301	0.572261	0.589418	0.5562
D(BDREMIT(-6),2)	0.264983	0.518866	0.510696	0.6101
D(BDREMIT(-7),2)	0.117978	0.462424	0.255130	0.7989
D(BDREMIT(-8),2)	-0.078219	0.403161	-0.194014	0.8463
D(BDREMIT(-9),2)	-0.019496	0.341381	-0.057111	0.9545
D(BDREMIT(-10),2)	-0.049605	0.277764	-0.178588	0.8584
D(BDREMIT(-11),2)	-0.161871	0.212205	-0.762805	0.4464
D(BDREMIT(-12),2)	0.015728	0.149134	0.105463	0.9161
D(BDREMIT(-13),2)	-0.193645	0.082484	-2.347663	0.0198
C	-34.45096	55.58114	-0.619832	0.5360
@TREND("1998M01")	1.001302	0.517975	1.933108	0.0545

R-squared	0.842193	Mean dependent var	6.035194
Adjusted R-squared	0.831234	S.D. dependent var	877.4356
S.E. of regression	360.4606	Akaike info criterion	14.67911
Sum squared resid	28065273	Schwarz criterion	14.91682
Log likelihood	-1686.777	Hannan-Quinn criter.	14.77498
F-statistic	76.85059	Durbin-Watson stat	1.982346
Prob(F-statistic)	0.000000		

Null Hypothesis: USTBR has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 2 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.462711	0.3465
Test critical values:	1% level	-3.996113	
	5% level	-3.428349	
	10% level	-3.137574	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(USTBR)
Method: Least Squares
Date: 07/11/18 Time: 14:57
Sample (adjusted): 1998M04 2018M06
Included observations: 244 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
USTBR(-1)	-0.023023	0.009349	-2.462711	0.0145
D(USTBR(-1))	0.158168	0.061592	2.567997	0.0108
D(USTBR(-2))	0.274226	0.061694	4.444956	0.0000
C	0.145918	0.060005	2.431753	0.0158
@TREND("1998M01")	-0.000681	0.000282	-2.414671	0.0165

R-squared	0.141370	Mean dependent var	-0.011967
Adjusted R-squared	0.127000	S.D. dependent var	0.222178
S.E. of regression	0.207591	Akaike info criterion	-0.286214
Sum squared resid	10.29949	Schwarz criterion	-0.214550
Log likelihood	39.91805	Hannan-Quinn criter.	-0.257352
F-statistic	9.837600	Durbin-Watson stat	2.066960
Prob(F-statistic)	0.000000		

Null Hypothesis: D(USTBR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.411060	0.0000
Test critical values:	1% level	-3.996113	
	5% level	-3.428349	
	10% level	-3.137574	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(USTBR,2)
Method: Least Squares
Date: 07/11/18 Time: 15:01
Sample (adjusted): 1998M04 2018M06
Included observations: 244 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(USTBR(-1))	-0.579257	0.078161	-7.411060	0.0000
D(USTBR(-1),2)	-0.265325	0.062234	-4.263334	0.0000
C	0.014015	0.027339	0.512649	0.6087
@TREND("1998M01")	-0.000168	0.000192	-0.874682	0.3826

R-squared	0.436947	Mean dependent var	0.000164
Adjusted R-squared	0.429909	S.D. dependent var	0.277825
S.E. of regression	0.209770	Akaike info criterion	-0.269351
Sum squared resid	10.56085	Schwarz criterion	-0.212020
Log likelihood	36.86077	Hannan-Quinn criter.	-0.246261
F-statistic	62.08246	Durbin-Watson stat	2.053910
Prob(F-statistic)	0.000000		

Chapter 7(A)-BD P-P Test

Null Hypothesis: DGEN has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.125973	0.5283
Test critical values:	1% level	-3.995800	
	5% level	-3.428198	
	10% level	-3.137485	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	79161.65
HAC corrected variance (Bartlett kernel)	88076.41

Phillips-Perron Test Equation
Dependent Variable: D(DGEN)
Method: Least Squares
Date: 07/12/18 Time: 18:20
Sample (adjusted): 1998M02 2018M06
Included observations: 246 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DGEN(-1)	-0.031986	0.015795	-2.025036	0.0440
C	-9.568395	37.11706	-0.257790	0.7968
@TREND("1998M01")	0.719090	0.407366	1.765218	0.0788

R-squared	0.016937	Mean dependent var	16.15122
Adjusted R-squared	0.008846	S.D. dependent var	284.3486
S.E. of regression	283.0882	Akaike info criterion	14.14151
Sum squared resid	19473765	Schwarz criterion	14.18426
Log likelihood	-1736.406	Hannan-Quinn criter.	14.15873
F-statistic	2.093248	Durbin-Watson stat	1.774491
Prob(F-statistic)	0.125504		

Null Hypothesis: D(DGEN) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-14.06021	0.0000
Test critical values:	1% level	-3.995956	
	5% level	-3.428273	
	10% level	-3.137529	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	80032.64
HAC corrected variance (Bartlett kernel)	77483.77

Phillips-Perron Test Equation
Dependent Variable: D(DGEN,2)
Method: Least Squares
Date: 07/12/18 Time: 18:23
Sample (adjusted): 1998M03 2018M06
Included observations: 245 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DGEN(-1))	-0.900916	0.063974	-14.08256	0.0000
C	6.431648	36.70803	0.175211	0.8611
@TREND("1998M01")	0.065775	0.257183	0.255751	0.7984

R-squared	0.450399	Mean dependent var	-0.182367
Adjusted R-squared	0.445857	S.D. dependent var	382.3824
S.E. of regression	284.6485	Akaike info criterion	14.15256
Sum squared resid	19607996	Schwarz criterion	14.19543
Log likelihood	-1730.688	Hannan-Quinn criter.	14.16982
F-statistic	99.15963	Durbin-Watson stat	1.992106
Prob(F-statistic)	0.000000		

Null Hypothesis: BDBOT has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 7 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-14.01308	0.0000
Test critical values:	1% level	-3.995800	
	5% level	-3.428198	
	10% level	-3.137485	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	46038.86
HAC corrected variance (Bartlett kernel)	73257.51

Phillips-Perron Test Equation
Dependent Variable: D(BDBOT)
Method: Least Squares
Date: 07/12/18 Time: 18:27
Sample (adjusted): 1998M02 2018M06
Included observations: 246 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BDBOT(-1)	-0.831746	0.063584	-13.08109	0.0000
C	-4.632797	27.61855	-0.167742	0.8669
@TREND("1998M01")	-1.908741	0.240443	-7.938438	0.0000

R-squared	0.413292	Mean dependent var	-3.309682
Adjusted R-squared	0.408463	S.D. dependent var	280.6956
S.E. of regression	215.8871	Akaike info criterion	13.59951
Sum squared resid	11325559	Schwarz criterion	13.64226
Log likelihood	-1669.740	Hannan-Quinn criter.	13.61672
F-statistic	85.58754	Durbin-Watson stat	2.082375
Prob(F-statistic)	0.000000		

Null Hypothesis: BDCPI has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 16 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		0.228077	0.9981
Test critical values:	1% level	-3.995800	
	5% level	-3.428198	
	10% level	-3.137485	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	12.67379
HAC corrected variance (Bartlett kernel)	5.280696

Phillips-Perron Test Equation
Dependent Variable: D(BDCPI)
Method: Least Squares
Date: 07/12/18 Time: 18:29
Sample (adjusted): 1998M02 2018M076
Included observations: 246 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BDCPI(-1)	-0.010257	0.013070	-0.784816	0.4333
C	0.637352	0.908144	0.701819	0.4835
@TREND("1998M01")	0.015143	0.010852	1.395474	0.1641

R-squared	0.021606	Mean dependent var	0.887602
Adjusted R-squared	0.013553	S.D. dependent var	3.606458
S.E. of regression	3.581935	Akaike info criterion	5.401804
Sum squared resid	3117.753	Schwarz criterion	5.444552
Log likelihood	-661.4218	Hannan-Quinn criter.	5.419016
F-statistic	2.683071	Durbin-Watson stat	2.146358
Prob(F-statistic)	0.070378		

Null Hypothesis: D(BDCPI) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 19 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-20.78585	0.0000
Test critical values:	1% level	-3.995956	
	5% level	-3.428273	
	10% level	-3.137529	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	12.67192
HAC corrected variance (Bartlett kernel)	3.840548

Phillips-Perron Test Equation
Dependent Variable: D(BDCPI,2)
Method: Least Squares
Date: 07/12/18 Time: 18:30
Sample (adjusted): 1998M03 2018M06
Included observations: 245 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BDCPI(-1))	-1.082075	0.064098	-16.88170	0.0000
C	0.022480	0.461873	0.048671	0.9612
@TREND("1998M01")	0.007596	0.003268	2.324251	0.0209

R-squared	0.540792	Mean dependent var	0.000000
Adjusted R-squared	0.536997	S.D. dependent var	5.263865
S.E. of regression	3.581761	Akaike info criterion	5.401755
Sum squared resid	3104.620	Schwarz criterion	5.444628
Log likelihood	-658.7150	Hannan-Quinn criter.	5.419020
F-statistic	142.4974	Durbin-Watson stat	2.013606
Prob(F-statistic)	0.000000		

Null Hypothesis: BDDIR has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.112107	0.5361
Test critical values:	1% level	-3.995800	
	5% level	-3.428198	
	10% level	-3.137485	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.027885
HAC corrected variance (Bartlett kernel)	0.039213

Phillips-Perron Test Equation
Dependent Variable: D(BDDIR)
Method: Least Squares
Date: 07/12/18 Time: 18:32
Sample (adjusted): 1998M02 2018M06
Included observations: 246 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BDDIR(-1)	-0.026100	0.014713	-1.773942	0.0773
C	0.130868	0.089726	1.458525	0.1460
@TREND("1998M01")	0.000392	0.000173	2.264979	0.0244

R-squared	0.022946	Mean dependent var	0.006138
Adjusted R-squared	0.014904	S.D. dependent var	0.169281
S.E. of regression	0.168015	Akaike info criterion	-0.717412
Sum squared resid	6.859622	Schwarz criterion	-0.674664
Log likelihood	91.24166	Hannan-Quinn criter.	-0.700199
F-statistic	2.853361	Durbin-Watson stat	1.894323
Prob(F-statistic)	0.059584		

Null Hypothesis: D(BDDIR) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-15.10606	0.0000
Test critical values:	1% level	-3.995956	
	5% level	-3.428273	
	10% level	-3.137529	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.028313
HAC corrected variance (Bartlett kernel)	0.035139

Phillips-Perron Test Equation
Dependent Variable: D(BDDIR,2)
Method: Least Squares
Date: 07/12/18 Time: 18:34
Sample (adjusted): 1998M03 2018M06
Included observations: 245 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BDDIR(-1))	-0.959867	0.064234	-14.94338	0.0000
C	-0.023108	0.021885	-1.055876	0.2921
@TREND("1998M01")	0.000234	0.000154	1.523449	0.1290

R-squared	0.479912	Mean dependent var	0.000286
Adjusted R-squared	0.475614	S.D. dependent var	0.233799
S.E. of regression	0.169305	Akaike info criterion	-0.702064
Sum squared resid	6.936708	Schwarz criterion	-0.659192
Log likelihood	89.00285	Hannan-Quinn criter.	-0.684799
F-statistic	111.6530	Durbin-Watson stat	2.002806
Prob(F-statistic)	0.000000		

Null Hypothesis: BDEXR has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.562686	0.2980
Test critical values:	1% level	-3.995800	
	5% level	-3.428198	
	10% level	-3.137485	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.325722
HAC corrected variance (Bartlett kernel)	0.448762

Phillips-Perron Test Equation
Dependent Variable: D(BDEXR)
Method: Least Squares
Date: 07/12/18 Time: 18:39
Sample (adjusted): 1998M02 2018M06
Included observations: 246 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BDEXR(-1)	-0.037961	0.017119	-2.217485	0.0275
C	1.515406	0.620851	2.440853	0.0154
@TREND("1998M01")	0.006833	0.003093	2.209020	0.0281

R-squared	0.019907	Mean dependent var	0.156961
Adjusted R-squared	0.011840	S.D. dependent var	0.577663
S.E. of regression	0.574233	Akaike info criterion	1.740557
Sum squared resid	80.12764	Schwarz criterion	1.783305
Log likelihood	-211.0885	Hannan-Quinn criter.	1.757769
F-statistic	2.467773	Durbin-Watson stat	1.581007
Prob(F-statistic)	0.086896		

Null Hypothesis: D(BDEXR) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-12.77646	0.0000
Test critical values:	1% level	-3.995956	
	5% level	-3.428273	
	10% level	-3.137529	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.320879
HAC corrected variance (Bartlett kernel)	0.323471

Phillips-Perron Test Equation
Dependent Variable: D(BDEXR,2)
Method: Least Squares
Date: 07/12/18 Time: 18:42
Sample (adjusted): 1998M03 2018M06
Included observations: 245 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BDEXR(-1))	-0.804881	0.063049	-12.76596	0.0000
C	0.122137	0.074079	1.648747	0.1005
@TREND("1998M01")	3.80E-05	0.000515	0.073837	0.9412

R-squared	0.402430	Mean dependent var	1.63E-06
Adjusted R-squared	0.397491	S.D. dependent var	0.734285
S.E. of regression	0.569962	Akaike info criterion	1.725677
Sum squared resid	78.61543	Schwarz criterion	1.768549
Log likelihood	-208.3954	Hannan-Quinn criter.	1.742941
F-statistic	81.48668	Durbin-Watson stat	1.983488
Prob(F-statistic)	0.000000		

Null Hypothesis: BDPCAPGDP has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 14 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		1.603428	1.0000
Test critical values:	1% level	-3.995800	
	5% level	-3.428198	
	10% level	-3.137485	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	1186117.
HAC corrected variance (Bartlett kernel)	534528.5

Phillips-Perron Test Equation
Dependent Variable: D(BDPCAPGDP)
Method: Least Squares
Date: 07/12/18 Time: 18:45
Sample (adjusted): 1998M02 2018M06
Included observations: 246 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BDPCAPGDP(-1)	0.003974	0.010262	0.387245	0.6989
C	-120.9708	140.9297	-0.858377	0.3915
@TREND("1998M01")	2.214863	2.353019	0.941285	0.3475

R-squared	0.038439	Mean dependent var	260.4943
Adjusted R-squared	0.030525	S.D. dependent var	1112.909
S.E. of regression	1095.792	Akaike info criterion	16.84846
Sum squared resid	2.92E+08	Schwarz criterion	16.89121
Log likelihood	-2069.361	Hannan-Quinn criter.	16.86568
F-statistic	4.857056	Durbin-Watson stat	1.801473
Prob(F-statistic)	0.008544		

Null Hypothesis: D(BDPCAPGDP) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 14 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-14.57375	0.0000
Test critical values:	1% level	-3.995956	
	5% level	-3.428273	
	10% level	-3.137529	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	1179059.
HAC corrected variance (Bartlett kernel)	515844.7

Phillips-Perron Test Equation
Dependent Variable: D(BDPCAPGDP,2)
Method: Least Squares
Date: 07/12/18 Time: 18:47
Sample (adjusted): 1998M03 2018M06
Included observations: 245 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BDPCAPGDP(-1))	-0.897176	0.063985	-14.02157	0.0000
C	-104.4104	141.1082	-0.739932	0.4601
@TREND("1998M01")	2.734465	1.006747	2.716138	0.0071

R-squared	0.448253	Mean dependent var	0.000000
Adjusted R-squared	0.443693	S.D. dependent var	1464.826
S.E. of regression	1092.554	Akaike info criterion	16.84259
Sum squared resid	2.89E+08	Schwarz criterion	16.88547
Log likelihood	-2060.218	Hannan-Quinn criter.	16.85986
F-statistic	98.30356	Durbin-Watson stat	1.976405
Prob(F-statistic)	0.000000		

Null Hypothesis: IOP has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.399692	0.0537
Test critical values:	1% level	-3.995800	
	5% level	-3.428198	
	10% level	-3.137485	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	28.99919
HAC corrected variance (Bartlett kernel)	42.72433

Phillips-Perron Test Equation
Dependent Variable: D(IOP)
Method: Least Squares
Date: 07/12/18 Time: 18:50
Sample (adjusted): 1998M02 2018M06
Included observations: 246 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IOP(-1)	-0.061836	0.021416	-2.887429	0.0042
C	-0.312109	0.703079	-0.443918	0.6575
@TREND("1998M01")	0.029123	0.010407	2.798495	0.0055

R-squared	0.034235	Mean dependent var	0.346179
Adjusted R-squared	0.026287	S.D. dependent var	5.490878
S.E. of regression	5.418229	Akaike info criterion	6.229535
Sum squared resid	7133.801	Schwarz criterion	6.272283
Log likelihood	-763.2328	Hannan-Quinn criter.	6.246748
F-statistic	4.307044	Durbin-Watson stat	1.445788
Prob(F-statistic)	0.014517		

Null Hypothesis: D(IOP) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-11.89139	0.0000
Test critical values:	1% level	-3.995956	
	5% level	-3.428273	
	10% level	-3.137529	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	28.12655
HAC corrected variance (Bartlett kernel)	26.90209

Phillips-Perron Test Equation
Dependent Variable: D(IOP,2)
Method: Least Squares
Date: 07/12/18 Time: 18:51
Sample (adjusted): 1998M03 2018M06
Included observations: 245 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(IOP(-1))	-0.743017	0.062130	-11.95897	0.0000
C	0.009668	0.688117	0.014050	0.9888
@TREND("1998M01")	0.002000	0.004823	0.414780	0.6787

R-squared	0.371459	Mean dependent var	0.005633
Adjusted R-squared	0.366265	S.D. dependent var	6.703161
S.E. of regression	5.336218	Akaike info criterion	6.199081
Sum squared resid	6891.005	Schwarz criterion	6.241953
Log likelihood	-756.3874	Hannan-Quinn criter.	6.216346
F-statistic	71.50941	Durbin-Watson stat	1.986882
Prob(F-statistic)	0.000000		

Null Hypothesis: BDM2 has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		8.789214	1.0000
Test critical values:	1% level	-3.995800	
	5% level	-3.428198	
	10% level	-3.137485	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	6348399.
HAC corrected variance (Bartlett kernel)	2595848.

Phillips-Perron Test Equation
Dependent Variable: D(BDM2)
Method: Least Squares
Date: 07/12/18 Time: 19:10
Sample (adjusted): 1998M02 2018M06
Included observations: 246 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BDM2(-1)	0.013409	0.002464	5.442239	0.0000
C	-385.0450	364.8000	-1.055496	0.2922
@TREND("1998M01")	3.613388	5.296183	0.682263	0.4957

R-squared	0.450461	Mean dependent var	2365.708
Adjusted R-squared	0.445938	S.D. dependent var	3405.786
S.E. of regression	2535.108	Akaike info criterion	18.52598
Sum squared resid	1.56E+09	Schwarz criterion	18.56873
Log likelihood	-2275.696	Hannan-Quinn criter.	18.54319
F-statistic	99.59444	Durbin-Watson stat	2.874425
Prob(F-statistic)	0.000000		

Null Hypothesis: D(BDM2) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 9 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-20.00861	0.0000
Test critical values:	1% level	-3.995956	
	5% level	-3.428273	
	10% level	-3.137529	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	6621590.
HAC corrected variance (Bartlett kernel)	15529271

Phillips-Perron Test Equation
Dependent Variable: D(BDM2,2)
Method: Least Squares
Date: 07/12/18 Time: 19:13
Sample (adjusted): 1998M03 2018M06
Included observations: 245 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BDM2(-1))	-1.271699	0.062145	-20.46343	0.0000
C	-1666.358	343.3767	-4.852856	0.0000
@TREND("1998M01")	37.70985	2.961690	12.73255	0.0000

R-squared	0.633779	Mean dependent var	40.79469
Adjusted R-squared	0.630752	S.D. dependent var	4260.863
S.E. of regression	2589.146	Akaike info criterion	18.56821
Sum squared resid	1.62E+09	Schwarz criterion	18.61109
Log likelihood	-2271.606	Hannan-Quinn criter.	18.58548
F-statistic	209.4015	Durbin-Watson stat	1.877049
Prob(F-statistic)	0.000000		

Null Hypothesis: BDREMIT has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 14 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.427500	0.3644
Test critical values:	1% level	-3.995800	
	5% level	-3.428198	
	10% level	-3.137485	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	228972.7
HAC corrected variance (Bartlett kernel)	144467.5

Phillips-Perron Test Equation
Dependent Variable: D(BDREMIT)
Method: Least Squares
Date: 07/12/18 Time: 19:18
Sample (adjusted): 1998M02 2018M06
Included observations: 246 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BDREMIT(-1)	-0.073797	0.024373	-3.027834	0.0027
C	-137.6987	73.96982	-1.861552	0.0639
@TREND("1998M01")	3.131232	0.995339	3.145896	0.0019

R-squared	0.039892	Mean dependent var	37.82584
Adjusted R-squared	0.031989	S.D. dependent var	489.3462
S.E. of regression	481.4557	Akaike info criterion	15.20363
Sum squared resid	56327292	Schwarz criterion	15.24637
Log likelihood	-1867.046	Hannan-Quinn criter.	15.22084
F-statistic	5.048200	Durbin-Watson stat	2.933086
Prob(F-statistic)	0.007111		

Null Hypothesis: D(BDREMIT) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 25 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-46.62155	0.0001
Test critical values:	1% level	-3.995956	
	5% level	-3.428273	
	10% level	-3.137529	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	167762.6
HAC corrected variance (Bartlett kernel)	42227.10

Phillips-Perron Test Equation
Dependent Variable: D(BDREMIT,2)
Method: Least Squares
Date: 07/12/18 Time: 19:20
Sample (adjusted): 1998M03 2018M06
Included observations: 245 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BDREMIT(-1))	-1.553210	0.054735	-28.37678	0.0000
C	-14.81105	53.14359	-0.278699	0.7807
@TREND("1998M01")	0.570978	0.372604	1.532401	0.1267

R-squared	0.768943	Mean dependent var	5.908510
Adjusted R-squared	0.767034	S.D. dependent var	853.8399
S.E. of regression	412.1193	Akaike info criterion	14.89267
Sum squared resid	41101835	Schwarz criterion	14.93554
Log likelihood	-1821.352	Hannan-Quinn criter.	14.90994
F-statistic	402.6811	Durbin-Watson stat	2.248033
Prob(F-statistic)	0.000000		

Null Hypothesis: USTBR has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 8 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.377642	0.3903
Test critical values:	1% level	-3.995800	
	5% level	-3.428198	
	10% level	-3.137485	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.047636
HAC corrected variance (Bartlett kernel)	0.124755

Phillips-Perron Test Equation
Dependent Variable: D(USTBR)
Method: Least Squares
Date: 07/12/18 Time: 19:24
Sample (adjusted): 1998M02 2018M06
Included observations: 246 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
USTBR(-1)	-0.018702	0.009728	-1.922521	0.0557
C	0.129092	0.061751	2.090524	0.0376
@TREND("1998M01")	-0.000695	0.000290	-2.394909	0.0174

R-squared	0.023292	Mean dependent var	-0.011911
Adjusted R-squared	0.015254	S.D. dependent var	0.221293
S.E. of regression	0.219599	Akaike info criterion	-0.181909
Sum squared resid	11.71834	Schwarz criterion	-0.139161
Log likelihood	25.37477	Hannan-Quinn criter.	-0.164696
F-statistic	2.897514	Durbin-Watson stat	1.571435
Prob(F-statistic)	0.057068		

Null Hypothesis: D(USTBR) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 7 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-13.56951	0.0000
Test critical values:	1% level	-3.995956	
	5% level	-3.428273	
	10% level	-3.137529	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.046387
HAC corrected variance (Bartlett kernel)	0.074712

Phillips-Perron Test Equation
Dependent Variable: D(USTBR,2)
Method: Least Squares
Date: 07/12/18 Time: 19:26
Sample (adjusted): 1998M03 2018M06
Included observations: 245 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(USTBR(-1))	-0.788571	0.062835	-12.54981	0.0000
C	0.018168	0.027986	0.649200	0.5168
@TREND("1998M01")	-0.000224	0.000197	-1.137091	0.2566

R-squared	0.394241	Mean dependent var	-0.000122
Adjusted R-squared	0.389234	S.D. dependent var	0.277291
S.E. of regression	0.216707	Akaike info criterion	-0.208368
Sum squared resid	11.36483	Schwarz criterion	-0.165495
Log likelihood	28.52505	Hannan-Quinn criter.	-0.191103
F-statistic	78.74929	Durbin-Watson stat	2.111605
Prob(F-statistic)	0.000000		

Chapter 7(A)-UK ADF Test

Null Hypothesis: FTSE_100 has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.997290	0.5996
Test critical values:	1% level	-3.996113	
	5% level	-3.428349	
	10% level	-3.137574	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FTSE_100)
Method: Least Squares
Date: 08/03/18 Time: 10:18
Sample (adjusted): 1998M02 2018M06
Included observations: 244 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FTSE_100(-1)	-0.034195	0.017358	-1.997290	0.0500
C	160.3479	90.82629	1.765435	0.0788
@TREND("1998M01")	0.377881	0.228495	1.653785	0.0995

R-squared	0.018254	Mean dependent var	8.928156
Adjusted R-squared	0.010107	S.D. dependent var	219.0329
S.E. of regression	217.9232	Akaike info criterion	13.61838
Sum squared resid	11445218	Schwarz criterion	13.66138
Log likelihood	-1658.443	Hannan-Quinn criter.	13.63570
F-statistic	2.240490	Durbin-Watson stat	2.068908
Prob(F-statistic)	0.108618		

Null Hypothesis: D(FTSE_100) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-15.79014	0.0000
Test critical values:	1% level	-3.996271	
	5% level	-3.428426	
	10% level	-3.137619	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FTSE_100,2)
Method: Least Squares
Date: 08/03/18 Time: 10:20
Sample (adjusted): 1998M03 2018M06
Included observations: 243 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FTSE_100(-1))	-1.058241	0.064166	-15.79014	0.0000
C	-15.79607	28.33739	-0.557428	0.5778
@TREND("1998M01")	0.195301	0.200334	0.974874	0.3306

R-squared	0.531259	Mean dependent var	-1.440823
Adjusted R-squared	0.527353	S.D. dependent var	318.2201
S.E. of regression	218.7742	Akaike info criterion	13.62623
Sum squared resid	11486921	Schwarz criterion	13.66935
Log likelihood	-1652.587	Hannan-Quinn criter.	13.64360
F-statistic	136.0048	Durbin-Watson stat	2.011983
Prob(F-statistic)	0.000000		

Null Hypothesis: UKBOT has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 3 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.002396	0.9945
Test critical values:	1% level	-3.996592	
	5% level	-3.428581	
	10% level	-3.137711	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(UKBOT)
Method: Least Squares
Date: 08/03/18 Time: 10:23
Sample (adjusted): 1998M05 2018M06
Included observations: 241 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UKBOT(-1)	-0.007944	0.013833	-0.002396	0.5663
D(UKBOT(-1))	2.57E-05	0.062706	0.000410	0.9997
D(UKBOT(-2))	3.73E-05	0.062704	0.000595	0.9995
D(UKBOT(-3))	-0.300583	0.062676	-4.795830	0.0000
C	-55.20866	44.87812	-1.230191	0.2199
@TREND("1998M01")	0.257628	0.400057	0.643978	0.5202

R-squared	0.098163	Mean dependent var	-5.643112
Adjusted R-squared	0.078975	S.D. dependent var	352.6752
S.E. of regression	338.4625	Akaike info criterion	14.51128
Sum squared resid	26920863	Schwarz criterion	14.59804
Log likelihood	-1742.610	Hannan-Quinn criter.	14.54624
F-statistic	5.115855	Durbin-Watson stat	1.999998
Prob(F-statistic)	0.000179		

Null Hypothesis: D(UKBOT) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 2 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-12.32341	0.0000
Test critical values:	1% level	-3.996592	
	5% level	-3.428581	
	10% level	-3.137711	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(UKBOT,2)
Method: Least Squares
Date: 08/03/18 Time: 10:25
Sample (adjusted): 1998M05 2018M06
Included observations: 241 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(UKBOT(-1))	-1.315922	0.107738	-12.32341	0.0000
D(UKBOT(-1),2)	0.310807	0.087791	3.540290	0.0005
D(UKBOT(-2),2)	0.305709	0.061949	4.934880	0.0000
C	-56.75402	44.73371	-1.268708	0.2058
@TREND("1998M01")	0.399195	0.314626	1.268792	0.2058

R-squared	0.548563	Mean dependent var	-0.063610
Adjusted R-squared	0.540912	S.D. dependent var	498.8211
S.E. of regression	337.9815	Akaike info criterion	14.50439
Sum squared resid	26958640	Schwarz criterion	14.57669
Log likelihood	-1742.779	Hannan-Quinn criter.	14.53352
F-statistic	71.69379	Durbin-Watson stat	2.002791
Prob(F-statistic)	0.000000		

Null Hypothesis: UKCPI has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 13 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.111400	0.9945
Test critical values:	1% level	-3.998280	
	5% level	-3.429398	
	10% level	-3.138192	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(UKCPI)
Method: Least Squares
Date: 08/03/18 Time: 10:27
Sample (adjusted): 1999M03 2018M06
Included observations: 231 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UKCPI(-1)	0.003730	0.007566	-0.111400	0.6225
D(UKCPI(-1))	0.116280	0.067098	1.732976	0.0845
D(UKCPI(-2))	-0.069546	0.053880	-1.290767	0.1982
D(UKCPI(-3))	-0.024785	0.053795	-0.460738	0.6455
D(UKCPI(-4))	-0.067703	0.053482	-1.265883	0.2069
D(UKCPI(-5))	-0.039904	0.054311	-0.734739	0.4633
D(UKCPI(-6))	0.081060	0.054232	1.494693	0.1365
D(UKCPI(-7))	-0.037010	0.054188	-0.682988	0.4953
D(UKCPI(-8))	-0.018641	0.054050	-0.344880	0.7305
D(UKCPI(-9))	-0.083512	0.053687	-1.555535	0.1213
D(UKCPI(-10))	-0.033324	0.053664	-0.620971	0.5353
D(UKCPI(-11))	-0.075988	0.052781	-1.439688	0.1514
D(UKCPI(-12))	0.647136	0.053941	11.99709	0.0000
D(UKCPI(-13))	-0.212457	0.069437	-3.059708	0.0025
C	-0.247690	0.586114	-0.422596	0.6730
@TREND("1998M01")	0.000214	0.001138	0.188322	0.8508

R-squared	0.569289	Mean dependent var	0.187199
Adjusted R-squared	0.539239	S.D. dependent var	0.371507
S.E. of regression	0.252176	Akaike info criterion	0.149373
Sum squared resid	13.67248	Schwarz criterion	0.387809
Log likelihood	-1.252545	Hannan-Quinn criter.	0.245542
F-statistic	18.94498	Durbin-Watson stat	2.051011
Prob(F-statistic)	0.000000		

Null Hypothesis: D(UKCPI) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 12 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.184683	0.090
Test critical values:	1% level	-3.998280	
	5% level	-3.429398	
	10% level	-3.138192	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(UKCPI,2)
Method: Least Squares
Date: 08/03/18 Time: 10:28
Sample (adjusted): 1999M03 2018M06
Included observations: 231 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(UKCPI(-1))	-0.731581	0.228808	-3.184683	0.0016
D(UKCPI(-1),2)	-0.149206	0.226639	-0.658342	0.5110
D(UKCPI(-2),2)	-0.210758	0.213127	-0.988884	0.3238
D(UKCPI(-3),2)	-0.227774	0.200116	-1.138207	0.2563
D(UKCPI(-4),2)	-0.288426	0.187239	-1.540419	0.1249
D(UKCPI(-5),2)	-0.320766	0.174998	-1.832966	0.0682
D(UKCPI(-6),2)	-0.232757	0.162613	-1.431360	0.1538
D(UKCPI(-7),2)	-0.263234	0.150359	-1.750704	0.0814
D(UKCPI(-8),2)	-0.274847	0.133710	-2.055551	0.0410
D(UKCPI(-9),2)	-0.351838	0.116961	-3.008157	0.0029
D(UKCPI(-10),2)	-0.378797	0.100679	-3.762403	0.0002
D(UKCPI(-11),2)	-0.448795	0.083671	-5.363818	0.0000
D(UKCPI(-12),2)	0.204950	0.067628	3.030554	0.0027
C	0.040623	0.038560	1.053505	0.2933
@TREND("1998M01")	0.000751	0.000329	2.282793	0.0234

R-squared	0.794846	Mean dependent var	-0.000571
Adjusted R-squared	0.781549	S.D. dependent var	0.538599
S.E. of regression	0.251734	Akaike info criterion	0.141844
Sum squared resid	13.68794	Schwarz criterion	0.365378
Log likelihood	-1.383028	Hannan-Quinn criter.	0.232003
F-statistic	59.77631	Durbin-Watson stat	2.045394
Prob(F-statistic)	0.000000		

Null Hypothesis: UKDIR has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.211967	0.4804
Test critical values:	1% level	-3.996271	
	5% level	-3.428426	
	10% level	-3.137619	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(UKDIR)
Method: Least Squares
Date: 08/03/18 Time: 10:31
Sample (adjusted): 1998M03 2018M06
Included observations: 243 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UKDIR(-1)	-0.022080	0.010305	-2.211967	0.0332
D(UKDIR(-1))	0.386257	0.057751	6.688339	0.0000
C	0.171347	0.080486	2.128918	0.0343
@TREND("1998M01")	-0.000686	0.000306	-2.238469	0.0261

R-squared	0.168618	Mean dependent var	-0.022593
Adjusted R-squared	0.158183	S.D. dependent var	0.232615
S.E. of regression	0.213425	Akaike info criterion	-0.234734
Sum squared resid	10.88655	Schwarz criterion	-0.177235
Log likelihood	32.52018	Hannan-Quinn criter.	-0.211574
F-statistic	16.15775	Durbin-Watson stat	2.021416
Prob(F-statistic)	0.000000		

Null Hypothesis: D(UKDIR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.95081	0.0000
Test critical values:	1% level	-3.996271	
	5% level	-3.428426	
	10% level	-3.137619	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(UKDIR,2)
Method: Least Squares
Date: 08/03/18 Time: 10:33
Sample (adjusted): 1998M03 2018M06
Included observations: 243 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(UKDIR(-1))	-0.625773	0.057906	-10.95081	0.0000
C	0.009387	0.027846	0.337111	0.7363
@TREND("1998M01")	-0.000180	0.000197	-0.915362	0.3609

R-squared	0.327664	Mean dependent var	0.003642
Adjusted R-squared	0.322061	S.D. dependent var	0.261141
S.E. of regression	0.215016	Akaike info criterion	-0.223939
Sum squared resid	11.09566	Schwarz criterion	-0.180815
Log likelihood	30.20856	Hannan-Quinn criter.	-0.206569
F-statistic	58.48207	Durbin-Watson stat	2.002034
Prob(F-statistic)	0.000000		

Null Hypothesis: UKEXR has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.148191	0.5159
Test critical values:	1% level	-3.996113	
	5% level	-3.428349	
	10% level	-3.137574	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(UKEXR)
Method: Least Squares
Date: 08/03/18 Time: 10:36
Sample (adjusted): 1998M02 2018M06
Included observations: 244 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UKEXR(-1)	-0.034897	0.017480	-2.148191	0.0470
C	0.057137	0.027702	2.062543	0.0402
@TREND("1998M01")	2.84E-06	3.92E-05	0.072662	0.9421

R-squared	0.017644	Mean dependent var	0.000169
Adjusted R-squared	0.009492	S.D. dependent var	0.041084
S.E. of regression	0.040889	Akaike info criterion	-3.543714
Sum squared resid	0.402922	Schwarz criterion	-3.500716
Log likelihood	435.3331	Hannan-Quinn criter.	-3.526397
F-statistic	2.164291	Durbin-Watson stat	1.845802
Prob(F-statistic)	0.117058		

Null Hypothesis: D(UKEXR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-15.03370	0.0000
Test critical values:	1% level	-3.996271	
	5% level	-3.428426	
	10% level	-3.137619	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(UKEXR,2)
Method: Least Squares
Date: 08/03/18 Time: 10:38
Sample (adjusted): 1998M03 2018M06
Included observations: 243 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(UKEXR(-1))	-0.946429	0.064229	-15.03370	0.0000
C	0.003721	0.005319	0.699640	0.4848
@TREND("1998M01")	-2.69E-05	3.76E-05	-0.715131	0.4752

R-squared	0.474988	Mean dependent var	0.000380
Adjusted R-squared	0.470612	S.D. dependent var	0.056413
S.E. of regression	0.041046	Akaike info criterion	-3.535996
Sum squared resid	0.404338	Schwarz criterion	-3.492872
Log likelihood	432.6236	Hannan-Quinn criter.	-3.518626
F-statistic	108.5660	Durbin-Watson stat	1.993259
Prob(F-statistic)	0.000000		

Null Hypothesis: UKGDPCAP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.894927	0.9538
Test critical values:	1% level	-3.996113	
	5% level	-3.428349	
	10% level	-3.137574	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(UKGDPCAP)
Method: Least Squares
Date: 08/03/18 Time: 10:41
Sample (adjusted): 1998M02 2018M06
Included observations: 244 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UKGDPCAP(-1)	-0.010173	0.011508	-0.894927	0.3776
C	18.11141	14.97938	1.209089	0.2278
@TREND("1998M01")	0.001923	0.031260	0.061523	0.9510

R-squared	0.016036	Mean dependent var	2.131148
Adjusted R-squared	0.007870	S.D. dependent var	14.43501
S.E. of regression	14.37809	Akaike info criterion	8.181508
Sum squared resid	49821.83	Schwarz criterion	8.224506
Log likelihood	-995.1439	Hannan-Quinn criter.	8.198825
F-statistic	1.963846	Durbin-Watson stat	2.056057
Prob(F-statistic)	0.142557		

Null Hypothesis: D(UKGDPCAP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-16.28594	0.0000
Test critical values:	1% level	-3.996271	
	5% level	-3.428426	
	10% level	-3.137619	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(UKGDPCAP,2)
Method: Least Squares
Date: 08/03/18 Time: 10:42
Sample (adjusted): 1998M03 2018M06
Included observations: 243 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(UKGDPCAP(-1))	-1.035436	0.064493	-16.28594	0.0000
C	5.230268	1.894725	2.760437	0.0062
@TREND("1998M01")	-0.024508	0.013271	-1.846768	0.0660

R-squared	0.517841	Mean dependent var	0.000000
Adjusted R-squared	0.513823	S.D. dependent var	20.67897
S.E. of regression	14.41870	Akaike info criterion	8.187198
Sum squared resid	49895.74	Schwarz criterion	8.230322
Log likelihood	-991.7445	Hannan-Quinn criter.	8.204568
F-statistic	128.8806	Durbin-Watson stat	2.003118
Prob(F-statistic)	0.000000		

Null Hypothesis: IOP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.786332	0.0188
Test critical values:	1% level	-3.996271	
	5% level	-3.428426	
	10% level	-3.137619	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(IOP)
Method: Least Squares
Date: 08/03/18 Time: 10:46
Sample (adjusted): 1998M03 2018M06
Included observations: 243 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IOP(-1)	-0.078829	0.020930	-3.786332	0.0002
D(IOP(-1))	0.303569	0.062128	4.886177	0.0000
C	-0.402672	0.685301	-0.587584	0.5574
@TREND("1998M01")	0.035259	0.010189	3.460443	0.0006

R-squared	0.122211	Mean dependent var	0.328642
Adjusted R-squared	0.111193	S.D. dependent var	5.521769
S.E. of regression	5.205734	Akaike info criterion	6.153723
Sum squared resid	6476.821	Schwarz criterion	6.211221
Log likelihood	-743.6773	Hannan-Quinn criter.	6.176883
F-statistic	11.09169	Durbin-Watson stat	1.995509
Prob(F-statistic)	0.000001		

Null Hypothesis: UKM2 has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 3 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.392187	0.3827
Test critical values:	1% level	-3.996592	
	5% level	-3.428581	
	10% level	-3.137711	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(UKM2)
Method: Least Squares
Date: 08/03/18 Time: 11:03
Sample (adjusted): 1998M05 2018M06
Included observations: 241 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UKM2(-1)	-0.029072	0.013533	-2.392187	0.0327
D(UKM2(-1))	-0.011374	0.061489	-0.184975	0.8534
D(UKM2(-2))	-0.019290	0.061513	-0.313586	0.7541
D(UKM2(-3))	0.350350	0.061393	5.706651	0.0000
C	18.08056	9.077666	1.991763	0.0476
@TREND("1998M01")	0.382873	0.188184	2.034565	0.0430

R-squared	0.133112	Mean dependent var	9.780083
Adjusted R-squared	0.114668	S.D. dependent var	61.13541
S.E. of regression	57.52360	Akaike info criterion	10.96685
Sum squared resid	777606.6	Schwarz criterion	11.05361
Log likelihood	-1315.505	Hannan-Quinn criter.	11.00180
F-statistic	7.216925	Durbin-Watson stat	1.920705
Prob(F-statistic)	0.000003		

Null Hypothesis: D(UKM2) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 2 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.750822	0.0000
Test critical values:	1% level	-3.996592	
	5% level	-3.428581	
	10% level	-3.137711	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(UKM2,2)
Method: Least Squares
Date: 08/03/18 Time: 11:05
Sample (adjusted): 1998M05 2018M06
Included observations: 241 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(UKM2(-1))	-0.726415	0.110990	-6.750822	0.0000
D(UKM2(-1),2)	-0.300874	0.088688	-3.392509	0.0008
D(UKM2(-2),2)	-0.336183	0.061504	-5.466065	0.0000
C	7.642692	7.726300	0.989179	0.3236
@TREND("1998M01")	-0.004850	0.053675	-0.090365	0.9281

R-squared	0.574708	Mean dependent var	-0.423237
Adjusted R-squared	0.567500	S.D. dependent var	88.13604
S.E. of regression	57.96246	Akaike info criterion	10.97800
Sum squared resid	792876.7	Schwarz criterion	11.05030
Log likelihood	-1317.849	Hannan-Quinn criter.	11.00712
F-statistic	79.72818	Durbin-Watson stat	1.912889
Prob(F-statistic)	0.000000		

Null Hypothesis: UKREMIT has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.057348	0.5666
Test critical values:	1% level	-3.996113	
	5% level	-3.428349	
	10% level	-3.137574	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(UKREMIT)
Method: Least Squares
Date: 08/03/18 Time: 11:08
Sample (adjusted): 1998M02 2018M06
Included observations: 244 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UKREMIT(-1)	-0.045033	0.018942	-2.057348	0.0182
C	9953611.	3953131.	2.517906	0.0125
@TREND("1998M01")	-1904.799	12885.08	-0.147830	0.8826

R-squared	0.025837	Mean dependent var	219616.0
Adjusted R-squared	0.017753	S.D. dependent var	13712329
S.E. of regression	13590070	Akaike info criterion	35.69980
Sum squared resid	4.45E+16	Schwarz criterion	35.74279
Log likelihood	-4352.375	Hannan-Quinn criter.	35.71711
F-statistic	3.195915	Durbin-Watson stat	1.963178
Prob(F-statistic)	0.042670		

Null Hypothesis: D(UKREMIT) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-15.75315	0.0000
Test critical values:	1% level	-3.996271	
	5% level	-3.428426	
	10% level	-3.137619	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(UKREMIT,2)
Method: Least Squares
Date: 08/03/18 Time: 11:09
Sample (adjusted): 1998M03 2018M06
Included observations: 243 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(UKREMIT(-1))	-1.003297	0.064549	-15.75315	0.0000
C	1551560.	1786723.	0.868383	0.3861
@TREND("1998M01")	-10815.55	12617.86	-0.857162	0.3922

R-squared	0.501655	Mean dependent var	-2.13E-10
Adjusted R-squared	0.497502	S.D. dependent var	19434689
S.E. of regression	13776686	Akaike info criterion	35.72712
Sum squared resid	4.56E+16	Schwarz criterion	35.77025
Log likelihood	-4337.845	Hannan-Quinn criter.	35.74449
F-statistic	120.7970	Durbin-Watson stat	2.000048
Prob(F-statistic)	0.000000		

Null Hypothesis: UKTBR has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 2 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.492176	0.3318
Test critical values:	1% level	-3.996431	
	5% level	-3.428503	
	10% level	-3.137665	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(UKTBR)
Method: Least Squares
Date: 08/03/18 Time: 11:12
Sample (adjusted): 1998M04 2018M06
Included observations: 242 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UKTBR(-1)	-0.022999	0.009388	-2.492176	0.0150
D(UKTBR(-1))	0.157994	0.061854	2.554288	0.0113
D(UKTBR(-2))	0.274101	0.061953	4.424352	0.0000
C	0.146249	0.060280	2.426173	0.0160
@TREND("1998M01")	-0.000686	0.000284	-2.411441	0.0167

R-squared	0.141475	Mean dependent var	-0.012066
Adjusted R-squared	0.126986	S.D. dependent var	0.223096
S.E. of regression	0.208450	Akaike info criterion	-0.277791
Sum squared resid	10.29797	Schwarz criterion	-0.205706
Log likelihood	38.61273	Hannan-Quinn criter.	-0.248753
F-statistic	9.763748	Durbin-Watson stat	2.066930
Prob(F-statistic)	0.000000		

Null Hypothesis: D(UKTBR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=15)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.478436	0.0000
Test critical values:	1% level	-3.996431	
	5% level	-3.428503	
	10% level	-3.137665	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(UKTBR,2)
Method: Least Squares
Date: 08/03/18 Time: 11:15
Sample (adjusted): 1998M04 2018M06
Included observations: 242 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(UKTBR(-1))	-0.579598	0.078497	-7.478436	0.0000
D(UKTBR(-1),2)	-0.265188	0.062492	-4.243540	0.0000
C	0.014575	0.027570	0.528651	0.5975
@TREND("1998M01")	-0.000175	0.000195	-0.894607	0.3719

R-squared	0.437057	Mean dependent var	0.000124
Adjusted R-squared	0.429961	S.D. dependent var	0.278975
S.E. of regression	0.210629	Akaike info criterion	-0.261050
Sum squared resid	10.55873	Schwarz criterion	-0.203382
Log likelihood	35.58706	Hannan-Quinn criter.	-0.237819
F-statistic	61.59269	Durbin-Watson stat	2.053885
Prob(F-statistic)	0.000000		

Chapter 7(A)-UK P-P Test

Null Hypothesis: FTSE_100 has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.1010	0.5423
Test critical values:	1% level	-3.996113	
	5% level	-3.428349	
	10% level	-3.137574	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	46906.63
HAC corrected variance (Bartlett kernel)	47797.45

Phillips-Perron Test Equation
Dependent Variable: D(FTSE_100)
Method: Least Squares
Date: 08/04/18 Time: 13:03
Sample (adjusted): 1998M02 2018M06
Included observations: 244 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FTSE_100(-1)	-0.034195	0.017358	-1.969963	0.0500
C	160.3479	90.82629	1.765435	0.0788
@TREND("1998M01")	0.377881	0.228495	1.653785	0.0995

R-squared	0.018254	Mean dependent var	8.928156
Adjusted R-squared	0.010107	S.D. dependent var	219.0329
S.E. of regression	217.9232	Akaike info criterion	13.61838
Sum squared resid	11445218	Schwarz criterion	13.66138
Log likelihood	-1658.443	Hannan-Quinn criter.	13.63570
F-statistic	2.240490	Durbin-Watson stat	2.068908
Prob(F-statistic)	0.108618		

Null Hypothesis: D(FTSE_100) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-15.798	0.0000
Test critical values:	1% level	-3.996271	
	5% level	-3.428426	
	10% level	-3.137619	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	47271.28
HAC corrected variance (Bartlett kernel)	48405.46

Phillips-Perron Test Equation
Dependent Variable: D(FTSE_100,2)
Method: Least Squares
Date: 08/04/18 Time: 13:05
Sample (adjusted): 1998M03 2018M06
Included observations: 243 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FTSE_100(-1))	-1.058241	0.064166	-16.49222	0.0000
C	-15.79607	28.33739	-0.557428	0.5778
@TREND("1998M01")	0.195301	0.200334	0.974874	0.3306

R-squared	0.531259	Mean dependent var	-1.440823
Adjusted R-squared	0.527353	S.D. dependent var	318.2201
S.E. of regression	218.7742	Akaike info criterion	13.62623
Sum squared resid	11486921	Schwarz criterion	13.66935
Log likelihood	-1652.587	Hannan-Quinn criter.	13.64360
F-statistic	136.0048	Durbin-Watson stat	2.011983
Prob(F-statistic)	0.000000		

Null Hypothesis: UKBOT has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 16 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-0.07626	0.9950
Test critical values:	1% level	-3.996113	
	5% level	-3.428349	
	10% level	-3.137574	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	121261.2
HAC corrected variance (Bartlett kernel)	86280.56

Phillips-Perron Test Equation
Dependent Variable: D(UKBOT)
Method: Least Squares
Date: 08/04/18 Time: 13:09
Sample (adjusted): 1998M02 2018M06
Included observations: 244 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UKBOT(-1)	-0.016969	0.013898	-1.220994	0.2233
C	-37.69328	45.02773	-0.837113	0.4034
@TREND("1998M01")	-0.010788	0.398536	-0.027068	0.9784

R-squared	0.009346	Mean dependent var	-5.082623
Adjusted R-squared	0.001125	S.D. dependent var	350.5837
S.E. of regression	350.3865	Akaike info criterion	14.56817
Sum squared resid	29587732	Schwarz criterion	14.61117
Log likelihood	-1774.317	Hannan-Quinn criter.	14.58549
F-statistic	1.136849	Durbin-Watson stat	1.984827
Prob(F-statistic)	0.322543		

Null Hypothesis: D(UKBOT) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 21 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-16.721	0.0000
Test critical values:	1% level	-3.996271	
	5% level	-3.428426	
	10% level	-3.137619	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	122405.8
HAC corrected variance (Bartlett kernel)	65815.07

Phillips-Perron Test Equation
Dependent Variable: D(UKBOT,2)
Method: Least Squares
Date: 08/04/18 Time: 13:11
Sample (adjusted): 1998M03 2018M06
Included observations: 243 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(UKBOT(-1))	-1.003658	0.064524	-15.55490	0.0000
C	-42.39948	45.66053	-0.928581	0.3540
@TREND("1998M01")	0.299060	0.322476	0.927387	0.3547

R-squared	0.502030	Mean dependent var	-0.556214
Adjusted R-squared	0.497880	S.D. dependent var	496.8150
S.E. of regression	352.0453	Akaike info criterion	14.57767
Sum squared resid	29744616	Schwarz criterion	14.62079
Log likelihood	-1768.186	Hannan-Quinn criter.	14.59504
F-statistic	120.9782	Durbin-Watson stat	2.000356
Prob(F-statistic)	0.000000		

Null Hypothesis: UKCPI has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 18 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		0.766577	0.9997
Test critical values:	1% level	-3.996113	
	5% level	-3.428349	
	10% level	-3.137574	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.132849
HAC corrected variance (Bartlett kernel)	0.075315

Phillips-Perron Test Equation
Dependent Variable: D(UKCPI)
Method: Least Squares
Date: 08/04/18 Time: 13:14
Sample (adjusted): 1998M02 2018M06
Included observations: 244 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UKCPI(-1)	0.004110	0.008533	0.481667	0.6305
C	-0.237928	0.677134	-0.351376	0.7256
@TREND("1998M01")	0.000147	0.001430	0.102654	0.9183

R-squared	0.025215	Mean dependent var	0.187471
Adjusted R-squared	0.017126	S.D. dependent var	0.369927
S.E. of regression	0.366745	Akaike info criterion	0.843922
Sum squared resid	32.41504	Schwarz criterion	0.886920
Log likelihood	-99.95843	Hannan-Quinn criter.	0.861239
F-statistic	3.117026	Durbin-Watson stat	2.139001
Prob(F-statistic)	0.046079		

Null Hypothesis: D(UKCPI) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 17 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-17.212	0.0000
Test critical values:	1% level	-3.996271	
	5% level	-3.428426	
	10% level	-3.137619	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.132220
HAC corrected variance (Bartlett kernel)	0.089084

Phillips-Perron Test Equation
Dependent Variable: D(UKCPI,2)
Method: Least Squares
Date: 08/04/18 Time: 13:15
Sample (adjusted): 1998M03 2018M06
Included observations: 243 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(UKCPI(-1))	-1.066703	0.064234	-16.60645	0.0000
C	0.086340	0.047703	1.809934	0.0716
@TREND("1998M01")	0.000913	0.000339	2.696222	0.0075

R-squared	0.534693	Mean dependent var	-0.000955
Adjusted R-squared	0.530816	S.D. dependent var	0.534164
S.E. of regression	0.365887	Akaike info criterion	0.839283
Sum squared resid	32.12954	Schwarz criterion	0.882407
Log likelihood	-98.97286	Hannan-Quinn criter.	0.856653
F-statistic	137.8943	Durbin-Watson stat	2.015271
Prob(F-statistic)	0.000000		

Null Hypothesis: UKDIR has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 8 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.1780	0.4993
Test critical values:	1% level	-3.996113	
	5% level	-3.428349	
	10% level	-3.137574	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.056140
HAC corrected variance (Bartlett kernel)	0.140253

Phillips-Perron Test Equation
Dependent Variable: D(UKDIR)
Method: Least Squares
Date: 08/04/18 Time: 13:18
Sample (adjusted): 1998M02 2018M06
Included observations: 244 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UKDIR(-1)	-0.014637	0.011455	-1.277735	0.2026
C	0.099491	0.089325	1.113805	0.2665
@TREND("1998M01")	-0.000486	0.000341	-1.425853	0.1552

R-squared	0.008683	Mean dependent var	-0.026086
Adjusted R-squared	0.000456	S.D. dependent var	0.238463
S.E. of regression	0.238409	Akaike info criterion	-0.017439
Sum squared resid	13.69817	Schwarz criterion	0.025559
Log likelihood	5.127518	Hannan-Quinn criter.	-0.000121
F-statistic	1.055460	Durbin-Watson stat	1.186828
Prob(F-statistic)	0.349636		

Null Hypothesis: D(UKDIR) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 7 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-11.3367	0.0000
Test critical values:	1% level	-3.996271	
	5% level	-3.428426	
	10% level	-3.137619	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.045661
HAC corrected variance (Bartlett kernel)	0.055847

Phillips-Perron Test Equation
Dependent Variable: D(UKDIR,2)
Method: Least Squares
Date: 08/04/18 Time: 13:20
Sample (adjusted): 1998M03 2018M06
Included observations: 243 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(UKDIR(-1))	-0.625773	0.057906	-10.80677	0.0000
C	0.009387	0.027846	0.337111	0.7363
@TREND("1998M01")	-0.000180	0.000197	-0.915362	0.3609

R-squared	0.327664	Mean dependent var	0.003642
Adjusted R-squared	0.322061	S.D. dependent var	0.261141
S.E. of regression	0.215016	Akaike info criterion	-0.223939
Sum squared resid	11.09566	Schwarz criterion	-0.180815
Log likelihood	30.20856	Hannan-Quinn criter.	-0.206569
F-statistic	58.48207	Durbin-Watson stat	2.002034
Prob(F-statistic)	0.000000		

Null Hypothesis: UKEXR has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.3631	0.3980
Test critical values:	1% level	-3.996113	
	5% level	-3.428349	
	10% level	-3.137574	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.001651
HAC corrected variance (Bartlett kernel)	0.001994

Phillips-Perron Test Equation
Dependent Variable: D(UKEXR)
Method: Least Squares
Date: 08/04/18 Time: 13:24
Sample (adjusted): 1998M02 2018M06
Included observations: 244 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UKEXR(-1)	-0.034897	0.017480	-1.996413	0.0470
C	0.057137	0.027702	2.062543	0.0402
@TREND("1998M01")	2.84E-06	3.92E-05	0.072662	0.9421

R-squared	0.017644	Mean dependent var	0.000169
Adjusted R-squared	0.009492	S.D. dependent var	0.041084
S.E. of regression	0.040889	Akaike info criterion	-3.543714
Sum squared resid	0.402922	Schwarz criterion	-3.500716
Log likelihood	435.3331	Hannan-Quinn criter.	-3.526397
F-statistic	2.164291	Durbin-Watson stat	1.845802
Prob(F-statistic)	0.117058		

Null Hypothesis: D(UKEXR) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-15.041	0.0000
Test critical values:	1% level	-3.996271	
	5% level	-3.428426	
	10% level	-3.137619	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.001664
HAC corrected variance (Bartlett kernel)	0.001679

Phillips-Perron Test Equation
Dependent Variable: D(UKEXR,2)
Method: Least Squares
Date: 08/04/18 Time: 13:27
Sample (adjusted): 1998M03 2018M06
Included observations: 243 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(UKEXR(-1))	-0.946429	0.064229	-14.73519	0.0000
C	0.003721	0.005319	0.699640	0.4848
@TREND("1998M01")	-2.69E-05	3.76E-05	-0.715131	0.4752

R-squared	0.474988	Mean dependent var	0.000380
Adjusted R-squared	0.470612	S.D. dependent var	0.056413
S.E. of regression	0.041046	Akaike info criterion	-3.535996
Sum squared resid	0.404338	Schwarz criterion	-3.492872
Log likelihood	432.6236	Hannan-Quinn criter.	-3.518626
F-statistic	108.5660	Durbin-Watson stat	1.993259
Prob(F-statistic)	0.000000		

Null Hypothesis: UKGDPCAP has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-0.7244	0.9696
Test critical values:	1% level	-3.996113	
	5% level	-3.428349	
	10% level	-3.137574	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	204.1878
HAC corrected variance (Bartlett kernel)	174.7256

Phillips-Perron Test Equation
Dependent Variable: D(UKGDPCAP)
Method: Least Squares
Date: 08/04/18 Time: 13:31
Sample (adjusted): 1998M02 2018M06
Included observations: 244 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UKGDPCAP(-1)	-0.010173	0.011508	-0.883999	0.3776
C	18.11141	14.97938	1.209089	0.2278
@TREND("1998M01")	0.001923	0.031260	0.061523	0.9510

R-squared	0.016036	Mean dependent var	2.131148
Adjusted R-squared	0.007870	S.D. dependent var	14.43501
S.E. of regression	14.37809	Akaike info criterion	8.181508
Sum squared resid	49821.83	Schwarz criterion	8.224506
Log likelihood	-995.1439	Hannan-Quinn criter.	8.198825
F-statistic	1.963846	Durbin-Watson stat	2.056057
Prob(F-statistic)	0.142557		

Null Hypothesis: D(UKGDPCAP) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-16.403	0.0000
Test critical values:	1% level	-3.996271	
	5% level	-3.428426	
	10% level	-3.137619	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	205.3322
HAC corrected variance (Bartlett kernel)	170.1159

Phillips-Perron Test Equation
Dependent Variable: D(UKGDPCAP,2)
Method: Least Squares
Date: 08/04/18 Time: 13:33
Sample (adjusted): 1998M03 2018M06
Included observations: 243 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(UKGDPCAP(-1))	-1.035436	0.064493	-16.05491	0.0000
C	5.230268	1.894725	2.760437	0.0062
@TREND("1998M01")	-0.024508	0.013271	-1.846768	0.0660

R-squared	0.517841	Mean dependent var	0.000000
Adjusted R-squared	0.513823	S.D. dependent var	20.67897
S.E. of regression	14.41870	Akaike info criterion	8.187198
Sum squared resid	49895.74	Schwarz criterion	8.230322
Log likelihood	-991.7445	Hannan-Quinn criter.	8.204568
F-statistic	128.8806	Durbin-Watson stat	2.003118
Prob(F-statistic)	0.000000		

Null Hypothesis: IOP has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.37010	0.0578
Test critical values:	1% level	-3.996113	
	5% level	-3.428349	
	10% level	-3.137574	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	29.21329
HAC corrected variance (Bartlett kernel)	43.27518

Phillips-Perron Test Equation
Dependent Variable: D(IOP)
Method: Least Squares
Date: 08/04/18 Time: 13:51
Sample (adjusted): 1998M02 2018M06
Included observations: 244 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IOP(-1)	-0.061824	0.021496	-2.876074	0.0044
C	-0.284413	0.708532	-0.401411	0.6885
@TREND("1998M01")	0.028782	0.010474	2.747830	0.0065

R-squared	0.033967	Mean dependent var	0.330000
Adjusted R-squared	0.025950	S.D. dependent var	5.510437
S.E. of regression	5.438468	Akaike info criterion	6.237091
Sum squared resid	7128.042	Schwarz criterion	6.280089
Log likelihood	-757.9251	Hannan-Quinn criter.	6.254408
F-statistic	4.236951	Durbin-Watson stat	1.418902
Prob(F-statistic)	0.015543		

Null Hypothesis: D(IOP) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-11.995	0.0000
Test critical values:	1% level	-3.996271	
	5% level	-3.428426	
	10% level	-3.137619	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	28.23550
HAC corrected variance (Bartlett kernel)	27.08577

Phillips-Perron Test Equation
Dependent Variable: D(IOP,2)
Method: Least Squares
Date: 08/04/18 Time: 13:53
Sample (adjusted): 1998M03 2018M06
Included observations: 243 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(IOP(-1))	-0.733617	0.063001	-11.64457	0.0000
C	0.062039	0.692371	0.089604	0.9287
@TREND("1998M01")	0.001340	0.004895	0.273759	0.7845

R-squared	0.361128	Mean dependent var	-0.053457
Adjusted R-squared	0.355804	S.D. dependent var	6.661718
S.E. of regression	5.346816	Akaike info criterion	6.203148
Sum squared resid	6861.226	Schwarz criterion	6.246273
Log likelihood	-750.6825	Hannan-Quinn criter.	6.220518
F-statistic	67.83105	Durbin-Watson stat	1.962731
Prob(F-statistic)	0.000000		

Null Hypothesis: UKM2 has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.96742	0.6158
Test critical values:	1% level	-3.996113	
	5% level	-3.428349	
	10% level	-3.137574	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	3657.505
HAC corrected variance (Bartlett kernel)	4146.637

Phillips-Perron Test Equation
Dependent Variable: D(UKM2)
Method: Least Squares
Date: 08/04/18 Time: 13:56
Sample (adjusted): 1998M02 2018M06
Included observations: 244 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UKM2(-1)	-0.021633	0.013915	-1.554717	0.1213
C	19.55680	9.545788	2.048736	0.0416
@TREND("1998M01")	0.276758	0.192078	1.440863	0.1509

R-squared	0.010043	Mean dependent var	9.905738
Adjusted R-squared	0.001828	S.D. dependent var	60.90824
S.E. of regression	60.85256	Akaike info criterion	11.06700
Sum squared resid	892431.1	Schwarz criterion	11.11000
Log likelihood	-1347.174	Hannan-Quinn criter.	11.08432
F-statistic	1.222471	Durbin-Watson stat	2.053532
Prob(F-statistic)	0.296321		

Null Hypothesis: D(UKM2) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-16.351	0.0000
Test critical values:	1% level	-3.996271	
	5% level	-3.428426	
	10% level	-3.137619	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	3695.106
HAC corrected variance (Bartlett kernel)	4330.798

Phillips-Perron Test Equation
Dependent Variable: D(UKM2,2)
Method: Least Squares
Date: 08/04/18 Time: 13:57
Sample (adjusted): 1998M03 2018M06
Included observations: 243 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(UKM2(-1))	-1.043261	0.064641	-16.13941	0.0000
C	12.18546	7.948904	1.532974	0.1266
@TREND("1998M01")	-0.013569	0.055937	-0.242578	0.8085

R-squared	0.520506	Mean dependent var	-0.152263
Adjusted R-squared	0.516510	S.D. dependent var	87.96650
S.E. of regression	61.16612	Akaike info criterion	11.07733
Sum squared resid	897910.7	Schwarz criterion	11.12046
Log likelihood	-1342.896	Hannan-Quinn criter.	11.09470
F-statistic	130.2638	Durbin-Watson stat	1.991936
Prob(F-statistic)	0.000000		

Null Hypothesis: UKREMIT has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.07441	0.5571
Test critical values:	1% level	-3.996113	
	5% level	-3.428349	
	10% level	-3.137574	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	1.82E+14
HAC corrected variance (Bartlett kernel)	1.92E+14

Phillips-Perron Test Equation
Dependent Variable: D(UKREMIT)
Method: Least Squares
Date: 08/04/18 Time: 14:00
Sample (adjusted): 1998M02 2018M06
Included observations: 244 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UKREMIT(-1)	-0.045033	0.018942	-2.377341	0.0182
C	9953611.	3953131.	2.517906	0.0125
@TREND("1998M01")	-1904.799	12885.08	-0.147830	0.8826

R-squared	0.025837	Mean dependent var	219616.0
Adjusted R-squared	0.017753	S.D. dependent var	13712329
S.E. of regression	13590070	Akaike info criterion	35.69980
Sum squared resid	4.45E+16	Schwarz criterion	35.74279
Log likelihood	-4352.375	Hannan-Quinn criter.	35.71711
F-statistic	3.195915	Durbin-Watson stat	1.963178
Prob(F-statistic)	0.042670		

Null Hypothesis: D(UKREMIT) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-15.753	0.0000
Test critical values:	1% level	-3.996271	
	5% level	-3.428426	
	10% level	-3.137619	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	1.87E+14
HAC corrected variance (Bartlett kernel)	1.87E+14

Phillips-Perron Test Equation
Dependent Variable: D(UKREMIT,2)
Method: Least Squares
Date: 08/04/18 Time: 14:02
Sample (adjusted): 1998M03 2018M06
Included observations: 243 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(UKREMIT(-1))	-1.003297	0.064549	-15.54329	0.0000
C	1551560.	1786723.	0.868383	0.3861
@TREND("1998M01")	-10815.55	12617.86	-0.857162	0.3922

R-squared	0.501655	Mean dependent var	-2.13E-10
Adjusted R-squared	0.497502	S.D. dependent var	19434689
S.E. of regression	13776686	Akaike info criterion	35.72712
Sum squared resid	4.56E+16	Schwarz criterion	35.77025
Log likelihood	-4337.845	Hannan-Quinn criter.	35.74449
F-statistic	120.7970	Durbin-Watson stat	2.000048
Prob(F-statistic)	0.000000		

Null Hypothesis: UKTBR has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 8 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.40809	0.3744
Test critical values:	1% level	-3.996113	
	5% level	-3.428349	
	10% level	-3.137574	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.048011
HAC corrected variance (Bartlett kernel)	0.125649

Phillips-Perron Test Equation
Dependent Variable: D(UKTBR)
Method: Least Squares
Date: 08/04/18 Time: 14:07
Sample (adjusted): 1998M02 2018M06
Included observations: 244 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
UKTBR(-1)	-0.018660	0.009768	-1.910417	0.0573
C	0.129563	0.062021	2.089027	0.0378
@TREND("1998M01")	-0.000702	0.000293	-2.400791	0.0171

R-squared	0.023576	Mean dependent var	-0.012008
Adjusted R-squared	0.015473	S.D. dependent var	0.222199
S.E. of regression	0.220473	Akaike info criterion	-0.173860
Sum squared resid	11.71466	Schwarz criterion	-0.130862
Log likelihood	24.21092	Hannan-Quinn criter.	-0.156543
F-statistic	2.909537	Durbin-Watson stat	1.571985
Prob(F-statistic)	0.056418		

Null Hypothesis: D(UKTBR) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 7 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-13.699	0.0000
Test critical values:	1% level	-3.996271	
	5% level	-3.428426	
	10% level	-3.137619	

*MacKinnon (1996) one-sided p-values.

Residual variance (no correction)	0.046757
HAC corrected variance (Bartlett kernel)	0.075293

Phillips-Perron Test Equation
Dependent Variable: D(UKTBR,2)
Method: Least Squares
Date: 08/04/18 Time: 14:09
Sample (adjusted): 1998M03 2018M06
Included observations: 243 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(UKTBR(-1))	-0.788847	0.063098	-12.50189	0.0000
C	0.018816	0.028218	0.666812	0.5055
@TREND("1998M01")	-0.000231	0.000200	-1.157654	0.2482

R-squared	0.394395	Mean dependent var	-0.000165
Adjusted R-squared	0.389348	S.D. dependent var	0.278434
S.E. of regression	0.217580	Akaike info criterion	-0.200229
Sum squared resid	11.36188	Schwarz criterion	-0.157105
Log likelihood	27.32785	Hannan-Quinn criter.	-0.182859
F-statistic	78.14884	Durbin-Watson stat	2.111448
Prob(F-statistic)	0.000000		

Chapter 7(A)-BD Optimal Lag Length Selection Criteria

VAR Lag Order Selection Criteria
Endogenous variables: DGEN BDCPI BDDIR BDEXR BDIOP BDM2 BDPCAPGDP BDREMIT BDTBR
Exogenous variables: C
Date: 07/19/18 Time: 10:17
Sample: 1998M01 2018M06
Included observations: 235

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-11866.21	NA	6.31e+32	101.0656	101.1981	101.1190
1	-8693.095	6076.178	2.35e+21	74.74975	76.07470*	75.28391
2	-8526.458	306.3288	1.14e+21	74.02092	76.53832	75.03582*
3	-8441.249	150.1141	1.11e+21	73.98509	77.69495	75.48074
4	-8355.403	144.6585	1.08e+21	73.94386	78.84616	75.92024
5	-8267.093	142.0482	1.03e+21	73.88164	79.97640	76.33877
6	-8149.409	180.2822	7.82e+20	73.56944	80.85665	76.50730
7	-8030.487	173.0693	5.94e+20	73.24670	81.72636	76.66531
8	-7925.728	144.4328	5.17e+20	73.04450	82.71662	76.94385
9	-7772.125	200.0112	3.03e+20	72.42660	83.29117	76.80669
10	-7668.385	127.1362	2.78e+20	72.23307	84.29009	77.09391
11	-7557.294	127.6368	2.47e+20	71.97697	85.22645	77.31855
12	-7373.313	197.2903*	1.22e+20*	71.10054*	85.54247	76.92286

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Chapter 7(A)-BD Johansen Cointegration

Date: 07/30/18 Time: 12:18
Sample (adjusted): 1998M03 2018M06
Included observations: 245 after adjustments
Trend assumption: Linear deterministic trend
Series: DGEN BDCPI BDDIR BDEXR BDIOP BDM2 BDPCAPGDP BDREMIT BDTBR
Lags interval (in first differences): 1 to 11

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.461359	447.8734	197.3709	0.0000
At most 1 *	0.320332	302.4772	159.5297	0.0000
At most 2 *	0.238003	211.7319	125.6154	0.0000
At most 3 *	0.190888	147.8559	95.75366	0.0000
At most 4 *	0.153018	98.07868	69.81889	0.0001
At most 5 *	0.119349	59.05095	47.85613	0.0032
At most 6	0.078834	29.18394	29.79707	0.0587
At most 7	0.038045	9.886820	15.49471	0.2895
At most 8	0.003279	0.771791	3.841466	0.3797

Trace test indicates 6 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.461359	145.3961	58.43354	0.0000
At most 1 *	0.320332	90.74537	52.36261	0.0000
At most 2 *	0.238003	63.87599	46.23142	0.0003
At most 3 *	0.190888	49.77721	40.07757	0.0030
At most 4 *	0.153018	39.02773	33.87687	0.0111
At most 5 *	0.119349	29.86701	27.58434	0.0250
At most 6	0.078834	19.29712	21.13162	0.0886
At most 7	0.038045	9.115030	14.26460	0.2767
At most 8	0.003279	0.771791	3.841466	0.3797

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

DGEN	BDCPI	BDDIR	BDEXR	BDIOP	BDM2	BDPCAPGDP	BDREMIT	USTBR
0.000181	-0.004959	-0.037541	0.008484	0.003845	2.43E-07	4.74E-05	0.000216	0.008525
-0.000282	-0.067894	0.618095	0.150927	-0.024132	5.95E-05	-0.000522	0.000909	-0.019568
0.000221	-0.087775	-0.584209	0.115856	-0.057451	-4.32E-05	0.000438	0.001817	0.131902
4.71E-05	-0.105703	1.004442	0.012533	0.054189	-2.61E-05	0.000377	0.000338	-0.424933
-0.001632	0.174084	-0.600644	-0.248755	0.010348	1.39E-05	-0.000513	0.000515	-0.010816
-0.000251	-0.079198	-1.079053	0.044337	0.032247	1.86E-05	6.36E-05	0.000240	0.370431
0.000382	0.023288	0.411395	0.036041	-0.001607	-3.01E-05	-6.70E-05	0.001351	0.446858
-0.000267	-0.056961	-0.105995	0.204820	-0.003105	9.55E-06	0.000139	-0.000656	0.171022
-0.000256	0.010805	0.316438	-0.073192	-0.022326	2.39E-05	-2.40E-05	-0.000470	0.407590

Unrestricted Adjustment Coefficients (alpha):

D(DGEN)	27.83056	-0.283374	33.22978	-33.52830	65.53395	2.176763	-2.683898	3.371232	-8.832876
D(BDCPI)	-0.263071	1.224111	0.009475	-0.296708	-0.395196	0.347236	0.049219	0.027907	-0.039619
D(BDDIR)	0.000172	-0.023553	-0.015682	-0.029794	-0.001832	0.027498	0.007063	0.001146	0.005367
D(BDEXR)	-0.057368	0.054008	-0.168044	-0.071464	0.008155	-0.044519	-0.015656	-0.024526	-0.001269
D(BDIOP)	-0.027044	-0.187570	0.967692	-1.278738	-0.297795	-0.601589	0.184179	0.026248	0.074227
D(BDM2)	2316.738	-292.5935	28.44045	33.81183	62.62190	-56.09407	-70.58304	-18.32783	-10.61637
D(BDPCAPG	-41.67492	414.4214	32.00603	-45.96193	-20.22861	93.82536	14.48353	14.20557	11.47059
D(BDREMIT)	74.60755	33.50153	-52.58503	-50.51105	-19.23883	-13.06591	-34.99999	29.74564	4.202438
D(BDTBR)	-0.008516	-0.007949	0.025428	-0.008605	-0.002745	0.009679	-0.036442	-0.011898	0.001922

1 Cointegrating Equation(s): Log likelihood -8986.044

Normalized cointegrating coefficients (standard error in parentheses)

DGEN	BDCPI	BDDIR	BDEXR	BDIOP	BDM2	BDPCAPGDP	BDREMIT	USTBR
1.000000	-27.37809	-207.2507	46.83589	21.22574	0.001343	-0.842423	-1.192739	47.06143
	(63.6865)	(537.235)	(99.5094)	(27.5924)	(0.02420)	(0.22663)	(0.80352)	(147.709)

Adjustment coefficients (standard error in parentheses)

D(DGEN)	-0.12821
	(0.00325)
D(BDCPI)	-4.77E-05
	(4.0E-05)
D(BDDIR)	3.12E-08
	(2.0E-06)
D(BDEXR)	-1.04E-05
	(6.5E-06)
D(BDIOP)	-4.90E-06
	(6.0E-05)
D(BDM2)	0.419652
	(0.02484)
D(BDPCAPG	-0.007549
	(0.01173)
D(BDREMIT)	0.013514
	(0.00446)
D(BDTBR)	-1.54E-06
	(2.5E-06)

2 Cointegrating Equation(s): Log likelihood -8955.501

Normalized cointegrating coefficients (standard error in parentheses)

DGEN	BDCPI	BDDIR	BDEXR	IOP	BDM2	BDPCAPGDP	BDREMIT	USTBR
1.000000	0.000000	-409.8726	-12.59278	27.79532	-0.020338	0.424009	0.741799	49.33950
		(488.599)	(59.8247)	(25.0160)	(0.02156)	(0.18746)	(0.71597)	(234.775)
0.000000	1.000000	-7.400876	-2.170665	0.239957	-0.000792	0.005933	-0.016470	0.083220
		(3.51493)	(0.43037)	(0.17996)	(0.00016)	(0.00135)	(0.00515)	(1.68895)

Adjustment coefficients (standard error in parentheses)

D(DGEN)	0.005121	-0.118779
	(0.00601)	(1.22138)
D(BDCPI)	-0.000393	-0.081805
	(6.9E-05)	(0.01400)
D(BDDIR)	6.68E-06	0.001598
	(3.6E-06)	(0.00073)
D(BDEXR)	-2.56E-05	-0.003382
	(1.2E-05)	(0.00242)
D(IOP)	4.80E-05	0.012869
	(0.00011)	(0.02244)
D(BDM2)	0.502190	8.375991
	(0.04553)	(9.24534)
D(BDPCAPG	-0.124454	-27.92994
	(0.01971)	(4.00247)
D(BDREMIT)	0.004064	-2.644542
	(0.00821)	(1.66780)
D(USTBR)	7.00E-07	0.000582
	(4.7E-06)	(0.00095)

3 Cointegrating Equation(s): Log likelihood -8932.750

Normalized cointegrating coefficients (standard error in parentheses)

DGEN	BDCPI	BDDIR	BDEXR	IOP	BDM2	BDPCAPGDP	BDREMIT	USTBR
1.000000	0.000000	0.000000	13.18066	43.04153	0.018445	-0.113858	-0.667516	3.340381
			(72.1464)	(29.6586)	(0.02559)	(0.21487)	(0.86335)	(260.706)
0.000000	1.000000	0.000000	-1.705287	0.515251	-9.16E-05	0.000333	-0.017811	-0.747365
			(0.26351)	(0.10833)	(9.3E-05)	(0.00078)	(0.00315)	(0.95222)
0.000000	0.000000	1.000000	0.062882	0.037197	9.46E-05	-0.000757	-0.000181	-0.112228
			(0.04797)	(0.01972)	(1.7E-05)	(0.00014)	(0.00057)	(0.17335)

Adjustment coefficients (standard error in parentheses)

D(DGEN)	0.012460	-3.035511	-20.63308
	(0.00715)	(1.97830)	(15.1619)
D(BDCPI)	-0.000391	-0.082636	0.760957
	(8.3E-05)	(0.02284)	(0.17502)
D(BDDIR)	3.21E-06	0.002975	-0.005403
	(4.3E-06)	(0.00119)	(0.00913)
D(BDEXR)	-6.27E-05	0.011368	0.133708
	(1.4E-05)	(0.00375)	(0.02872)
D(IOP)	0.000262	-0.072070	-0.680255
	(0.00013)	(0.03594)	(0.27547)
D(BDM2)	0.508471	5.879641	-284.4389
	(0.05452)	(15.0844)	(115.609)
D(BDPCAPG	-0.117385	-30.73926	239.0179
	(0.02359)	(6.52679)	(50.0221)
D(BDREMIT)	-0.007550	1.971090	48.62689
	(0.00974)	(2.69448)	(20.6508)
D(USTBR)	6.32E-06	-0.001650	-0.019449
	(5.6E-06)	(0.00154)	(0.01177)

4 Cointegrating Equation(s): Log likelihood -8914.081

Normalized cointegrating coefficients (standard error in parentheses)

DGEN	BDCPI	BDDIR	BDEXR	IOP	BDM2	BDPCAPGDP	BDREMIT	USTBR
1.000000	0.000000	0.000000	0.000000	46.98490	0.010947	0.180286	0.588150	-18.94193
				(25.5440)	(0.02382)	(0.18740)	(0.83742)	(240.717)
0.000000	1.000000	0.000000	0.000000	0.005066	0.000878	-0.008261	-0.007543	2.135475
				(0.16763)	(0.00016)	(0.00123)	(0.00550)	(1.57970)
0.000000	0.000000	1.000000	0.000000	0.056010	5.89E-05	-0.000440	-0.000560	-0.218531
				(0.01339)	(1.2E-05)	(9.8E-05)	(0.00044)	(0.12615)
0.000000	0.000000	0.000000	1.000000	-0.299179	0.000569	-0.005040	0.006021	1.690531
				(0.10440)	(9.7E-05)	(0.00077)	(0.00342)	(0.98387)

Adjustment coefficients (standard error in parentheses)

D(DGEN)	0.010879	0.508537	-54.31031	3.622985
	(0.00714)	(2.71011)	(23.2716)	(3.37348)
D(BDCPI)	-0.000405	-0.051273	0.462931	0.179898
	(8.3E-05)	(0.03138)	(0.26949)	(0.03907)
D(BDDIR)	1.81E-06	0.006124	-0.035329	-0.005744
	(4.3E-06)	(0.00162)	(0.01388)	(0.00201)
D(BDEXR)	-6.61E-05	0.018922	0.061927	-0.012700
	(1.4E-05)	(0.00512)	(0.04400)	(0.00638)
D(IOP)	0.000201	0.063097	-1.964673	0.067547
	(0.00013)	(0.04793)	(0.41159)	(0.05966)
D(BDM2)	0.510065	2.305623	-250.4769	-20.78668
	(0.05488)	(20.8200)	(178.781)	(25.9163)
D(BDPCAPG	-0.119552	-25.88094	192.8518	65.32581
	(0.02372)	(8.99790)	(77.2646)	(11.2004)
D(BDREMIT)	-0.009931	7.310269	-2.108526	-1.036118
	(0.00971)	(3.68488)	(31.6419)	(4.58684)
D(USTBR)	5.91E-06	-0.000741	-0.028092	0.001566
	(5.6E-06)	(0.00212)	(0.01819)	(0.00264)

5 Cointegrating Equation(s): Log likelihood -8902.324

Normalized cointegrating coefficients (standard error in parentheses)

DGEN	BDCPI	BDDIR	BDEXR	IOP	BDM2	BDPCAPGDP	BDREMIT	USTBR
1.000000	0.000000	0.000000	0.000000	0.000000	-0.046763	0.490041	-3.503665	109.7587
					(0.02753)	(0.21649)	(0.89686)	(271.894)
0.000000	1.000000	0.000000	0.000000	0.000000	0.000872	-0.008228	-0.007984	2.149352
					(0.00015)	(0.00121)	(0.00502)	(1.52111)
0.000000	0.000000	1.000000	0.000000	0.000000	-9.94E-06	-7.05E-05	-0.005438	-0.065108
					(4.9E-05)	(0.00039)	(0.00161)	(0.48822)
0.000000	0.000000	0.000000	1.000000	0.000000	0.000936	-0.007012	0.032076	0.871024
					(0.00036)	(0.00284)	(0.01175)	(3.56265)
0.000000	0.000000	0.000000	0.000000	1.000000	0.001228	-0.006593	0.087088	-2.739190
					(0.00100)	(0.00783)	(0.03243)	(9.83262)

Adjustment coefficients (standard error in parentheses)

D(DGEN)	-0.096042	11.91698	-93.67291	-12.67892	-2.933985
	(0.02882)	(3.97793)	(24.8159)	(5.37645)	(1.42862)
D(BDCPI)	0.000240	-0.120071	0.700303	0.278205	-0.051264
	(0.00034)	(0.04710)	(0.29384)	(0.06366)	(0.01692)
D(BDDIR)	4.80E-06	0.005805	-0.034228	-0.005288	-0.000163
	(1.8E-05)	(0.00245)	(0.01526)	(0.00331)	(0.00088)
D(BDEXR)	-7.94E-05	0.020341	0.057028	-0.014729	0.004342
	(5.6E-05)	(0.00775)	(0.04835)	(0.01048)	(0.00278)
D(IOP)	0.000687	0.011255	-1.785804	0.141625	-0.123548
	(0.00052)	(0.07238)	(0.45152)	(0.09782)	(0.02599)
D(BDM2)	0.407895	13.20712	-288.0903	-36.36420	16.81470
	(0.22813)	(31.4849)	(196.415)	(42.5540)	(11.3074)
D(BDPCAPG	-0.086548	-29.40242	205.0020	70.35778	-14.69996
	(0.09861)	(13.6097)	(84.9027)	(18.3945)	(4.88776)
D(BDREMIT)	0.021458	3.961087	9.447168	3.749640	-0.436761
	(0.04034)	(5.56731)	(34.7311)	(7.52460)	(1.99943)
D(USTBR)	1.04E-05	-0.001218	-0.026443	0.002249	-0.001797
	(2.3E-05)	(0.00320)	(0.01999)	(0.00433)	(0.00115)

6 Cointegrating Equation(s): Log likelihood -8894.135

Normalized cointegrating coefficients (standard error in parentheses)

DGEN	BDCPI	BDDIR	BDEXR	IOP	BDM2	BDPCAPGDP	BDREMIT	USTBR
1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.541540	29.89375	-1498.911
						(1.34149)	(7.93268)	(2744.78)
0.000000	1.000000	0.000000	0.000000	0.000000	0.000000	-0.009189	-0.630851	32.15129
						(0.02709)	(0.16019)	(55.4260)
0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	-5.96E-05	0.001663	-0.407124
						(9.2E-05)	(0.00054)	(0.18846)
0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	-0.008043	-0.636606	33.07978
						(0.02771)	(0.16388)	(56.7049)
0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	-0.007945	-0.790127	39.51403
						(0.03386)	(0.20022)	(69.2771)
0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	1.101279	714.1914	-34400.81
						(31.2970)	(185.070)	(64035.7)

Adjustment coefficients (standard error in parentheses)

D(DGEN)	-0.096589	11.74459	-96.02175	-12.58241	-2.863792	0.000381
	(0.02914)	(4.20321)	(30.9535)	(5.42975)	(1.53185)	(0.00140)
D(BDCPI)	0.000153	-0.147571	0.325616	0.293601	-0.040067	8.11E-05
	(0.00034)	(0.04946)	(0.36423)	(0.06389)	(0.01803)	(1.6E-05)
D(BDDIR)	-2.11E-06	0.003627	-0.063900	-0.004069	0.000723	5.39E-07
	(1.8E-05)	(0.00255)	(0.01876)	(0.00329)	(0.00093)	(8.5E-07)
D(BDEXR)	-6.82E-05	0.023867	0.105067	-0.016703	0.002907	1.16E-05
	(5.7E-05)	(0.00816)	(0.06008)	(0.01054)	(0.00297)	(2.7E-06)
D(IOP)	0.000838	0.058900	-1.136658	0.114953	-0.142947	-3.49E-05
	(0.00053)	(0.07587)	(0.55872)	(0.09801)	(0.02765)	(2.5E-05)
D(BDM2)	0.421989	17.64966	-227.5619	-38.85124	15.00585	-0.019129
	(0.23058)	(33.2569)	(244.912)	(42.9616)	(12.1204)	(0.01104)
D(BDPCAPG	-0.110122	-36.83320	103.7595	74.51771	-11.67439	0.025931
	(0.09916)	(14.3022)	(105.325)	(18.4756)	(5.21238)	(0.00475)
D(BDREMIT)	0.024741	4.995880	23.54597	3.170337	-0.858095	0.005088
	(0.04076)	(5.87908)	(43.2950)	(7.59464)	(2.14261)	(0.00195)
D(USTBR)	7.96E-06	-0.001985	-0.036888	0.002678	-0.001484	-1.21E-06
	(2.3E-05)	(0.00338)	(0.02491)	(0.00437)	(0.00123)	(1.1E-06)

7 Cointegrating Equation(s): Log likelihood -8888.330

Normalized cointegrating coefficients (standard error in parentheses)

DGEN	BDCPI	BDDIR	BDEXR	IOP	BDM2	BDPCAPGDP	BDREMIT	USTBR
1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	-62.86252	1899.977
							(5.02374)	(5219.55)
0.000000	1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.942987	-25.51919
							(0.07669)	(79.6760)
0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	0.000000	0.011869	-0.781110
							(0.00100)	(1.04149)
0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	0.741066	-17.40257
							(0.05930)	(61.6127)
0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.570767	-10.35349
							(0.04598)	(47.7758)
0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	525.5615	-27488.80
							(46.0620)	(47857.3)
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	171.2825	-6276.344
							(14.1331)	(14683.9)

Adjustment coefficients (standard error in parentheses)

D(DGEN)	-0.097613	11.68208	-97.12590	-12.67914	-2.859480	0.000462	-0.029944
	(0.02987)	(4.22191)	(31.7455)	(5.46451)	(1.53201)	(0.00149)	(0.01610)
D(BDCPI)	0.000171	-0.146425	0.345865	0.295375	-0.040146	7.96E-05	-0.000538
	(0.00035)	(0.04967)	(0.37352)	(0.06430)	(0.01803)	(1.8E-05)	(0.00019)
D(BDDIR)	5.82E-07	0.003792	-0.060994	-0.003814	0.000712	3.26E-07	-3.57E-06
	(1.8E-05)	(0.00256)	(0.01922)	(0.00331)	(0.00093)	(9.0E-07)	(9.7E-06)
D(BDEXR)	-7.42E-05	0.023503	0.098626	-0.017267	0.002932	1.21E-05	-0.000137
	(5.8E-05)	(0.00819)	(0.06159)	(0.01060)	(0.00297)	(2.9E-06)	(3.1E-05)
D(IOP)	0.000909	0.063189	-1.060888	0.121591	-0.143243	-4.05E-05	0.000141
	(0.00054)	(0.07615)	(0.57261)	(0.09857)	(0.02763)	(2.7E-05)	(0.00029)
D(BDM2)	0.395053	16.00592	-256.5994	-41.39515	15.11925	-0.017004	0.256833
	(0.23618)	(33.3874)	(251.046)	(43.2140)	(12.1153)	(0.01177)	(0.12728)
D(BDPCAPG	-0.104595	-36.49591	109.7179	75.03971	-11.69766	0.025495	-0.206396
	(0.10162)	(14.3647)	(108.011)	(18.5925)	(5.21253)	(0.00506)	(0.05476)
D(BDREMIT)	0.011384	4.180800	9.147159	1.908887	-0.801864	0.006142	-0.044645
	(0.04159)	(5.87861)	(44.2025)	(7.60881)	(2.13318)	(0.00207)	(0.02241)
D(USTBR)	-5.95E-06	-0.002834	-0.051880	0.001365	-0.001426	-1.09E-07	1.61E-05
	(2.4E-05)	(0.00335)	(0.02517)	(0.00433)	(0.00121)	(1.2E-06)	(1.3E-05)

8 Cointegrating Equation(s): Log likelihood -8886.577

Normalized cointegrating coefficients (standard error in parentheses)

DGEN	BDCPI	BDDIR	BDEXR	IOP	BDM2	BDPCAPGDP	BDREMIT	USTBR
1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	205.2005
								(162.935)
0.000000	1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	-0.096211
								(2.59102)
0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	-0.461121
								(0.10847)
0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	0.000000	2.576612
								(1.75120)
0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	5.034418
								(2.43939)
0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	-13319.64
								(5585.64)
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	-1658.557
								(735.092)
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	-26.96005
								(66.6331)

Adjustment coefficients (standard error in parentheses)

D(DGEN)	-0.098512	11.49005	-97.48323	-11.98865	-2.869946	0.000494	-0.029473	0.083197
	(0.03021)	(4.33305)	(31.7948)	(6.49513)	(1.53281)	(0.00150)	(0.01627)	(0.04492)
D(BDCPI)	0.000164	-0.148015	0.342907	0.301091	-0.040233	7.99E-05	-0.000534	0.000901
	(0.00036)	(0.05098)	(0.37411)	(0.07642)	(0.01804)	(1.8E-05)	(0.00019)	(0.00053)
D(BDDIR)	2.77E-07	0.003727	-0.061116	-0.003580	0.000708	3.37E-07	-3.41E-06	-4.55E-05
	(1.8E-05)	(0.00262)	(0.01925)	(0.00393)	(0.00093)	(9.1E-07)	(9.9E-06)	(2.7E-05)
D(BDEXR)	-6.77E-05	0.024900	0.101226	-0.022290	0.003008	1.18E-05	-0.000141	-0.000304
	(5.9E-05)	(0.00840)	(0.06162)	(0.01259)	(0.00297)	(2.9E-06)	(3.2E-05)	(8.7E-05)
D(IOP)	0.000902	0.061694	-1.063670	0.126967	-0.143324	-4.02E-05	0.000145	0.001083
	(0.00054)	(0.07816)	(0.57354)	(0.11716)	(0.02765)	(2.7E-05)	(0.00029)	(0.00081)
D(BDM2)	0.399940	17.04990	-254.6567	-45.14905	15.17615	-0.017179	0.254277	0.233091
	(0.23892)	(34.2677)	(251.448)	(51.3664)	(12.1222)	(0.01184)	(0.12867)	(0.35528)
D(BDPCAPG	-0.108383	-37.30508	108.2122	77.94929	-11.74176	0.025631	-0.204416	0.432643
	(0.10279)	(14.7421)	(108.174)	(22.0981)	(5.21502)	(0.00509)	(0.05536)	(0.15284)
D(BDREMIT)	0.003452	2.486452	5.994263	8.001374	-0.894212	0.006426	-0.040497	-0.145890
	(0.04193)	(6.01380)	(44.1278)	(9.01454)	(2.12738)	(0.00208)	(0.02258)	(0.06235)
D(USTBR)	-2.78E-06	-0.002156	-0.050619	-0.001072	-0.001389	-2.22E-07	1.44E-05	-6.30E-06
	(2.4E-05)	(0.00343)	(0.02517)	(0.00514)	(0.00121)	(1.2E-06)	(1.3E-05)	(3.6E-05)

Chapter 7(A)-UK Optimal Lag Length Criteria

VAR Lag Order Selection Criteria
Endogenous variables: FTSE100 UKBOT UKCPI UKDIR UKEXR UKGDPCAP UKIOP UKM2 UKREMIT UKTBR
Exogenous variables: C
Date: 08/17/18 Time: 15:49
Sample: 1998M01 2018M06
Included observations: 240

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-11361.84	NA	1.98e+31	97.60377	97.73707	97.65752
1	-8143.179	6161.040	3.98e+19	70.67106	72.00408*	71.20859
2	-7949.273	356.1878	1.72e+19	69.70191	72.23465	70.72322*
3	-7882.124	118.1587	1.51e+19*	69.82081	73.55326	71.32590
4	-7811.085	119.5162	1.90e+19	69.90631	74.83848	71.89518
5	-7732.843	125.5903	1.99e+19	69.92998	76.06187	72.40263
6	-7656.311	116.9334	2.14e+19	69.96833	77.29994	72.92476
7	-7570.350	124.6986	2.15e+19	69.92575	78.45707	73.36596
8	-7504.347	90.64832	2.61e+19	70.05448	79.78552	73.97846
9	-7416.282	114.1437	2.68e+19	69.99384	80.92459	74.40160
10	-7351.653	78.77534	3.45e+19	70.13436	82.26483	75.02591
11	-7269.429	93.86968	3.93e+19	70.12385	83.45404	75.49918
12	-7137.346	140.5858*	3.02e+19	69.68537*	84.21528	75.54448

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Chapter 7(A)-UK Johansen Cointegration

Date: 08/20/18 Time: 20:14
Sample (adjusted): 1998M03 2018M06
Included observations: 250 after adjustments
Trend assumption: Linear deterministic trend
Series: FTSE100 UKBOT UKCPI UKDIR UKEXR UKGDPCAP UKIOP UKM2 UKREMIT UKTBR
Lags interval (in first differences): 1 to 11

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.486671	525.0136	239.2354	0.0000
At most 1 *	0.303576	369.6404	197.3709	0.0000
At most 2 *	0.285253	285.3417	159.5297	0.0000
At most 3 *	0.235857	207.0942	125.6154	0.0000
At most 4 *	0.202429	144.4172	95.75366	0.0000
At most 5 *	0.129726	91.71611	69.81889	0.0004
At most 6 *	0.114729	59.34152	47.85613	0.0029
At most 7 *	0.081789	30.94773	29.79707	0.0367
At most 8	0.045745	11.06620	15.49471	0.2075
At most 9	0.000669	0.156025	3.841466	0.6928

Trace test indicates 8 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.486671	155.3731	64.50472	0.0000
At most 1 *	0.303576	84.29869	58.43354	0.0000
At most 2 *	0.285253	78.24748	52.36261	0.0000
At most 3 *	0.235857	62.67703	46.23142	0.0004
At most 4 *	0.202429	52.70110	40.07757	0.0012
At most 5 *	0.129726	33.87687	32.37460	0.0247
At most 6 *	0.114729	28.39379	27.58434	0.0393
At most 7	0.081789	19.88153	21.13162	0.0740
At most 8	0.045745	10.91017	14.26460	0.1588
At most 9	0.000669	0.156025	3.841466	0.6928

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

FTSE100	UKBOT	UKCPI	UKDIR	UKEXR	UKGDPCAP	UKIOP	UKM2	UKREMIT	UKTBR
4.06E-05	-0.000107	0.036995	-1.419000	12.84094	-0.006269	-0.008589	-0.001667	0.001164	0.556215
0.000855	0.000692	-0.408775	-0.525852	0.552987	0.006943	0.093670	0.000186	0.007160	-0.133111
0.000433	0.000775	-0.074459	-0.148650	1.669869	0.010471	-0.045140	0.001019	0.004202	0.035006
-0.000376	-0.001120	0.178057	0.511710	-1.586769	-0.020824	-0.004606	0.002916	0.009183	0.619751
3.60E-06	8.20E-05	-0.015981	0.061433	-3.675353	0.000648	0.019925	-0.000636	0.006066	0.068351
-0.001539	0.000144	0.203788	0.188614	-1.482240	-0.000737	0.003684	0.001107	0.010104	0.935355
-0.000654	-0.000219	0.026240	-0.075705	-2.463912	0.013222	0.036237	-0.003289	-0.005685	0.388908
-2.62E-05	-0.000176	-0.222493	-0.604414	-8.276428	-0.000815	0.006665	0.003414	0.004278	0.683048
0.000257	2.24E-05	0.065911	0.192750	-2.067647	-0.000547	-0.003323	-0.000199	-0.005125	0.337749
-0.000518	-6.64E-05	-0.167246	0.142939	-2.763473	-0.002197	-0.002215	0.002948	0.001042	0.156733

Unrestricted Adjustment Coefficients (alpha):

D(FTSE100)	43.29922	-47.28558	-1.356334	-16.62631	-13.46727	31.88392	-9.178487	-6.544347	3.378164	3.150938
D(UKBOT)	3.389593	-67.13234	-97.04042	80.60949	-59.94282	-4.985310	5.123709	14.48984	1.704629	-10.34898
D(UKCPI)	-0.026966	0.051536	-0.019085	-0.044956	-0.056936	0.008088	-0.015595	0.042331	-0.011673	0.004531
D(UKDIR)	0.081569	0.042510	-0.003553	0.001429	0.006616	0.002660	-0.000432	0.009770	0.004670	-0.004388
D(UKEXR)	-0.000385	-0.001930	-0.001997	-0.000980	0.004475	0.001190	-0.001339	0.002171	-0.000436	-0.000639
D(UKGDPCAP)	2.295014	-0.896388	-1.271145	1.703630	1.875684	-0.552956	-0.157053	0.285400	0.337688	0.594709
D(UKIOP)	0.050687	-0.365811	0.716727	0.109286	-0.250696	-0.571048	-0.632927	0.416595	-0.042561	-0.031305
D(UKM2)	6.277681	-11.00439	9.006167	-0.722767	-0.442489	-0.694804	7.717601	6.717748	-1.787596	-0.328372
D(UKREMIT)	-1.669799	-1.962576	-1.514373	-2.920312	0.639483	-1.578858	0.844442	0.954344	3.079663	-0.016188
D(UKTBR)	0.053744	-0.023374	-0.024581	-0.033012	-0.002155	-0.016649	-0.001762	-0.013344	-0.015124	-0.002011

1 Cointegrating Equation(s): Log likelihood -7151.908

Normalized cointegrating coefficients (standard error in parentheses)

FTSE100	UKBOT	UKCPI	UKDIR	UKEXR	UKGDPCAP	UKIOP	UKM2	UKREMIT	UKTBR
1.000000	-2.629003	910.5765	-34926.63	316061.3	-154.3091	-211.4124	-41.02233	28.65177	13690.44
	(3.62711)	(1198.48)	(4240.47)	(40878.2)	(70.8354)	(282.736)	(16.8977)	(47.5051)	(2978.54)

Adjustment coefficients (standard error in parentheses)

D(FTSE100)	-0.23697
	(0.00052)
D(UKBOT)	0.000138
	(0.00121)
D(UKCPI)	-1.10E-06
	(9.3E-07)
D(UKDIR)	3.31E-06
	(4.8E-07)
D(UKEXR)	-1.56E-08
	(6.1E-08)
D(UKGDPCAP)	9.32E-05
	(3.5E-05)
D(UKIOP)	2.06E-06
	(1.2E-05)
D(UKM2)	0.000255
	(0.00016)
D(UKREMIT)	-6.78E-05
	(6.1E-05)
D(UKTBR)	2.18E-06
	(5.3E-07)

2 Cointegrating Equation(s): Log likelihood -7121.227

Normalized cointegrating coefficients (standard error in parentheses)

FTSE100	UKBOT	UKCPI	UKDIR	UKEXR	UKGDPCAP	UKIOP	UKM2	UKREMIT	UKTBR
1.000000	0.000000	-151.0886	-8696.702	74937.99	-30.13622	33.97232	-9.495744	13.15164	3105.538
		(264.754)	(998.688)	(9771.54)	(10.8981)	(67.2377)	(3.99069)	(11.3076)	(704.983)
0.000000	1.000000	-403.8280	9977.140	-91716.62	47.23195	93.33756	11.99184	-5.895821	-4026.204
		(321.972)	(1214.52)	(11883.3)	(13.2533)	(81.7689)	(4.85315)	(13.7513)	(857.342)

Adjustment coefficients (standard error in parentheses)

D(FTSE100)	-0.038662	-0.037366
	(0.01069)	(0.00875)
D(UKBOT)	-0.057249	-0.046846
	(0.02514)	(0.02058)
D(UKCPI)	4.30E-05	3.86E-05
	(1.9E-05)	(1.6E-05)
D(UKDIR)	3.97E-05	2.07E-05
	(9.8E-06)	(8.0E-06)
D(UKEXR)	-1.67E-06	-1.30E-06
	(1.3E-06)	(1.0E-06)
D(UKGDPCAP)	-0.000673	-0.000866
	(0.00074)	(0.00060)
D(UKIOP)	-0.000311	-0.000259
	(0.00026)	(0.00021)
D(UKM2)	-0.009152	-0.008290
	(0.00323)	(0.00265)
D(UKREMIT)	-0.001746	-0.001181
	(0.00129)	(0.00106)
D(UKTBR)	-1.78E-05	-2.19E-05
	(1.1E-05)	(9.1E-06)

3 Cointegrating Equation(s): Log likelihood -7102.976

Normalized cointegrating coefficients (standard error in parentheses)

FTSE100	UKBOT	UKCPI	UKDIR	UKEXR	UKGDPCAP	UKIOP	UKM2	UKREMIT	UKTBR
1.000000	0.000000	0.000000	-10742.18	94970.28	-36.63974	-31.73876	-11.56482	14.68050	4005.518
			(1197.49)	(11020.6)	(13.5078)	(68.0922)	(4.45483)	(13.5729)	(854.272)
0.000000	1.000000	0.000000	4510.013	-38174.52	29.84940	-82.29436	6.461632	-1.809489	-1620.746
			(619.775)	(5703.86)	(6.99112)	(35.2419)	(2.30565)	(7.02483)	(442.139)
0.000000	0.000000	1.000000	-13.53826	132.5864	-0.043044	-0.434918	-0.013694	0.010119	5.956639
			(1.87526)	(17.2583)	(0.02115)	(0.10663)	(0.00698)	(0.02126)	(1.33779)

Adjustment coefficients (standard error in parentheses)

D(FTSE100)	-0.039250	-0.038418	21.03201
	(0.01198)	(0.01305)	(5.21095)
D(UKBOT)	-0.099273	-0.122053	34.79297
	(0.02752)	(0.02998)	(11.9685)
D(UKCPI)	3.47E-05	2.38E-05	-0.020643
	(2.2E-05)	(2.4E-05)	(0.00946)
D(UKDIR)	3.81E-05	1.80E-05	-0.014095
	(1.1E-05)	(1.2E-05)	(0.00477)
D(UKEXR)	-2.53E-06	-2.84E-06	0.000923
	(1.4E-06)	(1.5E-06)	(0.00062)
D(UKGDPCAP)	-0.001224	-0.001851	0.545973
	(0.00082)	(0.00089)	(0.35676)
D(UKIOP)	-2.64E-07	0.000297	0.098043
	(0.00028)	(0.00031)	(0.12305)
D(UKM2)	-0.005252	-0.001310	4.059970
	(0.00358)	(0.00390)	(1.55666)
D(UKREMIT)	-0.002401	-0.002354	0.853237
	(0.00144)	(0.00157)	(0.62743)
D(UKTBR)	-2.84E-05	-4.10E-05	0.013373
	(1.2E-05)	(1.4E-05)	(0.00540)

4 Cointegrating Equation(s): Log likelihood -7086.492

Normalized cointegrating coefficients (standard error in parentheses)

FTSE100	UKBOT	UKCPI	UKDIR	UKEXR	UKGDPCAP	UKIOP	UKM2	UKREMIT	UKTBR
1.000000	0.000000	0.000000	0.000000	6945.464	-18.92884	-117.1240	10.94593	44.39655	1958.958
				(7226.41)	(13.1442)	(66.4953)	(4.11793)	(13.2493)	(693.591)
0.000000	1.000000	0.000000	0.000000	-1218.047	22.41363	-46.44609	-2.989317	-14.28552	-761.5155
				(2046.10)	(3.72166)	(18.8276)	(1.16596)	(3.75143)	(196.384)
0.000000	0.000000	1.000000	0.000000	21.64963	-0.020724	-0.542528	0.014676	0.047570	3.377381
				(12.9170)	(0.02349)	(0.11886)	(0.00736)	(0.02368)	(1.23977)
0.000000	0.000000	0.000000	1.000000	-8.194318	0.001649	-0.007949	0.002096	0.002766	-0.190516
				(0.88968)	(0.00162)	(0.00819)	(0.00051)	(0.00163)	(0.08539)

Adjustment coefficients (standard error in parentheses)

D(FTSE100)	-0.032996	-0.019800	18.07159	-44.88261
	(0.01282)	(0.01906)	(5.64469)	(19.9671)
D(UKBOT)	-0.129593	-0.212315	49.14602	86.16559
	(0.02907)	(0.04320)	(12.7956)	(45.2623)
D(UKCPI)	5.16E-05	7.41E-05	-0.028648	-0.009003
	(2.3E-05)	(3.4E-05)	(0.01020)	(0.03609)
D(UKDIR)	3.76E-05	1.64E-05	-0.013841	-0.136842
	(1.2E-05)	(1.8E-05)	(0.00519)	(0.01836)
D(UKEXR)	-2.16E-06	-1.75E-06	0.000749	0.001357
	(1.5E-06)	(2.3E-06)	(0.00067)	(0.00237)
D(UKGDPCAP)	-0.001864	-0.003759	0.849316	-1.724538
	(0.00087)	(0.00130)	(0.38466)	(1.36066)
D(UKIOP)	-4.14E-05	0.000174	0.117502	0.069819
	(0.00030)	(0.00045)	(0.13376)	(0.47314)
D(UKM2)	-0.004980	-0.000501	3.931276	-4.829971
	(0.00384)	(0.00571)	(1.69240)	(5.98656)
D(UKREMIT)	-0.001303	0.000916	0.333256	2.132229
	(0.00154)	(0.00229)	(0.67678)	(2.39398)
D(UKTBR)	-1.60E-05	-4.01E-06	0.007495	-0.077210
	(1.3E-05)	(2.0E-05)	(0.00579)	(0.02050)

5 Cointegrating Equation(s): Log likelihood -7074.226

Normalized cointegrating coefficients (standard error in parentheses)

FTSE100	UKBOT	UKCPI	UKDIR	UKEXR	UKGDPCAP	UKIOP	UKM2	UKREMIT	UKTBR
1.000000	0.000000	0.000000	0.000000	0.000000	-22.85244	-76.79978	10.12780	63.75516	2437.153
					(16.0262)	(84.8036)	(5.23951)	(16.9601)	(786.409)
0.000000	1.000000	0.000000	0.000000	0.000000	23.10172	-53.51787	-2.845839	-17.68050	-845.3780
					(3.99379)	(21.1333)	(1.30570)	(4.22652)	(195.976)
0.000000	0.000000	1.000000	0.000000	0.000000	-0.032954	-0.416834	0.012125	0.107912	4.867956
					(0.03679)	(0.19469)	(0.01203)	(0.03894)	(1.80546)
0.000000	0.000000	0.000000	1.000000	0.000000	0.006278	-0.055523	0.003061	-0.020073	-0.754694
					(0.01025)	(0.05425)	(0.00335)	(0.01085)	(0.50305)
0.000000	0.000000	0.000000	0.000000	1.000000	0.000565	-0.005806	0.000118	-0.002787	-0.068850
					(0.00125)	(0.00660)	(0.00041)	(0.00132)	(0.06118)

Adjustment coefficients (standard error in parentheses)

D(FTSE100)	-0.033044	-0.020904	18.28680	-45.70995	603.4687
	(0.01279)	(0.01904)	(5.63428)	(19.9325)	(168.406)
D(UKBOT)	-0.129809	-0.217229	50.10394	82.48312	-63.24007
	(0.02879)	(0.04285)	(12.6816)	(44.8638)	(379.046)
D(UKCPI)	5.14E-05	6.94E-05	-0.027738	-0.012501	-0.069043
	(2.3E-05)	(3.4E-05)	(0.01007)	(0.03562)	(0.30097)
D(UKDIR)	3.76E-05	1.69E-05	-0.013946	-0.136435	1.038418
	(1.2E-05)	(1.8E-05)	(0.00519)	(0.01836)	(0.15516)
D(UKEXR)	-2.15E-06	-1.38E-06	0.000677	0.001632	-0.024237
	(1.5E-06)	(2.2E-06)	(0.00066)	(0.00233)	(0.01965)
D(UKGDPCAP)	-0.001858	-0.003605	0.819341	-1.609309	17.25475
	(0.00086)	(0.00129)	(0.38092)	(1.34759)	(11.3856)
D(UKIOP)	-4.23E-05	0.000154	0.121508	0.054418	2.393402
	(0.00030)	(0.00045)	(0.13364)	(0.47277)	(3.99435)
D(UKM2)	-0.004981	-0.000537	3.938348	-4.857154	92.33835
	(0.00384)	(0.00572)	(1.69340)	(5.99078)	(50.6150)
D(UKREMIT)	-0.001301	0.000968	0.323037	2.171514	-22.77235
	(0.00154)	(0.00229)	(0.67694)	(2.39481)	(20.2334)
D(UKTBR)	-1.60E-05	-4.19E-06	0.007530	-0.077342	0.696454
	(1.3E-05)	(2.0E-05)	(0.00580)	(0.02051)	(0.17329)

6 Cointegrating Equation(s): Log likelihood -7065.550

Normalized cointegrating coefficients (standard error in parentheses)

FTSE100	UKBOT	UKCPI	UKDIR	UKEXR	UKGDPCAP	UKIOP	UKM2	UKREMIT	UKTBR
1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	-62.86651	0.232110	2.255355	-244.4207
						(25.4228)	(0.88613)	(3.62584)	(215.674)
0.000000	1.000000	0.000000	0.000000	0.000000	0.000000	-67.60313	7.157795	44.49016	1865.447
						(54.1730)	(1.88825)	(7.72624)	(459.577)
0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	-0.396741	-0.002144	0.019228	1.001063
						(0.11829)	(0.00412)	(0.01687)	(1.00352)
0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	-0.059351	0.005779	-0.003178	-0.018036
						(0.04764)	(0.00166)	(0.00679)	(0.40413)
0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	-0.006150	0.000362	-0.001267	-0.002561
						(0.00574)	(0.00020)	(0.00082)	(0.04867)
0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	0.609706	-0.433025	-2.691170	-117.3430
						(2.92099)	(0.10181)	(0.41660)	(24.7802)

Adjustment coefficients (standard error in parentheses)

D(FTSE100)	-0.082129	-0.016321	24.78437	-39.69619	556.2091	-0.299960
	(0.02268)	(0.01886)	(6.09005)	(19.7895)	(167.044)	(0.30769)
D(UKBOT)	-0.122134	-0.217946	49.08800	81.54282	-55.85064	-3.217268
	(0.05176)	(0.04304)	(13.9005)	(45.1693)	(381.277)	(0.70230)
D(UKCPI)	3.89E-05	7.06E-05	-0.026090	-0.010975	-0.081032	0.001220
	(4.1E-05)	(3.4E-05)	(0.01103)	(0.03586)	(0.30268)	(0.00056)
D(UKDIR)	3.35E-05	1.73E-05	-0.013404	-0.135934	1.034476	-0.000281
	(2.1E-05)	(1.8E-05)	(0.00569)	(0.01849)	(0.15607)	(0.00029)
D(UKEXR)	-3.98E-06	-1.21E-06	0.000920	0.001856	-0.026000	-9.47E-06
	(2.7E-06)	(2.2E-06)	(0.00072)	(0.00234)	(0.01974)	(3.6E-05)
D(UKGDPCAP)	-0.001006	-0.003684	0.706655	-1.713604	18.07436	-0.067776
	(0.00155)	(0.00129)	(0.41718)	(1.35562)	(11.4429)	(0.02108)
D(UKIOP)	0.000837	7.17E-05	0.005135	-0.053290	3.239832	0.002630
	(0.00054)	(0.00045)	(0.14533)	(0.47224)	(3.98625)	(0.00734)
D(UKM2)	-0.003912	-0.000637	3.796755	-4.988204	93.36822	-0.006176
	(0.00691)	(0.00575)	(1.85615)	(6.03153)	(50.9126)	(0.09378)
D(UKREMIT)	0.001130	0.000741	0.001284	1.873719	-20.43210	0.043376
	(0.00276)	(0.00229)	(0.74030)	(2.40560)	(20.3058)	(0.03740)
D(UKTBR)	9.60E-06	-6.58E-06	0.004137	-0.080483	0.721132	-5.83E-05
	(2.4E-05)	(2.0E-05)	(0.00633)	(0.02058)	(0.17369)	(0.00032)

7 Cointegrating Equation(s): Log likelihood -7058.052

Normalized cointegrating coefficients (standard error in parentheses)

FTSE100	UKBOT	UKCPI	UKDIR	UKEXR	UKGDPCAP	UKIOP	UKM2	UKREMIT	UKTBR
1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	-9.192588	-61.08125	-3909.244
							(1.80562)	(12.1587)	(755.861)
0.000000	1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	-2.976998	-23.61849	-2075.499
							(1.32571)	(8.92706)	(554.963)
0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	0.000000	-0.061622	-0.380480	-22.12711
							(0.01180)	(0.07947)	(4.94046)
0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	-0.003118	-0.062973	-3.477925
							(0.00203)	(0.01368)	(0.85056)
0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	-0.000560	-0.007463	-0.361093
							(0.00024)	(0.00159)	(0.09863)
0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	-0.341621	-2.076905	-81.79997
							(0.04215)	(0.28382)	(17.6440)
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	-0.149916	-1.007478	-58.29532
							(0.03198)	(0.21533)	(13.3864)

Adjustment coefficients (standard error in parentheses)

D(FTSE100)	-0.076126	-0.014313	24.54352	-39.00134	578.8241	-0.421322	-5.146798
	(0.02402)	(0.01902)	(6.09131)	(19.7878)	(169.545)	(0.34725)	(1.37413)
D(UKBOT)	-0.125485	-0.219067	49.22244	81.15494	-68.47501	-3.149520	-3.335350
	(0.05489)	(0.04347)	(13.9188)	(45.2156)	(387.415)	(0.79349)	(3.13992)
D(UKCPI)	4.91E-05	7.40E-05	-0.026499	-0.009795	-0.042608	0.001014	0.004458
	(4.4E-05)	(3.4E-05)	(0.01104)	(0.03586)	(0.30725)	(0.00063)	(0.00249)
D(UKDIR)	3.38E-05	1.74E-05	-0.013416	-0.135901	1.035540	-0.000287	0.003561
	(2.2E-05)	(1.8E-05)	(0.00570)	(0.01851)	(0.15859)	(0.00032)	(0.00129)
D(UKEXR)	-3.10E-06	-9.15E-07	0.000885	0.001958	-0.022700	-2.72E-05	-3.79E-05
	(2.8E-06)	(2.2E-06)	(0.00072)	(0.00234)	(0.02002)	(4.1E-05)	(0.00016)
D(UKGDPCAP)	-0.000904	-0.003650	0.702534	-1.701714	18.46133	-0.069853	-0.024500
	(0.00165)	(0.00130)	(0.41773)	(1.35701)	(11.6271)	(0.02381)	(0.09424)
D(UKIOP)	0.001251	0.000210	-0.011473	-0.005375	4.799309	-0.005738	-0.097592
	(0.00057)	(0.00045)	(0.14409)	(0.46808)	(4.01056)	(0.00821)	(0.03250)
D(UKM2)	-0.008959	-0.002325	3.999266	-5.572461	74.35272	0.095869	-1.219616
	(0.00726)	(0.00575)	(1.84195)	(5.98362)	(51.2687)	(0.10501)	(0.41552)
D(UKREMIT)	0.000578	0.000557	0.023443	1.809791	-22.51273	0.054541	-0.050157
	(0.00292)	(0.00231)	(0.74083)	(2.40661)	(20.6202)	(0.04223)	(0.16712)
D(UKTBR)	1.07E-05	-6.19E-06	0.004091	-0.080349	0.725472	-8.16E-05	-0.001558
	(2.5E-05)	(2.0E-05)	(0.00634)	(0.02060)	(0.17650)	(0.00036)	(0.00143)

8 Cointegrating Equation(s): Log likelihood -7052.733

Normalized cointegrating coefficients (standard error in parentheses)

FTSE100	UKBOT	UKCPI	UKDIR	UKEXR	UKGDPCAP	UKIOP	UKM2	UKREMIT	UKTBR
1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	37.59038	1258.424
								(8.75959)	(430.073)
0.000000	1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	8.336097	-401.9619
								(3.76085)	(184.648)
0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.280963	12.51424
								(0.05827)	(2.86093)
0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	0.000000	-0.029501	-1.724880
								(0.00618)	(0.30335)
0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	-0.001456	-0.046506
								(0.00048)	(0.02354)
0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	1.589993	110.2442
								(0.47588)	(23.3647)
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.601695	25.98087
								(0.11254)	(5.52522)
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	10.73383	562.1559
								(1.87785)	(92.1977)

Adjustment coefficients (standard error in parentheses)

D(FTSE100)	-0.075955	-0.013163	25.99959	-35.04584	632.9879	-0.415986	-5.190413	-0.079132
	(0.02401)	(0.01913)	(6.66717)	(21.1100)	(197.330)	(0.34719)	(1.37571)	(0.07377)
D(UKBOT)	-0.125864	-0.221614	45.99855	72.39707	-188.3991	-3.161334	-3.238783	0.183160
	(0.05486)	(0.04372)	(15.2352)	(48.2388)	(450.922)	(0.79337)	(3.14366)	(0.16858)
D(UKCPI)	4.80E-05	6.66E-05	-0.035917	-0.035380	-0.392955	0.000980	0.004740	0.000145
	(4.3E-05)	(3.4E-05)	(0.01200)	(0.03798)	(0.35507)	(0.00062)	(0.00248)	(0.00013)
D(UKDIR)	3.35E-05	1.57E-05	-0.015589	-0.141806	0.954682	-0.000295	0.003626	-9.40E-05
	(2.2E-05)	(1.8E-05)	(0.00623)	(0.01973)	(0.18441)	(0.00032)	(0.00129)	(6.9E-05)
D(UKEXR)	-3.16E-06	-1.30E-06	0.000402	0.000645	-0.040669	-2.90E-05	-2.34E-05	5.68E-06
	(2.8E-06)	(2.2E-06)	(0.00078)	(0.00248)	(0.02320)	(4.1E-05)	(0.00016)	(8.7E-06)
D(UKGDPCAP)	-0.000911	-0.003700	0.639035	-1.874214	16.09923	-0.070086	-0.022598	-0.000634
	(0.00165)	(0.00131)	(0.45739)	(1.44821)	(13.5374)	(0.02382)	(0.09438)	(0.00506)
D(UKIOP)	0.001240	0.000137	-0.104163	-0.257171	1.351387	-0.006078	-0.094815	0.003927
	(0.00057)	(0.00045)	(0.15712)	(0.49747)	(4.65022)	(0.00818)	(0.03242)	(0.00174)
D(UKM2)	-0.009135	-0.003506	2.504613	-9.632763	18.75376	0.090392	-1.174845	-0.008376
	(0.00721)	(0.00575)	(2.00326)	(6.34285)	(59.2911)	(0.10432)	(0.41336)	(0.02217)
D(UKREMIT)	0.000553	0.000389	-0.188893	1.232972	-30.41130	0.053763	-0.043797	-0.009313
	(0.00292)	(0.00233)	(0.81065)	(2.56674)	(23.9932)	(0.04221)	(0.16727)	(0.00897)
D(UKTBR)	1.11E-05	-3.85E-06	0.007059	-0.072284	0.835910	-7.07E-05	-0.001646	-0.000272
	(2.5E-05)	(2.0E-05)	(0.00693)	(0.02194)	(0.20507)	(0.00036)	(0.00143)	(7.7E-05)

9 Cointegrating Equation(s): Log likelihood -7049.379

Normalized cointegrating coefficients (standard error in parentheses)

FTSE100	UKBOT	UKCPI	UKDIR	UKEXR	UKGDPCAP	UKIOP	UKM2	UKREMIT	UKTBR
1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	811.4124
									(297.811)
0.000000	1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	-501.0918
									(197.618)
0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	9.173129
									(2.15079)
0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	0.000000	0.000000	-1.374069
									(0.23755)
0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	0.000000	-0.029186
									(0.01847)
0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	0.000000	91.33654
									(19.7329)
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	0.000000	18.82573
									(4.76752)
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	0.000000	434.5131
									(96.7748)
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	1.000000	11.89165
									(11.7296)

Adjustment coefficients (standard error in parentheses)

D(FTSE100)	-0.075086	-0.013087	26.22225	-34.39470	626.0031	-0.417834	-5.201640	-0.079803	-0.199192
	(0.02421)	(0.01913)	(6.71456)	(21.2376)	(198.909)	(0.34720)	(1.37609)	(0.07380)	(0.23513)
D(UKBOT)	-0.125426	-0.221576	46.11091	72.72564	-191.9237	-3.162267	-3.244447	0.182821	-0.534121
	(0.05533)	(0.04372)	(15.3459)	(48.5377)	(454.599)	(0.79351)	(3.14501)	(0.16867)	(0.53739)
D(UKCPI)	4.50E-05	6.63E-05	-0.036686	-0.037630	-0.368818	0.000986	0.004779	0.000147	-8.95E-05
	(4.4E-05)	(3.4E-05)	(0.01208)	(0.03820)	(0.35775)	(0.00062)	(0.00248)	(0.00013)	(0.00042)
D(UKDIR)	3.47E-05	1.58E-05	-0.015281	-0.140906	0.945026	-0.000297	0.003611	-9.49E-05	0.000485
	(2.3E-05)	(1.8E-05)	(0.00627)	(0.01984)	(0.18585)	(0.00032)	(0.00129)	(6.9E-05)	(0.00022)
D(UKEXR)	-3.27E-06	-1.31E-06	0.000373	0.000561	-0.039769	-2.87E-05	-2.19E-05	5.77E-06	2.66E-05
	(2.8E-06)	(2.2E-06)	(0.00079)	(0.00250)	(0.02339)	(4.1E-05)	(0.00016)	(8.7E-06)	(2.8E-05)
D(UKGDPCAP)	-0.000824	-0.003693	0.661292	-1.809125	15.40101	-0.070270	-0.023720	-0.000701	0.012731
	(0.00166)	(0.00131)	(0.46055)	(1.45670)	(13.6433)	(0.02381)	(0.09439)	(0.00506)	(0.01613)
D(UKIOP)	0.001229	0.000136	-0.106968	-0.265374	1.439388	-0.006055	-0.094674	0.003936	-0.000238
	(0.00057)	(0.00045)	(0.15825)	(0.50054)	(4.68797)	(0.00818)	(0.03243)	(0.00174)	(0.00554)
D(UKM2)	-0.009595	-0.003546	2.386790	-9.977323	22.44988	0.091370	-1.168904	-0.008020	-0.055963
	(0.00727)	(0.00575)	(2.01682)	(6.37903)	(59.7453)	(0.10429)	(0.41333)	(0.02217)	(0.07063)
D(UKREMIT)	0.001345	0.000458	0.014092	1.826577	-36.77895	0.052079	-0.054032	-0.009926	-0.077751
	(0.00292)	(0.00231)	(0.80914)	(2.55925)	(23.9697)	(0.04184)	(0.16583)	(0.00889)	(0.02833)
D(UKTBR)	7.21E-06	-4.19E-06	0.006063	-0.075199	0.867180	-6.24E-05	-0.001596	-0.000269	-0.000662
	(2.5E-05)	(2.0E-05)	(0.00696)	(0.02201)	(0.20613)	(0.00036)	(0.00143)	(7.6E-05)	(0.00024)

Chapter 7(B)-BD VECM

Vector Error Correction Estimates
Date: 09/21/18 Time: 18:03
Sample (adjusted): 1999M01 2018M06
Included observations: 235 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
DGEN(-1)	1.000000
BDCPI(-1)	-27.37809 (63.6865) [-0.42989]
BDDIR(-1)	-207.2507 (537.235) [-0.38577]
BDEXR(-1)	46.83589 (99.5094) [0.47067]
IOP(-1)	21.22574 (27.5924) [0.76926]
BDM2(-1)	0.001343 (0.02420) [0.05549]
BDPCAPGDP(-1)	0.261574 (0.22665) [1.15407]
BDREMIT(-1)	1.192704 (0.80394) [1.48357]
USTBR(-1)	47.06110 (258.151) [0.18230]
C	-10922.32

Error Correction:	D(DGEN)	D(BDCPI)	D(BDDIR)	D(BDEXR)	D(IOP)	D(BDM2)	D(BDPCAPG	D(BDREMIT)	D(USTBR)
CointEq1	-0.12821 (0.00325) [-39.44923]	-4.77E-05 (4.0E-05) [-1.19244]	3.12E-08 (2.0E-06) [0.01583]	-1.04E-05 (6.5E-06) [-1.60887]	-4.90E-06 (6.0E-05) [-0.08197]	0.419652 (0.02484) [16.8917]	-0.007549 (0.01173) [-0.64376]	0.013514 (0.00446) [3.03315]	-1.54E-06 (2.5E-06) [-0.61106]
D(DGEN(-1))	0.191609 (0.08498) [2.25473]	-0.001077 (0.00062) [-1.74040]	-3.86E-06 (5.3E-05) [-0.07227]	6.16E-05 (0.00017) [0.35482]	-0.001239 (0.00147) [-0.84410]	-0.145052 (0.43162) [-0.33607]	-0.455894 (0.18757) [-2.43052]	0.081955 (0.09191) [0.89169]	-3.13E-05 (7.0E-05) [-0.44574]
D(DGEN(-2))	-0.196931 (0.08903) [-2.21205]	-3.49E-05 (0.00065) [-0.05386]	-9.43E-05 (5.6E-05) [-1.68403]	-0.000236 (0.00018) [-1.29871]	0.003240 (0.00154) [2.10675]	-0.881550 (0.45216) [-1.94963]	-0.015027 (0.19650) [-0.07647]	-0.183037 (0.09628) [-1.90100]	5.48E-05 (7.3E-05) [0.74634]
D(DGEN(-3))	0.122537 (0.09206) [1.33111]	0.000197 (0.00067) [0.29448]	-3.68E-05 (5.8E-05) [-0.63582]	-1.50E-05 (0.00019) [-0.07986]	-0.001337 (0.00159) [-0.84051]	0.383062 (0.46755) [0.81930]	0.182754 (0.20319) [0.89944]	0.050007 (0.09956) [0.50228]	-1.57E-06 (7.6E-05) [-0.02073]
D(DGEN(-4))	0.005941 (0.08982) [0.06615]	0.001209 (0.00065) [1.84943]	-7.28E-05 (5.7E-05) [-1.28774]	-0.000129 (0.00018) [-0.70574]	0.003975 (0.00155) [2.56159]	-0.005040 (0.45621) [-0.01105]	0.019358 (0.19826) [0.09764]	0.021915 (0.09715) [0.22559]	-6.52E-07 (7.4E-05) [-0.00879]
D(DGEN(-5))	-0.081001 (0.09534) [-0.84959]	-0.000680 (0.00069) [-0.97958]	5.41E-05 (6.0E-05) [0.90211]	-0.000124 (0.00019) [-0.63516]	0.002155 (0.00165) [1.30847]	1.485918 (0.48424) [3.06857]	-0.040903 (0.21044) [-0.19437]	0.131922 (0.10311) [1.27937]	4.06E-05 (7.9E-05) [0.51587]
D(DGEN(-6))	0.123189 (0.09911) [1.24295]	-4.97E-05 (0.00072) [-0.06886]	1.40E-05 (6.2E-05) [0.22402]	-3.83E-05 (0.00020) [-0.18899]	-0.000369 (0.00171) [-0.21575]	-0.498477 (0.50338) [-0.99026]	-0.044020 (0.21876) [-0.20123]	-0.082620 (0.10719) [-0.77077]	-0.000176 (8.2E-05) [-2.14816]
D(DGEN(-7))	-0.047310 (0.09679) [-0.48882]	-0.001114 (0.00070) [-1.58068]	-3.79E-05 (6.1E-05) [-0.62240]	-5.19E-05 (0.00020) [-0.26281]	-0.002628 (0.00167) [-1.57175]	1.498458 (0.49157) [3.04831]	0.035819 (0.21363) [0.16767]	0.167086 (0.10468) [1.59622]	4.50E-05 (8.0E-05) [0.56329]
D(DGEN(-8))	0.336265 (0.10013) [3.35832]	0.000105 (0.00073) [0.14404]	2.74E-05 (6.3E-05) [0.43542]	-0.000294 (0.00020) [-1.43728]	0.002778 (0.00173) [1.60604]	-0.250197 (0.50855) [-0.49198]	0.220353 (0.22101) [0.99705]	-0.041026 (0.10829) [-0.37884]	-1.49E-05 (8.3E-05) [-0.17989]
D(DGEN(-9))	0.071749 (0.10100) [0.71037]	-0.000521 (0.00074) [-0.70897]	6.49E-06 (6.4E-05) [0.10220]	0.000149 (0.00021) [0.72438]	0.003522 (0.00174) [2.01846]	1.266256 (0.51299) [2.46840]	-0.122875 (0.22293) [-0.55118]	0.274681 (0.10924) [2.51455]	6.34E-05 (8.3E-05) [0.76020]
D(DGEN(-10))	0.050445 (0.10181) [0.49550]	0.000159 (0.00074) [0.21506]	4.67E-05 (6.4E-05) [0.72875]	3.08E-05 (0.00021) [0.14793]	-0.000351 (0.00176) [-0.19954]	-0.068518 (0.51708) [-0.13251]	0.090582 (0.22471) [0.40311]	0.172217 (0.11011) [1.56408]	-1.16E-05 (8.4E-05) [-0.13863]
D(DGEN(-11))	0.289928 (0.09614) [3.01580]	-0.003200 (0.00070) [-4.57204]	-1.64E-05 (6.0E-05) [-0.27106]	-0.000644 (0.00020) [-3.28101]	0.001717 (0.00166) [1.03374]	1.327053 (0.48827) [2.71784]	-0.341829 (0.21219) [-1.61093]	-0.261502 (0.10397) [-2.51506]	-7.67E-05 (7.9E-05) [-0.96730]
D(BDCPI(-1))	0.780334 (16.3919) [0.04760]	-0.281765 (0.11934) [-2.36106]	-0.003063 (0.01031) [-0.29701]	0.057302 (0.03347) [1.71187]	-0.418908 (0.28319) [-1.47925]	-227.4659 (83.2539) [-2.73220]	-12.98541 (36.1803) [-0.35891]	23.14052 (17.7283) [1.30529]	-0.005930 (0.01353) [-0.43836]
D(BDCPI(-2))	-11.60576 (17.3336) [-0.66955]	-0.320927 (0.12619) [-2.54312]	9.49E-06 (0.01090) [0.00087]	0.015831 (0.03540) [0.44726]	0.503215 (0.29946) [1.68042]	-110.1717 (88.0368) [-1.25143]	-90.74567 (38.2589) [-2.37189]	33.15051 (18.7468) [1.76833]	0.003057 (0.01430) [0.21374]
D(BDCPI(-3))	4.386287 (17.2152) [0.25479]	-0.521634 (0.12533) [-4.16200]	0.001945 (0.01083) [0.17957]	0.019784 (0.03515) [0.56277]	0.721281 (0.29741) [2.42518]	6.786793 (87.4357) [0.07762]	-156.5193 (37.9976) [-4.11919]	-15.32468 (18.6188) [-0.82308]	0.004088 (0.01421) [0.28774]
D(BDCPI(-4))	15.53768 (18.2187) [0.85284]	-0.391509 (0.13264) [-2.95170]	-0.001796 (0.01146) [-0.15673]	-0.016363 (0.03720) [-0.43983]	0.944247 (0.31475) [2.99998]	4.375356 (92.5325) [0.04728]	-115.6796 (40.2126) [-2.87670]	-2.531325 (19.7041) [-0.12847]	0.025190 (0.01503) [1.67541]

D(BDCPI(-5))	-2.449956	-0.339661	-0.006519	0.019737	-0.386545	232.5735	-75.20895	18.98081	0.000268
	(18.8174)	(0.13700)	(0.01184)	(0.03843)	(0.32509)	(95.5730)	(41.5339)	(20.3516)	(0.01553)
	[-0.13020]	[-2.47934]	[-0.55067]	[0.51362]	[-1.18903]	[2.43346]	[-1.81078]	[0.93265]	[0.01725]
D(BDCPI(-6))	11.01802	-0.522211	0.026377	-0.017658	-0.695782	74.37566	-118.0615	-20.27333	0.008673
	(18.4956)	(0.13465)	(0.01164)	(0.03777)	(0.31953)	(93.9384)	(40.8236)	(20.0035)	(0.01526)
	[0.59571]	[-3.87817]	[2.26698]	[-0.46752]	[-2.17750]	[0.79175]	[-2.89199]	[-1.01349]	[0.56823]
D(BDCPI(-7))	-21.72613	-0.585380	-0.016883	0.032943	-0.932818	245.8949	-123.5160	-4.877689	-0.005847
	(18.8477)	(0.13722)	(0.01186)	(0.03849)	(0.32562)	(95.7270)	(41.6009)	(20.3844)	(0.01555)
	[-1.15272]	[-4.26607]	[-1.42391]	[0.85591]	[-2.86477]	[2.56871]	[-2.96907]	[-0.23929]	[-0.37594]
D(BDCPI(-8))	12.58022	-0.246844	0.006783	0.015114	-0.108772	-173.5367	-55.92190	-94.77504	0.008078
	(19.8317)	(0.14438)	(0.01248)	(0.04050)	(0.34262)	(100.725)	(43.7726)	(21.4485)	(0.01637)
	[0.63435]	[-1.70967]	[0.54368]	[0.37321]	[-0.31748]	[-1.72288]	[-1.27755]	[-4.41872]	[0.49358]
D(BDCPI(-9))	-26.39146	-0.089610	0.003691	0.009747	0.417727	198.6656	-0.144908	81.46660	0.017988
	(20.0482)	(0.14596)	(0.01261)	(0.04094)	(0.34636)	(101.824)	(44.2507)	(21.6828)	(0.01654)
	[-1.31640]	[-0.61395]	[0.29264]	[0.23808]	[1.20606]	[1.95106]	[-0.00327]	[3.75721]	[1.08725]
D(BDCPI(-10))	2.398134	-0.204408	0.002565	0.097252	0.178370	-281.5877	-89.05862	31.93980	0.022085
	(20.5437)	(0.14956)	(0.01292)	(0.04195)	(0.35492)	(104.341)	(45.3442)	(22.2186)	(0.01695)
	[0.11673]	[-1.36669]	[0.19851]	[2.31818]	[0.50257]	[-2.69873]	[-1.96406]	[1.43753]	[1.30270]
D(BDCPI(-11))	-1.412467	-0.543045	-0.008255	0.102301	0.284814	505.8051	-233.1192	33.10489	-0.007819
	(18.1791)	(0.13235)	(0.01144)	(0.03712)	(0.31407)	(92.3309)	(40.1250)	(19.6612)	(0.01500)
	[-0.07770]	[-4.10312]	[-0.72182]	[2.75573]	[0.90686]	[5.47818]	[-5.80982]	[1.68377]	[-0.52120]
D(BDDIR(-1))	121.4537	2.282516	0.044398	0.090687	1.967736	-145.7840	635.3329	121.6182	-0.024441
	(142.715)	(1.03901)	(0.08978)	(0.29143)	(2.46557)	(724.844)	(315.001)	(154.350)	(0.11777)
	[0.85102]	[2.19682]	[0.49453]	[0.31117]	[0.79809]	[-0.20112]	[2.01692]	[0.78794]	[-0.20752]
D(BDDIR(-2))	88.38330	1.261750	-0.055577	0.106908	1.085566	454.1940	218.5591	284.4932	0.015942
	(142.084)	(1.03442)	(0.08938)	(0.29015)	(2.45467)	(721.641)	(313.609)	(153.668)	(0.11725)
	[0.62205]	[1.21977]	[-0.62180]	[0.36846]	[0.44224]	[0.62939]	[0.69692]	[1.85135]	[0.13597]
D(BDDIR(-3))	262.4235	0.387118	-0.047818	-0.158399	-0.295019	-113.5588	219.4476	-279.2668	0.042658
	(143.073)	(1.04162)	(0.09000)	(0.29217)	(2.47177)	(726.666)	(315.793)	(154.738)	(0.11807)
	[1.83419]	[0.37165]	[-0.53128]	[-0.54215]	[-0.11936]	[-0.15627]	[0.69491]	[-1.80477]	[0.36130]
D(BDDIR(-4))	67.98901	1.745011	-0.014614	-0.101908	-2.728167	844.8916	805.0458	70.66597	-0.024625
	(140.090)	(1.01990)	(0.08813)	(0.28608)	(2.42023)	(711.515)	(309.209)	(151.512)	(0.11561)
	[0.48532]	[1.71096]	[-0.16583]	[-0.35623]	[-1.12723]	[1.18745]	[2.60357]	[0.46641]	[-0.21300]
D(BDDIR(-5))	-24.38429	0.981694	0.043189	-0.472957	1.284733	-800.1954	349.6847	48.74203	-0.077263
	(141.360)	(1.02914)	(0.08893)	(0.28867)	(2.44216)	(717.962)	(312.010)	(152.885)	(0.11666)
	[-0.17250]	[0.95389]	[0.48567]	[-1.63841]	[0.52606]	[-1.11454]	[1.12075]	[0.31882]	[-0.66231]
D(BDDIR(-6))	-74.20020	-0.966442	0.023203	-0.195152	0.800108	291.3697	-87.74175	-105.2570	0.010266
	(113.806)	(0.82855)	(0.07159)	(0.23240)	(1.96614)	(578.018)	(251.194)	(123.085)	(0.09392)
	[-0.65199]	[-1.16643]	[0.32410]	[-0.83972]	[0.40694]	[0.50408]	[-0.34930]	[-0.85516]	[0.10931]
D(BDDIR(-7))	8.032616	-0.474996	-0.010878	0.158262	-1.534932	-382.6296	-56.71892	-6.173633	-0.046601
	(112.405)	(0.81835)	(0.07071)	(0.22954)	(1.94193)	(570.902)	(248.102)	(121.569)	(0.09276)
	[0.07146]	[-0.58043]	[-0.15384]	[0.68948]	[-0.79041]	[-0.67022]	[-0.22861]	[-0.05078]	[-0.50238]
D(BDDIR(-8))	-178.9129	0.700489	-0.008681	0.397215	-0.669460	-959.9023	178.2334	128.0774	0.039252
	(112.776)	(0.82105)	(0.07094)	(0.23030)	(1.94834)	(572.786)	(248.920)	(121.970)	(0.09307)
	[-1.58645]	[0.85317]	[-0.12237]	[1.72479]	[-0.34361]	[-1.67585]	[0.71603]	[1.05007]	[0.42176]
D(BDDIR(-9))	-80.07233	-0.351706	-0.025735	0.322595	3.003236	561.3603	-290.7372	36.80640	-0.060961
	(112.445)	(0.81864)	(0.07074)	(0.22962)	(1.94263)	(571.108)	(248.191)	(121.613)	(0.09279)
	[-0.71210]	[-0.42962]	[-0.36382]	[1.40489]	[1.54596]	[0.98293]	[-1.17143]	[0.30265]	[-0.65695]
D(BDDIR(-10))	68.24730	-0.319803	9.59E-05	-0.100510	1.967599	-301.9657	-162.1053	107.6879	-0.101250
	(113.004)	(0.82270)	(0.07109)	(0.23076)	(1.95227)	(573.942)	(249.423)	(122.217)	(0.09326)
	[0.60394]	[-0.38872]	[0.00135]	[-0.43556]	[1.00785]	[-0.52613]	[-0.64992]	[0.88112]	[-1.08573]
D(BDDIR(-11))	-97.06330	-0.170517	-0.038621	-0.123815	-1.470969	-217.7903	-76.73540	-106.6790	0.097678
	(113.772)	(0.82830)	(0.07157)	(0.23233)	(1.96555)	(577.845)	(251.118)	(123.048)	(0.09389)
	[-0.85314]	[-0.20586]	[-0.53961]	[-0.53292]	[-0.74838]	[-0.37690]	[-0.30557]	[-0.86697]	[1.04035]
D(BDEXR(-1))	-38.22791	-0.135582	0.005828	0.048034	0.529680	-331.4314	162.3104	74.88806	0.019143
	(44.3660)	(0.32300)	(0.02791)	(0.09060)	(0.76648)	(225.334)	(97.9251)	(47.9831)	(0.03661)
	[-0.86165]	[-0.41976]	[0.20883]	[0.53018]	[0.69106]	[-1.47085]	[1.65750]	[1.56072]	[0.52284]
D(BDEXR(-2))	67.85827	-0.180917	0.013939	-0.010234	-1.417105	268.7284	13.41490	55.56852	-0.000885
	(45.4222)	(0.33069)	(0.02857)	(0.09276)	(0.78472)	(230.698)	(100.256)	(49.1255)	(0.03748)
	[1.49394]	[-0.54709]	[0.48781]	[-0.11033]	[-1.80586]	[1.16485]	[0.13381]	[1.13115]	[-0.02362]
D(BDEXR(-3))	-1.734659	-0.305435	0.022483	-0.050552	-0.110737	4.387622	-23.77886	-52.46612	-0.051993
	(46.4142)	(0.33791)	(0.02920)	(0.09478)	(0.80186)	(235.736)	(102.446)	(50.1983)	(0.03830)
	[-0.03737]	[-0.90389]	[0.77003]	[-0.53336]	[-0.13810]	[0.01861]	[-0.23211]	[-1.04518]	[-1.35741]
D(BDEXR(-4))	-54.17567	-0.246809	0.018350	-0.021847	-0.685405	210.9181	184.7138	-22.63756	-0.019345
	(44.0121)	(0.32042)	(0.02769)	(0.08988)	(0.76036)	(223.536)	(97.1439)	(47.6004)	(0.03632)
	[-1.23093]	[-0.77026]	[0.66276]	[-0.24308]	[-0.90142]	[0.94355]	[1.90144]	[-0.47558]	[-0.53261]
D(BDEXR(-5))	24.73872	0.161023	0.067807	0.155954	0.422954	11.42836	87.54844	146.2457	-0.060236
	(47.0934)	(0.34286)	(0.02963)	(0.09617)	(0.81360)	(239.186)	(103.945)	(50.9329)	(0.03886)
	[0.52531]	[0.46965]	[2.28882]	[1.62168]	[0.51986]	[0.04778]	[0.84226]	[2.87134]	[-1.54993]
D(BDEXR(-6))	-41.51909	-0.509161	-0.033373	-0.150581	0.043717	-121.3379	-167.0368	-16.50078	0.041475
	(49.3343)	(0.35917)	(0.03103)	(0.10074)	(0.85231)	(250.567)	(108.891)	(53.3565)	(0.04071)
	[-0.84159]	[-1.41761]	[-1.07533]	[-1.49468]	[0.05129]	[-0.48425]	[-1.53398]	[-0.30926]	[1.01871]
D(BDEXR(-7))	43.82513	-0.323543	0.005719	0.145759	1.341423	146.8911	24.59550	34.69200	-0.000102
	(50.0880)	(0.36466)	(0.03151)	(0.10228)	(0.86533)	(254.396)	(110.555)	(54.1716)	(0.04133)
	[0.87496]	[-0.88725]	[0.18149]	[1.42504]	[1.55019]	[0.57741]	[0.22247]	[0.64041]	[-0.00246]
D(BDEXR(-8))	55.93664	-0.066312	-0.021569	0.284046	0.495242	156.9351	-45.90858	159.7973	0.052063
	(50.0725)	(0.36454)	(0.03150)	(0.10225)	(0.86506)	(254.317)	(110.521)	(54.1549)	(0.04132)
	[1.11711]	[-0.18190]	[-0.68475]	[2.77789]	[0.57249]	[0.61708]	[-0.41538]	[2.95074]	[1.25993]
D(BDEXR(-9))	-30.86653	0.102607	0.008986	0.106244	1.888221	206.3538	36.83968	31.22752	-0.027654
	(51.3435)	(0.37380)	(0.03230)	(0.10485)	(0.88702)	(260.772)	(113.326)	(55.5295)	(0.04237)
	[-0.60118]	[0.27450]	[0.27821]	[1.01332]	[2.12872]	[0.79132]	[0.32508]	[0.56236]	[-0.65267]
D(BDEXR(-10))	92.43388	-0.476095	-0.008318	0.123032	-1.253684	127.6443	-36.40058	35.14867	-0.003590
	(52.9366)	(0.38540)	(0.03330)	(0.10810)	(0.91454)	(268.863)	(116.842)	(57.2525)	(0.04369)
	[1.74613]	[-1.23534]	[-0.24978]	[1.13812]	[-1.37083]	[0.47476]	[-0.31154]	[0.61392]	[-0.08218]
D(BDEXR(-11))	24.63547	0.177733	-0.050304	-0.022577	0.072486	5.250520	12.21797	-61.01779	0.093459
	(51.5510)	(0.37531)	(0.03243)	(0.10527)	(0.89061)	(261.826)	(113.784)	(55.7540)	(0.04254)
	[0.47789]	[0.47357]	[-1.55117]	[-0.21446]	[0.08139]	[0.02005]	[0.10738]	[-1.09441]	[2.19685]

D(IOP(-1))	5.878430	-0.017779	-0.001355	-0.002524	0.177247	42.05051	1.930759	-0.175161	0.004890
	(5.20434)	(0.03789)	(0.00327)	(0.01063)	(0.08991)	(26.4327)	(11.4871)	(5.62864)	(0.00429)
	[1.12953]	[-0.46923]	[-0.41394]	[-0.23747]	[1.97135]	[1.59085]	[0.16808]	[-0.03112]	[1.13851]
D(IOP(-2))	9.940091	0.023896	-0.000526	-0.000877	-0.021565	81.45975	6.609910	-0.366268	-0.003410
	(4.98975)	(0.03633)	(0.00314)	(0.01019)	(0.08620)	(25.3428)	(11.0134)	(5.39657)	(0.00412)
	[1.99210]	[0.65780]	[-0.16768]	[-0.08611]	[-0.25016]	[3.21431]	[0.60017]	[-0.06787]	[-0.82803]
D(IOP(-3))	2.928323	0.098801	0.004311	-0.001719	0.166322	31.52858	34.92160	1.206222	-0.000626
	(4.82494)	(0.03513)	(0.00304)	(0.00985)	(0.08336)	(24.5058)	(10.6497)	(5.21832)	(0.00398)
	[0.60691]	[2.81266]	[1.42022]	[-0.17442]	[1.99530]	[1.28658]	[3.27913]	[0.23115]	[-0.15714]
D(IOP(-4))	-1.317667	0.017177	-0.000753	0.005172	0.085814	19.96458	17.67731	5.544263	-0.005271
	(5.13190)	(0.03736)	(0.00323)	(0.01048)	(0.08866)	(26.0648)	(11.3272)	(5.55030)	(0.00424)
	[-0.25676]	[0.45974]	[-0.23328]	[0.49350]	[0.96790]	[0.76596]	[1.56061]	[0.99891]	[-1.24451]
D(IOP(-5))	7.279171	0.098627	0.002283	0.007904	0.146198	-28.90515	23.81214	-1.613929	-0.003851
	(4.97507)	(0.03622)	(0.00313)	(0.01016)	(0.08595)	(25.2683)	(10.9810)	(5.38069)	(0.00411)
	[1.46313]	[2.72297]	[0.72948]	[0.77797]	[1.70096]	[-1.14393]	[2.16848]	[-0.29995]	[-0.93806]
D(IOP(-6))	9.824343	0.003438	-0.002572	0.021147	0.051769	42.43776	8.154172	-1.512491	0.002527
	(5.06212)	(0.03685)	(0.00318)	(0.01034)	(0.08745)	(25.7104)	(11.1732)	(5.47484)	(0.00418)
	[1.94076]	[0.09329]	[-0.80755]	[2.04572]	[0.59196]	[1.65061]	[0.72980]	[-0.27626]	[0.60500]
D(IOP(-7))	12.44317	0.038741	-0.004860	-0.009395	0.178254	-28.59727	8.207735	-1.995341	-0.005066
	(5.06678)	(0.03689)	(0.00319)	(0.01035)	(0.08753)	(25.7340)	(11.1834)	(5.47987)	(0.00418)
	[2.45583]	[1.05024]	[-1.52461]	[-0.90803]	[2.03638]	[-1.11126]	[0.73392]	[-0.36412]	[-1.21164]
D(IOP(-8))	1.607024	0.080958	0.001589	-0.003837	0.089582	13.35562	27.38594	0.120031	0.000856
	(5.18420)	(0.03774)	(0.00326)	(0.01059)	(0.08956)	(26.3304)	(11.4426)	(5.60686)	(0.00428)
	[0.30999]	[2.14499]	[0.48714]	[-0.36240]	[1.00021]	[0.50723]	[2.39333]	[0.02141]	[0.20001]
D(IOP(-9))	12.67177	0.081966	0.000581	0.014880	-0.031862	-35.07086	32.11841	7.293998	-0.001295
	(4.90841)	(0.03573)	(0.00309)	(0.01002)	(0.08480)	(24.9297)	(10.8339)	(5.30859)	(0.00405)
	[2.58165]	[2.29373]	[0.18830]	[1.48450]	[-0.37574]	[-1.40679]	[2.96462]	[1.37400]	[-0.31960]
D(IOP(-10))	3.664702	0.004563	-0.002187	0.000312	-0.022889	53.60766	5.282408	3.576011	-0.003940
	(5.12818)	(0.03733)	(0.00323)	(0.01047)	(0.08860)	(26.0459)	(11.3190)	(5.54628)	(0.00423)
	[0.71462]	[0.12221]	[-0.67796]	[0.02975]	[-0.25836]	[2.05820]	[0.46669]	[0.64476]	[-0.93107]
D(IOP(-11))	9.904026	0.062317	0.001995	0.000448	0.091262	14.83446	24.41527	4.803504	0.000194
	(4.43584)	(0.03229)	(0.00279)	(0.00906)	(0.07663)	(22.5295)	(9.79082)	(4.79749)	(0.00366)
	[2.23273]	[1.92965]	[0.71481]	[0.04950]	[1.19088]	[0.65845]	[2.49369]	[1.00125]	[0.05287]
D(BDM2(-1))	-0.037787	0.000130	-1.12E-06	4.93E-05	-0.000208	-0.328100	-0.028598	-0.036903	-1.89E-06
	(0.01863)	(0.00014)	(1.2E-05)	(3.8E-05)	(0.00032)	(0.09464)	(0.04113)	(0.02015)	(1.5E-05)
	[-2.02784]	[0.95591]	[-0.09582]	[1.29447]	[-0.64745]	[-3.46674]	[-0.69531]	[-1.83108]	[-0.12267]
D(BDM2(-2))	0.020106	8.38E-06	9.41E-06	3.11E-05	-0.000487	0.106944	-0.055152	0.008937	-4.97E-06
	(0.01915)	(0.00014)	(1.2E-05)	(3.9E-05)	(0.00033)	(0.09724)	(0.04226)	(0.02071)	(1.6E-05)
	[1.05009]	[0.06012]	[0.78158]	[0.79623]	[-1.47177]	[1.09974]	[-1.30506]	[0.43157]	[-0.31451]
D(BDM2(-3))	-0.066153	7.80E-05	-3.38E-06	-5.77E-05	-0.000603	-0.052496	-0.041792	-0.032701	-4.53E-07
	(0.01937)	(0.00014)	(1.2E-05)	(4.0E-05)	(0.00033)	(0.09837)	(0.04275)	(0.02095)	(1.6E-05)
	[-3.41573]	[0.55342]	[-0.27741]	[-1.45972]	[-1.80092]	[-0.53368]	[-0.97765]	[-1.56118]	[-0.02832]
D(BDM2(-4))	-0.041330	9.20E-05	7.15E-06	-4.40E-05	-0.001669	0.058439	0.012433	0.004781	1.57E-05
	(0.01989)	(0.00014)	(1.3E-05)	(4.1E-05)	(0.00034)	(0.10100)	(0.04389)	(0.02151)	(1.6E-05)
	[-2.07842]	[0.63582]	[0.57159]	[-1.08282]	[-4.85925]	[0.57862]	[0.28326]	[0.22230]	[0.95535]
D(BDM2(-5))	-0.026563	-7.89E-05	4.18E-06	5.04E-05	-0.001080	0.083290	-0.108131	0.002858	-8.16E-07
	(0.02083)	(0.00015)	(1.3E-05)	(4.3E-05)	(0.00036)	(0.10578)	(0.04597)	(0.02253)	(1.7E-05)
	[-1.27540]	[-0.52038]	[0.31899]	[1.18588]	[-3.00236]	[0.78737]	[-2.35218]	[0.12687]	[-0.04749]
D(BDM2(-6))	-0.062876	-0.000228	1.27E-05	-2.17E-05	-4.42E-05	0.339106	-0.130203	-0.031430	4.51E-05
	(0.02001)	(0.00015)	(1.3E-05)	(4.1E-05)	(0.00035)	(0.10165)	(0.04417)	(0.02165)	(1.7E-05)
	[-3.14166]	[-1.56241]	[1.00647]	[-0.53199]	[-0.12784]	[3.33608]	[-2.94751]	[-1.45207]	[2.72773]
D(BDM2(-7))	-0.062906	0.000358	7.67E-06	4.20E-05	0.000207	-0.121811	0.062767	0.006992	9.65E-06
	(0.02118)	(0.00015)	(1.3E-05)	(4.3E-05)	(0.00037)	(0.10757)	(0.04675)	(0.02291)	(1.7E-05)
	[-2.97002]	[2.32042]	[0.57556]	[0.97118]	[0.56553]	[-1.13235]	[1.34265]	[0.30522]	[0.55237]
D(BDM2(-8))	-0.075039	0.000284	1.15E-05	7.59E-05	-0.000131	-0.306832	0.002143	-0.013475	6.69E-06
	(0.01935)	(0.00014)	(1.2E-05)	(4.0E-05)	(0.00033)	(0.09830)	(0.04272)	(0.02093)	(1.6E-05)
	[-3.87708]	[2.01451]	[0.94145]	[1.92050]	[-0.39250]	[-3.12137]	[0.05017]	[-0.64372]	[0.41893]
D(BDM2(-9))	-0.048364	-8.74E-05	5.96E-06	7.24E-05	0.000211	0.061877	-0.060550	0.012385	-2.19E-05
	(0.02033)	(0.00015)	(1.3E-05)	(4.2E-05)	(0.00035)	(0.10326)	(0.04487)	(0.02199)	(1.7E-05)
	[-2.37896]	[-0.59052]	[0.46625]	[1.74288]	[0.60047]	[0.59926]	[-1.34937]	[0.56325]	[-1.30744]
D(BDM2(-10))	-0.009664	-0.000396	-7.01E-06	4.22E-05	8.97E-05	-0.188443	-0.139970	-0.066167	-7.93E-06
	(0.01958)	(0.00014)	(1.2E-05)	(4.0E-05)	(0.00034)	(0.09947)	(0.04323)	(0.02118)	(1.6E-05)
	[-0.49343]	[-2.77474]	[-0.56868]	[1.05582]	[0.26511]	[-1.89446]	[-3.23796]	[-3.12380]	[-0.49051]
D(BDM2(-11))	-0.048021	9.86E-05	-6.17E-06	2.05E-05	-0.000201	-0.085165	0.065167	0.016039	9.06E-06
	(0.02132)	(0.00016)	(1.3E-05)	(4.4E-05)	(0.00037)	(0.10830)	(0.04707)	(0.02306)	(1.8E-05)
	[-2.25200]	[0.63488]	[-0.45980]	[0.47143]	[-0.54587]	[-0.78637]	[1.38459]	[0.69547]	[0.51471]
D(BDPCAPGDP(-1))	-0.094057	-0.000774	6.41E-06	-0.000322	0.001835	0.938685	-0.230435	-0.205649	5.98E-05
	(0.05479)	(0.00040)	(3.4E-05)	(0.00011)	(0.00095)	(0.27829)	(0.12094)	(0.05926)	(4.5E-05)
	[-1.71659]	[-1.94152]	[0.18585]	[-2.87527]	[1.93846]	[3.37304]	[-1.90539]	[-3.47029]	[1.32360]
D(BDPCAPGDP(-2))	0.165317	-0.000371	2.28E-05	-2.26E-05	-0.002709	0.513595	0.025258	-0.030414	-5.87E-06
	(0.06038)	(0.00044)	(3.8E-05)	(0.00012)	(0.00104)	(0.30669)	(0.13328)	(0.06531)	(5.0E-05)
	[2.73779]	[-0.84331]	[0.59952]	[-0.18327]	[-2.59693]	[1.67466]	[0.18951]	[-0.46572]	[-0.11784]
D(BDPCAPGDP(-3))	-0.134397	0.000654	-2.07E-05	-0.000195	-0.001999	-0.055237	0.227308	0.010734	-3.52E-06
	(0.06400)	(0.00047)	(4.0E-05)	(0.00013)	(0.00111)	(0.32503)	(0.14125)	(0.06921)	(5.3E-05)
	[-2.10009]	[1.40314]	[-0.51471]	[-1.49528]	[-1.80819]	[-0.16994]	[1.60923]	[0.15509]	[-0.06658]
D(BDPCAPGDP(-4))	-0.010698	-0.000437	2.79E-05	-2.51E-05	-0.004147	0.517813	-0.033259	-0.090445	-4.26E-05
	(0.06493)	(0.00047)	(4.1E-05)	(0.00013)	(0.00112)	(0.32977)	(0.14331)	(0.07022)	(5.4E-05)
	[-0.16477]	[-0.92499]	[0.68354]	[-0.18964]	[-3.69694]	[1.57023]	[-0.23207]	[-1.28799]	[-0.79434]
D(BDPCAPGDP(-5))	0.014973	-0.000102	-2.35E-06	-3.76E-05	0.000706	0.123675	-0.130975	-0.087425	-5.35E-06
	(0.06474)	(0.00047)	(4.1E-05)	(0.00013)	(0.00112)	(0.32879)	(0.14289)	(0.07001)	(5.3E-05)
	[0.23130]	[-0.21738]	[-0.05781]	[-0.28464]	[0.63149]	[0.37615]	[-0.91665]	[-1.24869]	[-0.10010]
D(BDPCAPGDP(-6))	-0.123075	-1.93E-05	-4.29E-05	-7.14E-05	0.002324	0.355389	-0.047911	0.080651	5.52E-05
	(0.06425)	(0.00047)	(4.0E-05)	(0.00013)	(0.00111)	(0.32634)	(0.14182)	(0.06949)	(5.3E-05)
	[-1.91545]	[-0.04116]	[-1.06021]	[-0.54412]	[2.09395]	[1.08901]	[-0.33783]	[1.16058]	[1.04187]

D(BDPCAPGDP(-7))	0.040467	0.000934	6.12E-05	-0.000173	0.003926	-0.860884	0.168177	-0.016003	7.53E-06
	(0.06911)	(0.00050)	(4.3E-05)	(0.00014)	(0.00119)	(0.35098)	(0.15253)	(0.07474)	(5.7E-05)
	[0.58558]	[1.85604]	[1.40777]	[-1.22783]	[3.28838]	[-2.45277]	[1.10258]	[-0.21411]	[0.13206]
D(BDPCAPGDP(-8))	-0.027897	-0.000685	-1.38E-05	1.52E-05	8.39E-05	1.004554	-0.203696	0.314099	-9.42E-06
	(0.06982)	(0.00051)	(4.4E-05)	(0.00014)	(0.00121)	(0.35460)	(0.15410)	(0.07551)	(5.8E-05)
	[-0.39958]	[-1.34735]	[-0.31492]	[0.10677]	[0.06956]	[2.83294]	[-1.32184]	[4.15975]	[-0.16355]
D(BDPCAPGDP(-9))	0.024962	-0.000920	1.33E-05	2.85E-05	0.000497	-0.551130	-0.327007	-0.284131	-6.59E-05
	(0.07029)	(0.00051)	(4.4E-05)	(0.00014)	(0.00121)	(0.35698)	(0.15513)	(0.07602)	(5.8E-05)
	[0.35516]	[-1.79856]	[0.30135]	[0.19859]	[0.40904]	[-1.54387]	[-2.10789]	[-3.73778]	[-1.13601]
D(BDPCAPGDP(-10))	-0.030930	-0.001230	-4.22E-06	-0.000294	-0.000508	0.959431	-0.194552	-0.130241	-7.97E-05
	(0.07234)	(0.00053)	(4.6E-05)	(0.00015)	(0.00125)	(0.36740)	(0.15966)	(0.07823)	(6.0E-05)
	[-0.42757]	[-2.33532]	[-0.09283]	[-1.99301]	[-0.40682]	[2.61142]	[-1.21852]	[-1.66475]	[-1.33587]
D(BDPCAPGDP(-11))	-0.053209	0.000456	3.64E-05	-0.000239	-0.002339	-1.421021	0.495657	-0.033289	3.16E-05
	(0.06400)	(0.00047)	(4.0E-05)	(0.00013)	(0.00111)	(0.32504)	(0.14125)	(0.06921)	(5.3E-05)
	[-0.83144]	[0.97826]	[0.90480]	[-1.83211]	[-2.11516]	[-4.37189]	[3.50899]	[-0.48095]	[0.59888]
D(BDREMIT(-1))	-0.362062	0.000512	5.57E-05	0.000173	-0.003608	-0.357659	0.123478	-0.623162	4.63E-05
	(0.12858)	(0.00094)	(8.1E-05)	(0.00026)	(0.00222)	(0.65306)	(0.28380)	(0.13906)	(0.00011)
	[-2.81585]	[0.54645]	[0.68887]	[0.65980]	[-1.62420]	[-0.54767]	[0.43508]	[-4.48114]	[0.43645]
D(BDREMIT(-2))	-0.556033	0.002944	2.52E-05	0.000180	-0.001596	-2.171988	0.748781	-0.279864	-1.81E-05
	(0.12925)	(0.00094)	(8.1E-05)	(0.00026)	(0.00223)	(0.65646)	(0.28528)	(0.13979)	(0.00011)
	[-4.30201]	[3.12830]	[0.31018]	[0.68189]	[-0.71496]	[-3.30866]	[2.62472]	[-2.00207]	[-0.16987]
D(BDREMIT(-3))	-0.444298	0.002345	3.34E-05	0.000127	-0.000334	-1.538045	0.228068	0.054013	3.97E-05
	(0.12831)	(0.00093)	(8.1E-05)	(0.00026)	(0.00222)	(0.65166)	(0.28320)	(0.13877)	(0.00011)
	[-3.46281]	[2.51028]	[0.41381]	[0.48359]	[-0.15059]	[-2.36019]	[0.80533]	[0.38924]	[0.37524]
D(BDREMIT(-4))	-0.255371	0.000455	-6.46E-05	0.000181	0.003069	-2.039678	-0.592579	-0.024374	6.67E-06
	(0.12837)	(0.00093)	(8.1E-05)	(0.00026)	(0.00222)	(0.65201)	(0.28335)	(0.13884)	(0.00011)
	[-1.98927]	[0.48706]	[-0.79957]	[0.69030]	[1.38375]	[-3.12830]	[-2.09134]	[-0.17555]	[0.06295]
D(BDREMIT(-5))	-0.257941	-9.50E-05	-3.06E-05	5.78E-05	0.003304	-0.770228	-0.746202	-0.040077	0.000168
	(0.13239)	(0.00096)	(8.3E-05)	(0.00027)	(0.00229)	(0.67243)	(0.29222)	(0.14319)	(0.00011)
	[-1.94827]	[-0.09852]	[-0.36749]	[0.21362]	[1.44448]	[-1.14544]	[-2.55354]	[-0.27989]	[1.53538]
D(BDREMIT(-6))	-0.338002	0.000382	3.86E-05	8.59E-05	-1.02E-05	-0.210760	-0.208564	0.237703	2.05E-05
	(0.13208)	(0.00096)	(8.3E-05)	(0.00027)	(0.00228)	(0.67082)	(0.29152)	(0.14285)	(0.00011)
	[-2.55910]	[0.39752]	[0.46414]	[0.31831]	[-0.00445]	[-0.31418]	[-0.71543]	[1.66404]	[0.18841]
D(BDREMIT(-7))	-0.297624	-0.001627	8.69E-05	-0.000287	-0.007626	-0.241061	-0.600955	-0.053823	1.70E-05
	(0.12801)	(0.00093)	(8.1E-05)	(0.00026)	(0.00221)	(0.65015)	(0.28254)	(0.13844)	(0.00011)
	[-2.32503]	[-1.74555]	[1.07933]	[-1.09778]	[-3.44831]	[-0.37078]	[-2.12696]	[-0.38877]	[0.16077]
D(BDREMIT(-8))	-0.225923	-0.002917	3.24E-05	-0.000522	-0.010844	0.122300	-0.530567	-0.262760	-6.61E-05
	(0.15123)	(0.00110)	(9.5E-05)	(0.00031)	(0.00261)	(0.76810)	(0.33380)	(0.16356)	(0.00012)
	[-1.49389]	[-2.64957]	[0.34082]	[-1.68884]	[-4.15063]	[0.15922]	[-1.58948]	[-1.60650]	[-0.52994]
D(BDREMIT(-9))	-0.261104	-0.003251	1.41E-05	-0.000563	-0.009798	0.125776	-0.801703	-0.310651	-8.38E-05
	(0.17113)	(0.00125)	(0.00011)	(0.00035)	(0.00296)	(0.86917)	(0.37772)	(0.18508)	(0.00014)
	[-1.52576]	[-2.60909]	[0.13072]	[-1.61114]	[-3.31421]	[0.14471]	[-2.12247]	[-1.67844]	[-0.59358]
D(BDREMIT(-10))	-0.528574	-0.000485	0.000111	-0.000637	-0.007542	-0.441445	-0.106998	-0.148444	0.000121
	(0.16324)	(0.00119)	(0.00010)	(0.00033)	(0.00282)	(0.82908)	(0.36030)	(0.17655)	(0.00013)
	[-3.23805]	[-0.40804]	[1.07886]	[-1.91159]	[-2.67440]	[-0.53245]	[-0.29697]	[-0.84082]	[0.89645]
D(BDREMIT(-11))	-0.261842	-0.001280	3.17E-05	-0.000105	-0.003431	-1.456927	-0.240566	-0.014731	9.40E-05
	(0.11937)	(0.00087)	(7.5E-05)	(0.00024)	(0.00206)	(0.60629)	(0.26348)	(0.12911)	(9.9E-05)
	[-2.19347]	[-1.47324]	[0.42180]	[-0.43156]	[-1.66366]	[-2.40301]	[-0.91303]	[-0.11410]	[0.95466]
D(USTBR(-1))	-186.5014	-0.179347	0.062650	0.038911	3.931238	457.4539	128.9863	-54.92127	0.206500
	(105.276)	(0.76645)	(0.06623)	(0.21498)	(1.81878)	(534.695)	(232.367)	(113.859)	(0.08688)
	[-1.77154]	[-0.23400]	[0.94599]	[0.18100]	[2.16148]	[0.85554]	[0.55510]	[-0.48236]	[2.37688]
D(USTBR(-2))	45.03329	0.287233	-0.084320	0.239520	1.522105	-189.9137	60.93998	-6.959999	0.248777
	(111.158)	(0.80927)	(0.06993)	(0.22699)	(1.92039)	(564.570)	(245.350)	(120.221)	(0.09173)
	[0.40513]	[0.35493]	[-1.20583]	[1.05518]	[0.79260]	[-0.33639]	[0.24838]	[-0.05789]	[2.71198]
D(USTBR(-3))	111.9900	0.612921	-0.072453	0.086244	0.135509	-581.3662	-89.92120	84.69109	0.084081
	(110.168)	(0.80206)	(0.06930)	(0.22497)	(1.90328)	(559.539)	(243.163)	(119.150)	(0.09092)
	[1.01654]	[0.76419]	[-1.04545]	[0.38335]	[0.07120]	[-1.03901]	[-0.36980]	[0.71080]	[0.92483]
D(USTBR(-4))	76.11814	-0.616709	-0.034783	-0.185290	-0.984091	447.6206	-115.7330	-41.79097	-0.039353
	(108.758)	(0.79180)	(0.06842)	(0.22209)	(1.87893)	(552.380)	(240.052)	(117.625)	(0.08975)
	[0.69988]	[-0.77887]	[-0.50840]	[-0.83429]	[-0.52375]	[0.81035]	[-0.48212]	[-0.35529]	[-0.43847]
D(USTBR(-5))	102.0825	-0.887337	-0.055650	-0.157140	-1.879496	755.5396	-96.35372	-177.2209	0.133915
	(106.416)	(0.77475)	(0.06694)	(0.21731)	(1.83847)	(540.486)	(234.883)	(115.092)	(0.08782)
	[0.95927]	[-1.14533]	[-0.83129]	[-0.72311]	[-1.02231]	[1.39789]	[-0.41022]	[-1.53981]	[1.52489]
D(USTBR(-6))	-21.56606	1.811661	0.051761	0.031723	-2.914584	-204.0192	516.8491	21.61913	0.091233
	(107.110)	(0.77979)	(0.06738)	(0.21873)	(1.85045)	(544.008)	(236.414)	(115.842)	(0.08839)
	[-0.20135]	[2.32325]	[0.76820]	[0.14504]	[-1.57507]	[-0.37503]	[2.18621]	[0.18663]	[1.03214]
D(USTBR(-7))	-29.02075	0.948963	0.006268	0.001534	-1.509955	-1002.683	192.7026	68.47762	-0.097579
	(104.938)	(0.76398)	(0.06601)	(0.21429)	(1.81293)	(532.976)	(231.620)	(113.493)	(0.08660)
	[-0.27655]	[1.24213]	[0.09495]	[0.00716]	[-0.83288]	[-1.88129]	[0.83198]	[0.60336]	[-1.12679]
D(USTBR(-8))	-86.25184	-0.200490	0.113948	0.035654	0.907880	-485.2827	99.62465	-163.9947	0.208521
	(103.276)	(0.75189)	(0.06497)	(0.21090)	(1.78423)	(524.538)	(227.953)	(111.697)	(0.08523)
	[-0.83515]	[-0.26665]	[1.75389]	[0.16906]	[0.50884]	[-0.92516]	[0.43704]	[-1.46822]	[2.44662]
D(USTBR(-9))	34.77272	-0.356672	0.033754	0.002867	1.631324	459.9426	-293.8630	78.37071	0.008322
	(107.975)	(0.78609)	(0.06792)	(0.22049)	(1.86539)	(548.400)	(238.323)	(116.778)	(0.08911)
	[0.32205]	[-0.45373]	[0.49693]	[0.01300]	[0.87452]	[0.83870]	[-1.23305]	[0.67111]	[0.09340]
D(USTBR(-10))	-160.3547	-0.030810	0.076027	-0.103932	3.080301	-1081.570	-201.8263	33.52703	-0.085239
	(104.832)	(0.76321)	(0.06595)	(0.21408)	(1.81111)	(532.441)	(231.387)	(113.379)	(0.08651)
	[-1.52963]	[-0.04037]	[1.15284]	[-0.48549]	[1.70078]	[-2.03134]	[-0.87225]	[0.29571]	[-0.98528]
D(USTBR(-11))	-146.5204	0.110443	0.027583	-0.035392	-1.804104	370.3716	-204.4701	-42.25076	-0.091788
	(106.730)	(0.77703)	(0.06714)	(0.21795)	(1.84389)	(542.079)	(235.575)	(115.432)	(0.08808)
	[-1.37281]	[0.14213]	[0.41083]	[-0.16238]	[-0.97842]	[0.68324]	[-0.86796]	[-0.36602]	[-1.04212]
C	1198.715	4.820711	-0.118361	-0.403341	10.53370	2670.760	2234.847	351.8144	-0.175753
	(190.358)	(1.38587)	(0.11975)	(0.38873)	(3.28867)	(966.826)	(420.161)	(205.878)	(0.15709)
	[6.29715]	[3.47847]	[-0.98841]	[-1.03759]	[3.20302]	[2.76240]	[5.31902]	[1.70885]	[-1.11879]

R-squared	0.578363	0.857785	0.359479	0.562689	0.655018	0.920960	0.862769	0.829941	0.512767
Adj. R-squared	0.247992	0.751655	-0.118522	0.236337	0.397569	0.861975	0.760357	0.703032	0.149161
Sum sq. resids	8525731.	451.8910	3.373936	35.55308	2544.655	2.20E+08	41535452	9972603.	5.806237
S.E. equation	252.2397	1.836388	0.158678	0.515094	4.357747	1281.119	556.7460	272.8047	0.208159
F-statistic	1.771671	8.082382	0.752046	1.724180	2.544262	15.61348	8.424542	6.539632	1.410226
Log likelihood	-1567.085	-410.2786	165.1613	-111.5449	-613.3549	-1948.985	-1753.141	-1585.503	101.3762
Akaike AIC	14.19647	4.351307	-0.546054	1.808893	6.079616	17.44668	15.77992	14.35322	-0.003201
Schwarz SC	15.68335	5.838193	0.940832	3.295779	7.566502	18.93357	17.26681	15.84010	1.483684
Mean dependent	16.81081	0.929149	0.013915	0.161287	0.376851	2470.510	272.6877	39.45049	-0.012638
S.D. dependent	290.8723	3.684995	0.150035	0.589434	5.614464	3448.347	1137.300	500.6070	0.225669

Determinant resid covariance (dof adj.)	8.22E+18
Determinant resid covariance	5.24E+16
Log likelihood	-7524.552
Akaike information criterion	71.85151
Schwarz criterion	85.36597
Number of coefficients	918

Chapter 7(B)-UK VECM

Vector Error Correction Estimates
DaDate: 10/04/18 Time: 11:07
Sample (adjusted): 1998M03 2018M06
Included observations: 243 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
FTSE100(-1)	1.000000
UKBOT(-1)	-2.629003 (3.62711) [-0.72482]
UKCPI(-1)	910.5765 (1198.48) [0.75978]
UKDIR(-1)	-34926.63 (4240.47) [-8.23635]
UKEXR(-1)	316061.3 (40878.2) [7.73178]
UKGDPCAP(-1)	-154.3091 (70.8354) [-2.17842]
IOP(-1)	-211.4124 (282.736) [-0.74774]
UKM2(-1)	-41.02233 (16.8977) [-2.42769]
UKREMIT(-1)	28.65177 (47.5051) [0.60313]
UKTBR(-1)	13690.44 (2978.54) [-4.59636]
C	-13792.58

Error Correction:	D(FTSE100)	D(UKBOT)	D(UKCPI)	D(UKDIR)	D(UKEXR)	D(UKGDPCA	D(IOP)	D(UKM2)	D(UKREMIT)	D(UKTBR)
CointEq1	-0.23697 (0.00052) [-455.71154]	0.000138 (0.00121) [0.11405]	-1.10E-06 (9.3E-07) [-1.18280]	3.31E-06 (4.8E-07) [6.89583]	-1.56E-08 (6.1E-08) [-0.25574]	9.32E-05 (3.5E-05) [2.66286]	2.06E-06 (1.2E-05) [0.17167]	0.000255 (0.00016) [1.59375]	-6.78E-05 (6.1E-05) [-1.11148]	2.18E-06 (5.3E-07) [4.11321]
D(FTSE_100(-1))	-0.010906 (0.08641) [-0.12621]	-0.168577 (0.13568) [-1.24242]	0.000118 (8.9E-05) [1.32620]	-5.94E-05 (7.5E-05) [-0.79113]	-2.03E-06 (8.6E-06) [-0.23507]	-0.004192 (0.00507) [-0.82697]	0.000697 (0.00178) [0.39253]	-0.008053 (0.01888) [-0.42650]	5301.906 (5609.08) [0.94524]	-8.28E-06 (8.1E-05) [-0.10172]
D(FTSE_100(-2))	0.072210 (0.08768) [0.82353]	-0.001321 (0.13769) [-0.00959]	-8.16E-05 (9.0E-05) [-0.90221]	2.82E-05 (7.6E-05) [0.37051]	-1.24E-05 (8.8E-06) [-1.41048]	-0.001954 (0.00514) [-0.37981]	-0.002566 (0.00180) [-1.42340]	0.008372 (0.01916) [0.43696]	3761.290 (5691.82) [0.66082]	2.26E-05 (8.3E-05) [0.27419]
D(FTSE_100(-3))	0.118679 (0.08920) [1.33044]	-0.106276 (0.14007) [-0.75873]	3.16E-05 (9.2E-05) [0.34338]	-0.000107 (7.7E-05) [-1.37659]	7.43E-06 (8.9E-06) [0.83348]	-0.003806 (0.00523) [-0.72723]	0.002272 (0.00183) [1.23851]	-0.005622 (0.01949) [-0.28842]	18.53048 (5790.39) [0.00320]	-9.77E-05 (8.4E-05) [-1.16277]
D(FTSE_100(-4))	0.000179 (0.08974) [0.00200]	0.046712 (0.14091) [0.33150]	-4.15E-05 (9.3E-05) [-0.44777]	-6.99E-05 (7.8E-05) [-0.89775]	-1.54E-05 (9.0E-06) [-1.72067]	-0.001666 (0.00526) [-0.31638]	0.001623 (0.00185) [0.87947]	-0.015704 (0.01961) [-0.80088]	-6513.402 (5825.03) [-1.11817]	8.73E-05 (8.5E-05) [1.03267]
D(FTSE_100(-5))	-0.041112 (0.08814) [-0.46646]	0.186536 (0.13840) [1.34784]	2.62E-05 (9.1E-05) [0.28803]	-1.82E-05 (7.7E-05) [-0.23823]	1.34E-06 (8.8E-06) [0.15239]	-0.000181 (0.00517) [-0.03496]	0.000287 (0.00181) [0.15857]	-0.006963 (0.01926) [-0.36154]	-10919.80 (5721.16) [-1.90867]	7.91E-05 (8.3E-05) [0.95293]
D(FTSE_100(-6))	-0.018731 (0.08975) [-0.20872]	0.078460 (0.14092) [0.55676]	6.64E-05 (9.3E-05) [0.71732]	-7.98E-05 (7.8E-05) [-1.02442]	3.58E-06 (9.0E-06) [0.39892]	0.004224 (0.00527) [0.80228]	9.26E-05 (0.00185) [0.05019]	0.003158 (0.01961) [0.16104]	9181.886 (5825.60) [1.57613]	-5.84E-05 (8.5E-05) [-0.69070]
D(FTSE_100(-7))	0.051206 (0.08751) [0.58517]	-0.138544 (0.13741) [-1.00828]	-0.000165 (9.0E-05) [-1.82932]	-3.01E-05 (7.6E-05) [-0.39669]	-4.07E-06 (8.7E-06) [-0.46531]	-0.004771 (0.00513) [-0.92941]	0.001863 (0.00180) [1.03547]	0.027946 (0.01912) [1.46156]	-10612.37 (5680.25) [-1.86829]	-7.68E-05 (8.2E-05) [-0.93223]
D(FTSE_100(-8))	0.118139 (0.08987) [1.31451]	-0.073265 (0.14112) [-0.51915]	7.24E-05 (9.3E-05) [0.78018]	-2.13E-05 (7.8E-05) [-0.27241]	2.89E-06 (9.0E-06) [0.32166]	-0.010432 (0.00527) [-1.97848]	-0.000215 (0.00185) [-0.11613]	0.032022 (0.01964) [1.63061]	-3783.205 (5833.90) [-0.64849]	-0.000130 (8.5E-05) [-1.53559]
D(FTSE_100(-9))	-0.011258 (0.09017) [-0.12484]	0.073379 (0.14160) [0.51823]	-1.19E-06 (9.3E-05) [-0.01283]	6.06E-05 (7.8E-05) [0.77415]	3.22E-06 (9.0E-06) [0.35743]	0.002711 (0.00529) [0.51239]	-0.002468 (0.00185) [-1.33094]	-0.010067 (0.01970) [-0.51090]	1758.293 (5853.48) [0.30038]	-1.34E-05 (8.5E-05) [-0.15724]
D(FTSE_100(-10))	-0.037316 (0.08986) [-0.41528]	0.209646 (0.14110) [1.48578]	6.17E-06 (9.3E-05) [0.06649]	2.91E-05 (7.8E-05) [0.37329]	-4.37E-06 (9.0E-06) [-0.48639]	0.002943 (0.00527) [0.55821]	-0.000891 (0.00185) [-0.48247]	-0.038089 (0.01964) [-1.93982]	-2909.887 (5833.02) [-0.49886]	-5.87E-06 (8.5E-05) [-0.06937]
D(FTSE_100(-11))	-0.093436 (0.08981) [-1.04036]	0.060588 (0.14103) [0.42962]	7.56E-05 (9.3E-05) [0.81567]	-7.48E-06 (7.8E-05) [-0.09590]	-6.70E-06 (9.0E-06) [-0.74709]	-0.001479 (0.00527) [-0.28075]	-0.002012 (0.00185) [-1.08942]	-0.049234 (0.01962) [-2.50882]	-2766.648 (5829.87) [-0.47456]	1.57E-05 (8.5E-05) [0.18520]

D(UKBOT(-1))	0.015517	0.006720	3.91E-05	-5.12E-05	-9.97E-06	0.004344	0.002100	-0.016303	1733.044	3.01E-05
	(0.05891)	(0.09251)	(6.1E-05)	(5.1E-05)	(5.9E-06)	(0.00346)	(0.00121)	(0.01287)	(3824.07)	(5.5E-05)
	[0.26340]	[0.07264]	[0.64334]	[-1.00169]	[-1.69361]	[1.25684]	[1.73381]	[-1.26650]	[0.45319]	[0.54224]
D(UKBOT(-2))	0.006830	0.032023	2.57E-05	3.38E-06	1.04E-06	0.000972	0.001129	0.015782	6508.301	-1.28E-05
	(0.05980)	(0.09391)	(6.2E-05)	(5.2E-05)	(6.0E-06)	(0.00351)	(0.00123)	(0.01307)	(3882.04)	(5.6E-05)
	[0.11420]	[0.34100]	[0.41604]	[0.06513]	[0.17484]	[0.27705]	[0.91769]	[1.20770]	[1.67652]	[-0.22763]
D(UKBOT(-3))	-0.003615	-0.365143	3.11E-05	-1.60E-05	-1.01E-06	0.003759	-0.001289	-0.001619	-23.12436	1.59E-05
	(0.05845)	(0.09178)	(6.0E-05)	(5.1E-05)	(5.8E-06)	(0.00343)	(0.00120)	(0.01277)	(3794.08)	(5.5E-05)
	[-0.06185]	[-3.97848]	[0.51622]	[-0.31544]	[-0.17288]	[1.09630]	[-1.07246]	[-0.12680]	[-0.00609]	[0.28928]
D(UKBOT(-4))	0.012177	0.061114	-0.000124	-8.38E-05	-1.03E-05	0.002624	0.000179	-0.015458	-1838.469	-3.13E-05
	(0.06184)	(0.09711)	(6.4E-05)	(5.4E-05)	(6.2E-06)	(0.00363)	(0.00127)	(0.01351)	(4014.36)	(5.8E-05)
	[0.19690]	[0.62934]	[-1.93530]	[-1.56009]	[-1.66397]	[0.72338]	[0.14071]	[-1.14393]	[-0.45797]	[-0.53739]
D(UKBOT(-5))	-0.050290	-0.068595	-3.01E-06	2.30E-05	-6.54E-06	-0.006760	-4.10E-05	0.030021	4830.658	3.50E-05
	(0.06271)	(0.09847)	(6.5E-05)	(5.4E-05)	(6.3E-06)	(0.00368)	(0.00129)	(0.01370)	(4070.74)	(5.9E-05)
	[-0.80194]	[-0.69659]	[-0.04655]	[0.42226]	[-1.04317]	[-1.83757]	[-0.03178]	[2.19085]	[1.18668]	[0.59284]
D(UKBOT(-6))	-0.019701	-0.155306	-1.87E-05	-1.17E-05	-1.24E-05	0.001738	-0.002598	-0.018745	-2084.679	-6.82E-05
	(0.06342)	(0.09959)	(6.5E-05)	(5.5E-05)	(6.3E-06)	(0.00372)	(0.00130)	(0.01386)	(4117.00)	(6.0E-05)
	[-0.31063]	[-1.55944]	[-0.28632]	[-0.21277]	[-1.95790]	[0.46717]	[-1.99177]	[-1.35259]	[-0.50636]	[-1.14214]
D(UKBOT(-7))	0.059011	-0.009931	-0.000100	-6.49E-05	-1.42E-06	-0.001578	-0.003355	-0.027408	-10.49915	-6.58E-06
	(0.06430)	(0.10097)	(6.6E-05)	(5.6E-05)	(6.4E-06)	(0.00377)	(0.00132)	(0.01405)	(4174.15)	(6.1E-05)
	[0.91768]	[-0.09835]	[-1.50888]	[-1.16300]	[-0.22151]	[-0.41821]	[-2.53768]	[-1.95059]	[-0.00252]	[-0.10871]
D(UKBOT(-8))	-0.073431	-0.141434	-3.57E-05	1.80E-05	8.14E-07	-0.007571	-0.000599	0.005414	9309.850	-6.92E-05
	(0.06538)	(0.10266)	(6.7E-05)	(5.7E-05)	(6.5E-06)	(0.00384)	(0.00134)	(0.01429)	(4243.69)	(6.2E-05)
	[-1.12323]	[-1.37775]	[-0.52971]	[0.31786]	[0.12454]	[-1.97402]	[-0.44555]	[0.37898]	[2.19381]	[-1.12436]
D(UKBOT(-9))	-0.082041	0.221259	8.62E-05	-1.27E-05	-4.52E-06	0.000258	-0.000337	-0.000686	-1092.631	-1.71E-05
	(0.06059)	(0.09514)	(6.3E-05)	(5.3E-05)	(6.1E-06)	(0.00355)	(0.00125)	(0.01324)	(3933.11)	(5.7E-05)
	[-1.35401]	[2.32554]	[1.37869]	[-0.24080]	[-0.74632]	[0.07258]	[-0.27019]	[-0.05179]	[-0.27780]	[-0.29905]
D(UKBOT(-10))	0.121347	-0.062588	-0.000139	-2.87E-05	2.15E-06	-0.002220	-0.004035	-0.021696	1802.132	-6.62E-05
	(0.06256)	(0.09824)	(6.5E-05)	(5.4E-05)	(6.3E-06)	(0.00367)	(0.00129)	(0.01367)	(4061.24)	(5.9E-05)
	[1.93956]	[-0.63708]	[-2.15254]	[-0.52772]	[0.34421]	[-0.60476]	[-3.13607]	[-1.58702]	[0.44374]	[-1.12369]
D(UKBOT(-11))	-0.099840	-0.089099	-7.06E-05	6.79E-05	-1.61E-06	-0.005892	-0.001546	-0.003909	-850.4877	2.52E-05
	(0.06506)	(0.10216)	(6.7E-05)	(5.6E-05)	(6.5E-06)	(0.00382)	(0.00134)	(0.01422)	(4223.21)	(6.1E-05)
	[-1.53459]	[-0.87215]	[-1.05219]	[1.20118]	[-0.24715]	[-1.54369]	[-1.15555]	[-0.27500]	[-0.20138]	[0.41073]
D(UKCPI(-1))	-87.73423	-140.8921	-0.375225	0.006689	0.005962	5.952279	1.086316	9.313045	2438485.	0.043224
	(77.3595)	(121.474)	(0.07983)	(0.06717)	(0.00773)	(4.53843)	(1.59071)	(16.9038)	(5021625)	(0.07287)
	[-1.13411]	[-1.15985]	[-4.70022]	[0.09959]	[0.77126]	[1.31153]	[0.68291]	[0.55094]	[0.48560]	[0.59317]
D(UKCPI(-2))	-82.01257	177.0215	-0.282172	0.001524	-0.000157	2.853680	-4.470845	-32.73782	1223461.	0.109766
	(81.2030)	(127.509)	(0.08380)	(0.07051)	(0.00811)	(4.76391)	(1.66974)	(17.7437)	(5271117)	(0.07649)
	[-1.00997]	[1.38830]	[-3.36730]	[0.02162]	[-0.01937]	[0.59902]	[-2.67757]	[-1.84504]	[0.23211]	[1.43505]
D(UKCPI(-3))	-57.27632	40.07114	-0.229730	-0.114540	0.014057	-0.065123	-2.296490	-35.22042	5452230.	0.010811
	(80.7520)	(126.801)	(0.08333)	(0.07012)	(0.00807)	(4.73745)	(1.66047)	(17.6451)	(5241838)	(0.07606)
	[-0.70929]	[0.31602]	[-2.75679]	[-1.63357]	[1.74200]	[-0.01375]	[-1.38304]	[-1.99605]	[1.04014]	[0.14214]
D(UKCPI(-4))	22.36724	-26.28101	-0.255382	-0.136676	0.003260	3.754533	-2.901153	-34.99175	6366287.	-0.124474
	(81.4844)	(127.951)	(0.08409)	(0.07075)	(0.00814)	(4.78042)	(1.67553)	(17.8051)	(5289380)	(0.07675)
	[0.27450]	[-0.20540]	[-3.03707]	[-1.93175]	[0.40038]	[0.78540]	[-1.73149]	[-1.96526]	[1.20360]	[-1.62171]
D(UKCPI(-5))	-179.8995	-116.1155	-0.190821	-0.027998	0.011018	2.610780	-2.676665	-12.03439	-252863.2	-0.022124
	(83.2132)	(130.666)	(0.08587)	(0.07225)	(0.00832)	(4.88184)	(1.71108)	(18.1829)	(5401603)	(0.07838)
	[-2.16191]	[-0.88864]	[-2.22216]	[-0.38750]	[1.32496]	[0.53479]	[-1.56432]	[-0.66185]	[-0.04681]	[-0.28225]
D(UKCPI(-6))	42.35414	-9.088696	0.062907	0.038556	0.001121	4.890966	-5.015526	-39.86241	11805124	0.024399
	(84.8031)	(133.162)	(0.08751)	(0.07363)	(0.00847)	(4.97512)	(1.74377)	(18.5303)	(5504809)	(0.07988)
	[0.49944]	[-0.06825]	[0.71883]	[0.52361]	[0.13233]	[0.98309]	[-2.87625]	[-2.15120]	[2.14451]	[0.30544]
D(UKCPI(-7))	192.9662	103.1963	-0.311184	0.016499	-0.001507	4.754378	-5.384132	-65.32406	601708.3	-0.002159
	(84.4611)	(132.625)	(0.08716)	(0.07334)	(0.00844)	(4.95505)	(1.73674)	(18.4556)	(5482608)	(0.07956)
	[2.28467]	[0.77810]	[-3.57027]	[0.22497]	[-0.17855]	[0.95950]	[-3.10014]	[-3.53953]	[0.10975]	[-0.02714]
D(UKCPI(-8))	28.77377	-122.6472	-0.252405	-0.052141	0.008180	10.71898	-3.731514	-20.52150	162876.4	0.018306
	(85.2542)	(133.871)	(0.08798)	(0.07403)	(0.00852)	(5.00158)	(1.75305)	(18.6289)	(5534089)	(0.08031)
	[0.33751]	[-0.91616]	[-2.86894]	[-0.70436]	[0.96018]	[2.14312]	[-2.12859]	[-1.10160]	[0.02943]	[0.22795]
D(UKCPI(-9))	-126.1548	-60.53935	-0.389276	0.054730	0.001787	22.30445	-2.636433	-45.96248	5452022.	-0.029535
	(83.4201)	(130.991)	(0.08609)	(0.07243)	(0.00834)	(4.89398)	(1.71533)	(18.2281)	(5415033)	(0.07858)
	[-1.51228]	[-0.46217]	[-4.52196]	[0.75559]	[0.21440]	[4.55753]	[-1.53698]	[-2.52152]	[1.00683]	[-0.37586]
D(UKCPI(-10))	-79.12530	150.8054	-0.328938	0.033143	0.011706	16.73083	-2.369985	4.587781	5158756.	0.086356
	(85.9354)	(134.940)	(0.08868)	(0.07462)	(0.00859)	(5.04154)	(1.76705)	(18.7777)	(5578307)	(0.08095)
	[-0.92075]	[1.11757]	[-3.70922]	[0.44417]	[1.36312]	[3.31859]	[-1.34121]	[0.24432]	[0.92479]	[1.06682]
D(UKCPI(-11))	143.8709	161.7136	-0.443738	0.105720	-0.000246	12.18342	-4.532046	-26.49258	7689872.	-0.002554
	(86.2220)	(135.391)	(0.08898)	(0.07487)	(0.00862)	(5.05836)	(1.77295)	(18.8404)	(5596916)	(0.08122)
	[1.66861]	[1.19442]	[-4.98710]	[1.41212]	[-0.02850]	[2.40857]	[-2.55622]	[-1.40616]	[1.37395]	[-0.03145]

D(UKDIR(-1))	-110.7086	169.4893	0.109818	0.225366	-0.009699	7.344742	-0.117954	3.439192	9683760.	-0.021203
	(108.127)	(169.786)	(0.11158)	(0.09389)	(0.01081)	(6.34343)	(2.22336)	(23.6267)	(7018809)	(0.10185)
	[-1.02388]	[0.99825]	[0.98419]	[2.40043]	[-0.89765]	[1.15785]	[-0.05305]	[0.14556]	[1.37969]	[-0.20818]
D(UKDIR(-2))	-77.03745	-178.9217	-0.076483	-0.031514	0.011037	1.548376	-2.550387	28.54155	10351329	-0.138010
	(110.134)	(172.939)	(0.11365)	(0.09563)	(0.01101)	(6.46122)	(2.26465)	(24.0655)	(7149138)	(0.10374)
	[-0.69949]	[-1.03459]	[-0.67295]	[-0.32954]	[1.00281]	[0.23964]	[-1.12617]	[1.18600]	[1.44791]	[-1.33032]
D(UKDIR(-3))	150.7249	10.15583	-0.068864	-0.044711	0.000854	-12.58062	1.254712	-32.88876	-5943827.	0.114200
	(110.968)	(174.248)	(0.11451)	(0.09635)	(0.01109)	(6.51011)	(2.28178)	(24.2475)	(7203230)	(0.10453)
	[1.35828]	[0.05828]	[-0.60136]	[-0.46404]	[0.07700]	[-1.93247]	[0.54988]	[-1.35637]	[-0.82516]	[1.09254]
D(UKDIR(-4))	61.39119	86.74676	-0.132464	0.191485	-0.000875	-11.79460	-0.749809	-15.27255	-4569200.	-0.224446
	(111.736)	(175.454)	(0.11531)	(0.09702)	(0.01117)	(6.55519)	(2.29758)	(24.4155)	(7253112)	(0.10525)
	[0.54943]	[0.49441]	[-1.14880]	[1.97367]	[-0.07839]	[-1.79928]	[-0.32635]	[-0.62553]	[-0.62996]	[-2.13250]
D(UKDIR(-5))	-101.0617	-133.8769	0.100926	-0.105928	0.012607	2.546239	-4.150081	-25.84631	4197775.	0.064775
	(116.951)	(183.642)	(0.12069)	(0.10155)	(0.01169)	(6.86111)	(2.40481)	(25.5549)	(7591599)	(0.11016)
	[-0.86414]	[-0.72901]	[0.83626]	[-1.04314]	[1.07877]	[0.37111]	[-1.72574]	[-1.01140]	[0.55295]	[0.58800]
D(UKDIR(-6))	10.23651	132.2678	-0.215871	-0.019841	0.002899	10.74237	-0.348291	-8.809605	-13132301	-0.273419
	(109.488)	(171.923)	(0.11299)	(0.09507)	(0.01094)	(6.42327)	(2.25134)	(23.9241)	(7107144)	(0.10313)
	[0.09349]	[0.76934]	[-1.91060]	[-0.20870]	[0.26497]	[1.67242]	[-0.15470]	[-0.36823]	[-1.84776]	[-2.65115]
D(UKDIR(-7))	-53.96207	-78.36862	-0.057909	0.088334	0.019623	-9.651224	-1.689831	58.69576	2469638.	-0.061811
	(115.380)	(181.175)	(0.11907)	(0.10018)	(0.01153)	(6.76893)	(2.37250)	(25.2116)	(7489614)	(0.10868)
	[-0.46769]	[-0.43256]	[-0.48636]	[0.88172]	[1.70197]	[-1.42581]	[-0.71226]	[2.32813]	[0.32974]	[-0.56873]
D(UKDIR(-8))	49.28764	8.609997	0.052440	-0.137860	-0.018671	2.892648	-1.372445	25.65833	-2024602.	0.109135
	(111.363)	(174.868)	(0.11492)	(0.09670)	(0.01113)	(6.53330)	(2.28991)	(24.3339)	(7228894)	(0.10490)
	[0.44258]	[0.04924]	[0.45631]	[-1.42571]	[-1.67773]	[0.44275]	[-0.59934]	[1.05443]	[-0.28007]	[1.04038]
D(UKDIR(-9))	177.1891	84.19419	0.061214	0.012241	-0.018862	-6.228643	1.913559	-13.26018	-5738138.	-0.026316
	(112.902)	(177.284)	(0.11651)	(0.09803)	(0.01128)	(6.62357)	(2.32155)	(24.6701)	(7328772)	(0.10635)
	[1.56941]	[0.47491]	[0.52540]	[0.12487]	[-1.67185]	[-0.94038]	[0.82426]	[-0.53750]	[-0.78296]	[-0.24745]
D(UKDIR(-10))	41.11798	-159.8811	0.092422	0.127313	0.000311	-9.921167	-0.199161	-14.44119	-2438834.	-0.051470
	(112.644)	(176.879)	(0.11624)	(0.09781)	(0.01126)	(6.60842)	(2.31624)	(24.6137)	(7312014)	(0.10611)
	[0.36503]	[-0.90390]	[0.79508]	[1.30167]	[0.02763]	[-1.50129]	[-0.08598]	[-0.58671]	[-0.33354]	[-0.48509]
D(UKDIR(-11))	-106.6347	140.5070	0.242154	-0.030939	-0.004254	3.843599	1.376976	-13.16731	-7856099.	-0.094276
	(99.8875)	(156.849)	(0.10308)	(0.08673)	(0.00998)	(5.86006)	(2.05394)	(21.8264)	(6483977)	(0.09409)
	[-1.06755]	[0.89581]	[2.34921]	[-0.35672]	[-0.42620]	[0.65590]	[0.67041]	[-0.60327]	[-1.21162]	[-1.00198]
D(UKEXR(-1))	222.1902	-916.7503	-0.144651	0.085310	-0.085544	29.33377	9.136809	305.5510	-12847082	-0.648848
	(991.206)	(1556.44)	(1.02288)	(0.86066)	(0.09905)	(58.1507)	(20.3817)	(216.588)	(6.4E+07)	(0.93367)
	[0.22416]	[-0.58900]	[-0.14142]	[0.09912]	[-0.86364]	[0.50444]	[0.44828]	[1.41075]	[-0.19967]	[-0.69494]
D(UKEXR(-2))	-952.3755	-1511.593	1.169537	0.420394	-0.251121	4.254300	37.50145	40.35543	-3889636.	0.228186
	(974.906)	(1530.85)	(1.00606)	(0.84650)	(0.09742)	(57.1945)	(20.0466)	(213.027)	(6.3E+07)	(0.91832)
	[-0.97689]	[-0.98742]	[1.16249]	[0.49662]	[-2.57765]	[0.07438]	[1.87072]	[0.18944]	[-0.06146]	[0.24848]
D(UKEXR(-3))	-278.0403	1090.380	1.509989	-0.045783	0.085235	-16.97553	28.07071	197.4282	-62693923	0.009980
	(966.024)	(1516.90)	(0.99689)	(0.83879)	(0.09653)	(56.6734)	(19.8639)	(211.086)	(6.3E+07)	(0.90995)
	[-0.28782]	[0.71882]	[1.51470]	[-0.05458]	[0.88295]	[-0.29953]	[1.41315]	[0.93530]	[-0.99979]	[0.01097]
D(UKEXR(-4))	382.6310	-642.4603	2.123341	-0.047038	-0.010640	-68.87020	32.49281	397.6424	24143900	0.556780
	(910.278)	(1429.37)	(0.93936)	(0.79039)	(0.09096)	(53.4030)	(18.7177)	(198.905)	(5.9E+07)	(0.85744)
	[0.42035]	[-0.44947]	[2.26040]	[-0.05951]	[-0.11697]	[-1.28963]	[1.73594]	[1.99916]	[0.40860]	[0.64935]
D(UKEXR(-5))	699.3728	558.5120	0.169135	0.145572	0.087379	-51.19189	12.74920	-328.8116	-90391417	0.051749
	(914.550)	(1436.08)	(0.94377)	(0.79410)	(0.09139)	(53.6536)	(18.8055)	(199.838)	(5.9E+07)	(0.86146)
	[0.76472]	[0.38892]	[0.17921]	[0.18332]	[0.95610]	[-0.95412]	[0.67795]	[-1.64539]	[-1.52261]	[0.06007]
D(UKEXR(-6))	437.5932	-1336.772	2.142277	0.633653	0.119007	-88.09585	26.23663	-2.927857	41155750	0.499681
	(905.446)	(1421.78)	(0.93438)	(0.78619)	(0.09048)	(53.1195)	(18.6183)	(197.849)	(5.9E+07)	(0.85289)
	[0.48329]	[-0.94021]	[2.29273]	[0.80598]	[1.31527]	[-1.65845]	[1.40919]	[-0.01480]	[0.70022]	[0.58587]
D(UKEXR(-7))	-1869.360	-726.3053	4.372295	0.577941	-0.108944	-59.38789	27.70677	-380.6968	-55932697	1.696811
	(887.696)	(1393.91)	(0.91606)	(0.77078)	(0.08871)	(52.0782)	(18.2533)	(193.970)	(5.8E+07)	(0.83617)
	[-2.10585]	[-0.52106]	[4.77293]	[0.74981]	[-1.22812]	[-1.14036]	[1.51790]	[-1.96266]	[-0.97067]	[2.02927]
D(UKEXR(-8))	610.9838	1136.004	3.485511	-0.116685	-0.013996	-26.17227	37.91078	33.00287	26186878	0.008511
	(920.518)	(1445.45)	(0.94993)	(0.79928)	(0.09199)	(54.0037)	(18.9282)	(201.142)	(6.0E+07)	(0.86709)
	[0.66374]	[0.78592]	[3.66922]	[-0.14599]	[-0.15215]	[-0.48464]	[2.00287]	[0.16408]	[0.43825]	[0.00982]
D(UKEXR(-9))	-657.0973	-151.0908	1.919543	0.637169	0.129764	-5.438934	11.13020	133.7664	-31362875	0.096422
	(859.833)	(1350.16)	(0.88731)	(0.74659)	(0.08592)	(50.4435)	(17.6804)	(187.882)	(5.6E+07)	(0.80992)
	[-0.76421]	[-0.11191]	[2.16333]	[0.85344]	[1.51023]	[-0.10782]	[0.62952]	[0.71197]	[-0.56192]	[0.11905]
D(UKEXR(-10))	850.0146	634.5711	2.125679	-0.297885	-0.021261	-14.85213	18.76602	308.9705	-70305242	0.066426
	(829.810)	(1303.01)	(0.85633)	(0.72052)	(0.08292)	(48.6822)	(17.0630)	(181.322)	(5.4E+07)	(0.78164)
	[1.02435]	[0.48700]	[2.48233]	[-0.41343]	[-0.25640]	[-0.30508]	[1.09981]	[1.70399]	[-1.30520]	[0.08498]
D(UKEXR(-11))	-423.0679	134.9533	-0.076563	0.232765	0.066078	-7.132902	1.497921	16.61380	19987674	0.279420
	(568.859)	(893.252)	(0.58704)	(0.49394)	(0.05685)	(33.3730)	(11.6972)	(124.301)	(3.7E+07)	(0.53584)
	[-0.74371]	[0.15108]	[-0.13042]	[0.47125]	[1.16241]	[-0.21373]	[0.12806]	[0.13366]	[0.54129]	[0.52146]

D(UKGDPCAP(-1))	0.681624	-2.012869	0.002563	0.000228	0.000127	-0.181846	0.022255	-0.178237	-81064.37	0.001062
	(1.74983)	(2.74767)	(0.00181)	(0.00152)	(0.00017)	(0.10266)	(0.03598)	(0.38235)	(113586.)	(0.00165)
	[0.38954]	[-0.73257]	[1.41929]	[0.15028]	[0.72550]	[-1.77141]	[0.61853]	[-0.46616]	[-0.71368]	[0.64436]
D(UKGDPCAP(-2))	2.322454	-1.125386	0.003887	-0.002128	-2.89E-05	-0.039204	-0.066686	-0.463857	-67899.60	-0.001659
	(1.69777)	(2.66593)	(0.00175)	(0.00147)	(0.00017)	(0.09960)	(0.03491)	(0.37098)	(110207.)	(0.00160)
	[1.36794]	[-0.42214]	[2.21845]	[-1.44366]	[-0.17053]	[-0.39361]	[-1.91018]	[-1.25036]	[-0.61611]	[-1.03761]
D(UKGDPCAP(-3))	-4.412490	-0.604512	0.004897	0.000508	2.09E-05	-0.121561	0.013926	0.353317	-24401.90	-0.001582
	(1.73852)	(2.72992)	(0.00179)	(0.00151)	(0.00017)	(0.10199)	(0.03575)	(0.37988)	(112852.)	(0.00164)
	[-2.53807]	[-0.22144]	[2.72969]	[0.33649]	[0.12057]	[-1.19186]	[0.38955]	[0.93007]	[-0.21623]	[-0.96625]
D(UKGDPCAP(-4))	-1.308489	1.503732	0.002273	-0.000908	0.000110	-0.093475	-0.029882	-0.111236	-28880.34	-0.000610
	(1.66183)	(2.60949)	(0.00171)	(0.00144)	(0.00017)	(0.09749)	(0.03417)	(0.36313)	(107874.)	(0.00157)
	[-0.78738]	[0.57625]	[1.32567]	[-0.62915]	[0.66185]	[-0.95878]	[-0.87447]	[-0.30633]	[-0.26772]	[-0.38985]
D(UKGDPCAP(-5))	0.166323	-0.444070	-0.002709	0.002377	-2.46E-06	-0.035157	-0.046344	0.113617	15571.42	0.001110
	(1.67926)	(2.63687)	(0.00173)	(0.00146)	(0.00017)	(0.09852)	(0.03453)	(0.36694)	(109006.)	(0.00158)
	[0.09905]	[-0.16841]	[-1.56305]	[1.63000]	[-0.01465]	[-0.35686]	[-1.34213]	[0.30964]	[0.14285]	[0.70150]
D(UKGDPCAP(-6))	-0.405505	-1.647105	-0.002020	0.001160	4.91E-05	-0.138289	0.037561	0.324728	20928.05	0.000571
	(1.64313)	(2.58014)	(0.00170)	(0.00143)	(0.00016)	(0.09640)	(0.03379)	(0.35904)	(106660.)	(0.00155)
	[-0.24679]	[-0.63838]	[-1.19158]	[0.81323]	[0.29918]	[-1.43457]	[1.11169]	[0.90443]	[0.19621]	[0.36865]
D(UKGDPCAP(-7))	0.770026	-3.806659	0.000962	0.001196	0.000134	-0.142695	0.043065	0.119847	-144111.8	-0.001473
	(1.65329)	(2.59609)	(0.00171)	(0.00144)	(0.00017)	(0.09699)	(0.03400)	(0.36126)	(107320.)	(0.00156)
	[0.46575]	[-1.46630]	[0.56380]	[0.83299]	[0.81006]	[-1.47118]	[1.26678]	[0.33175]	[-1.34282]	[-0.94568]
D(UKGDPCAP(-8))	1.921755	2.361702	0.000965	0.000831	0.000205	-0.191446	-0.031789	0.432203	-221470.5	-0.001101
	(1.67666)	(2.63278)	(0.00173)	(0.00146)	(0.00017)	(0.09836)	(0.03448)	(0.36637)	(108837.)	(0.00158)
	[1.14618]	[0.89704]	[0.55800]	[0.57079]	[1.22580]	[-1.94631]	[-0.92206]	[1.17970]	[-2.03489]	[-0.69744]
D(UKGDPCAP(-9))	-1.080664	0.762758	-0.000644	7.01E-05	0.000303	-0.079977	0.038548	0.332127	4744.340	0.001199
	(1.73066)	(2.71757)	(0.00179)	(0.00150)	(0.00017)	(0.10153)	(0.03559)	(0.37817)	(112342.)	(0.00163)
	[-0.62442]	[0.28068]	[-0.36034]	[0.04668]	[1.75082]	[-0.78770]	[1.08321]	[0.87826]	[0.04223]	[0.73562]
D(UKGDPCAP(-10))	0.189332	-0.130461	-0.000291	-0.000447	0.000269	-0.051094	0.043387	0.501960	-80209.24	0.000202
	(1.71843)	(2.69837)	(0.00177)	(0.00149)	(0.00017)	(0.10081)	(0.03534)	(0.37549)	(111548.)	(0.00162)
	[0.11018]	[-0.04835]	[-0.16411]	[-0.29966]	[1.56754]	[-0.50681]	[1.22788]	[1.33680]	[-0.71906]	[0.12454]
D(UKGDPCAP(-11))	-0.773017	2.235373	0.003374	0.001808	-9.96E-05	-0.225642	-0.004217	0.329882	-103510.5	0.000539
	(1.63450)	(2.56659)	(0.00169)	(0.00142)	(0.00016)	(0.09589)	(0.03361)	(0.35716)	(106100.)	(0.00154)
	[-0.47294]	[0.87095]	[2.00031]	[1.27379]	[-0.60960]	[-2.35311]	[-0.12548]	[0.92364]	[-0.97559]	[0.35034]
D(IOP(-1))	4.559600	4.415339	0.001481	0.009006	0.000888	0.107664	-0.054890	-2.188620	220568.6	0.002266
	(4.61182)	(7.24173)	(0.00476)	(0.00400)	(0.00046)	(0.27056)	(0.09483)	(1.00773)	(299366.)	(0.00434)
	[0.98868]	[0.60971]	[0.31113]	[2.24894]	[1.92657]	[0.39793]	[-0.57882]	[-2.17184]	[0.73679]	[0.52162]
D(IOP(-2))	-1.226037	-0.653081	-0.000256	0.000406	-0.000314	0.217253	-0.093039	-1.487489	299862.9	-0.004162
	(4.62500)	(7.26242)	(0.00477)	(0.00402)	(0.00046)	(0.27133)	(0.09510)	(1.01061)	(300221.)	(0.00436)
	[-0.26509]	[-0.08993]	[-0.05371]	[0.10117]	[-0.68020]	[0.80069]	[-0.97831]	[-1.47188]	[0.99881]	[-0.95529]
D(IOP(-3))	5.268747	-7.995590	0.002505	0.009255	-7.47E-05	0.001871	-0.132714	-0.427178	-397489.3	0.001330
	(4.57154)	(7.17848)	(0.00472)	(0.00397)	(0.00046)	(0.26820)	(0.09400)	(0.99893)	(296751.)	(0.00431)
	[1.15251]	[-1.11383]	[0.53096]	[2.33164]	[-0.16344]	[0.00698]	[-1.41181]	[-0.42764]	[-1.33947]	[0.30877]
D(IOP(-4))	4.557046	0.629231	0.006437	0.010770	0.000136	0.553778	0.011133	-0.112002	503190.8	0.001309
	(4.80317)	(7.54220)	(0.00496)	(0.00417)	(0.00048)	(0.28179)	(0.09877)	(1.04954)	(311787.)	(0.00452)
	[0.94876]	[0.08343]	[1.29869]	[2.58249]	[0.28429]	[1.96524]	[0.11272]	[-0.10672]	[1.61389]	[0.28936]
D(IOP(-5))	7.729639	-0.396144	-0.006150	0.000186	-0.000471	0.407692	0.182637	-2.031751	52807.58	0.002992
	(4.92612)	(7.73526)	(0.00508)	(0.00428)	(0.00049)	(0.28900)	(0.10129)	(1.07641)	(319768.)	(0.00464)
	[1.56911]	[-0.05121]	[-1.20971]	[0.04344]	[-0.95701]	[1.41070]	[1.80305]	[-1.88753]	[0.16514]	[0.64478]
D(IOP(-6))	-3.485159	3.720690	0.002859	-0.001373	-0.000245	0.214758	0.130534	1.064598	114006.5	0.005606
	(5.07872)	(7.97487)	(0.00524)	(0.00441)	(0.00051)	(0.29795)	(0.10443)	(1.10975)	(329674.)	(0.00478)
	[-0.68623]	[0.46655]	[0.54550]	[-0.31135]	[-0.48301]	[0.72078]	[1.24995]	[0.95931]	[0.34582]	[1.17181]
D(IOP(-7))	-8.691887	-0.211406	0.008274	0.000878	0.000380	0.629853	0.121753	0.005282	384925.2	-0.000250
	(4.87332)	(7.65235)	(0.00503)	(0.00423)	(0.00049)	(0.28590)	(0.10021)	(1.06487)	(316341.)	(0.00459)
	[-1.78357]	[-0.02763]	[1.64515]	[0.20748]	[0.78091]	[2.20304]	[1.21500]	[0.00496]	[1.21680]	[-0.05456]
D(IOP(-8))	2.183739	-4.190655	0.009233	-0.000870	4.84E-05	-0.034526	0.049520	0.212225	-20765.66	0.000740
	(4.99510)	(7.84357)	(0.00515)	(0.00434)	(0.00050)	(0.29305)	(0.10271)	(1.09148)	(324246.)	(0.00471)
	[0.43718]	[-0.53428]	[1.79113]	[-0.20068]	[0.09702]	[-0.11782]	[0.48213]	[0.19444]	[-0.06404]	[0.15720]
D(IOP(-9))	3.705585	4.167527	0.009128	0.007309	-0.000398	-0.518802	0.040832	-1.337514	-237342.2	0.000543
	(4.81251)	(7.55687)	(0.00497)	(0.00418)	(0.00048)	(0.28233)	(0.09896)	(1.05158)	(312394.)	(0.00453)
	[0.76999]	[0.55149]	[1.83792]	[1.74917]	[-0.82659]	[-1.83755]	[0.41262]	[-1.27191]	[-0.75975]	[0.11985]
D(IOP(-10))	2.615196	1.486361	0.009555	-0.000896	0.000383	-0.518002	0.027530	0.463490	222391.4	-0.003160
	(4.84606)	(7.60954)	(0.00500)	(0.00421)	(0.00048)	(0.28430)	(0.09965)	(1.05891)	(314571.)	(0.00456)
	[0.53965]	[0.19533]	[1.91068]	[-0.21282]	[0.79084]	[-1.82201]	[0.27627]	[0.43770]	[0.70697]	[-0.69230]
D(IOP(-11))	-9.343573	3.583061	0.021162	0.000792	3.36E-05	0.292255	0.269782	-0.247293	-4227.242	-0.000238
	(4.58107)	(7.19344)	(0.00473)	(0.00398)	(0.00046)	(0.26876)	(0.09420)	(1.00101)	(297370.)	(0.00432)
	[-2.03961]	[0.49810]	[4.47633]	[0.19905]	[0.07347]	[1.08744]	[2.86398]	[-0.24704]	[-0.01422]	[-0.05518]
D(UKM2(-1))	-0.915346	-0.306009	-0.000826	0.000541	0.000627	0.076972	0.021005	-0.121168	70277.59	0.000209
	(0.41046)	(0.64453)	(0.00042)	(0.00036)	(4.1E-05)	(0.02408)	(0.00844)	(0.08969)	(26644.3)	(0.00039)
	[-2.23003]	[-0.47478]	[-1.94904]	[1.51733]	[15.2911]	[3.19646]	[2.48869]	[-1.35096]	[2.63762]	[0.54027]
D(UKM2(-2))	-0.443654	-0.551785	0.000394	-0.000175	9.18E-06	0.024059	-0.006814	-0.342809	19471.44	0.000124
	(0.73565)	(1.15516)	(0.00076)	(0.00064)	(7.4E-05)	(0.04316)	(0.01513)	(0.16075)	(47753.1)	(0.00069)
	[-0.60308]	[-0.47767]	[0.51861]	[-0.27430]	[0.12486]	[0.55745]	[-0.45046]	[-2.13261]	[0.40775]	[0.17943]
D(UKM2(-3))	0.900055	0.554925	-0.001173	-0.000140	0.000153	0.067245	-0.011904	0.304345	31462.51	-0.000115
	(0.70688)	(1.10998)	(0.00073)	(0.00061)	(7.1E-05)	(0.04147)	(0.01454)	(0.15446)	(45885.5)	(0.00067)
	[1.27328]	[0.49994]	[-1.60837]	[-0.22816]	[2.15981]	[1.62153]	[-0.81898]	[1.97038]	[0.68567]	[-0.17318]

D(UKM2(-4))	0.133506	-0.732213	-0.001822	-2.84E-06	-0.000155	0.027069	-0.015081	-0.195772	49156.17	-0.000247
	(0.68565)	(1.07664)	(0.00071)	(0.00060)	(6.9E-05)	(0.04022)	(0.01410)	(0.14982)	(44507.2)	(0.00065)
	[0.19472]	[-0.68009]	[-2.57459]	[-0.00477]	[-2.25763]	[0.67295]	[-1.06968]	[-1.30671]	[1.10445]	[-0.38312]
D(UKM2(-5))	-0.659307	1.000307	-0.001533	0.000374	3.70E-05	0.081778	-0.013908	-0.165589	-7346.046	-0.000634
	(0.65279)	(1.02504)	(0.00067)	(0.00057)	(6.5E-05)	(0.03830)	(0.01342)	(0.14264)	(42374.2)	(0.00061)
	[-1.00999]	[0.97587]	[-2.27618]	[0.65934]	[0.56678]	[2.13536]	[-1.03616]	[-1.16089]	[-0.17336]	[-1.03072]
D(UKM2(-6))	-1.091716	0.115641	2.81E-05	0.000239	-3.73E-05	0.014986	-0.011822	0.363455	4849.176	-5.99E-05
	(0.67703)	(1.06310)	(0.00070)	(0.00059)	(6.8E-05)	(0.03972)	(0.01392)	(0.14794)	(43947.7)	(0.00064)
	[-1.61251]	[0.10878]	[0.04024]	[0.40632]	[-0.55205]	[0.37731]	[-0.84918]	[2.45682]	[0.11034]	[-0.09397]
D(UKM2(-7))	0.377959	1.128481	-0.001181	-0.000542	-0.000102	0.029163	-0.016909	-0.232665	-68283.56	-0.000675
	(0.68005)	(1.06786)	(0.00070)	(0.00059)	(6.8E-05)	(0.03990)	(0.01398)	(0.14860)	(44144.1)	(0.00064)
	[0.55578]	[1.05677]	[-1.68250]	[-0.91793]	[-1.50134]	[0.73098]	[-1.20921]	[-1.56574]	[-1.54683]	[-1.05368]
D(UKM2(-8))	1.629674	1.307470	-0.003532	-0.000250	6.40E-06	0.027449	-0.022416	0.513295	12665.73	-0.000547
	(0.66515)	(1.04446)	(0.00069)	(0.00058)	(6.6E-05)	(0.03902)	(0.01368)	(0.14534)	(43176.8)	(0.00063)
	[2.45008]	[1.25182]	[-5.14528]	[-0.43282]	[0.09634]	[0.70341]	[-1.63895]	[3.53164]	[0.29335]	[-0.87322]
D(UKM2(-9))	-0.098893	-1.381871	-0.003122	0.000164	-0.000123	0.029442	-0.034320	-0.142809	5771.225	-0.000381
	(0.72144)	(1.13285)	(0.00074)	(0.00063)	(7.2E-05)	(0.04232)	(0.01483)	(0.15764)	(46830.8)	(0.00068)
	[-0.13708]	[-1.21982]	[-4.19347]	[0.26179]	[-1.70739]	[0.69563]	[-2.31352]	[-0.90591]	[0.12324]	[-0.56069]
D(UKM2(-10))	-0.291528	-0.179166	-0.001512	-0.000546	-7.93E-05	0.053412	-0.001714	0.008014	57291.89	0.000325
	(0.67320)	(1.05710)	(0.00069)	(0.00058)	(6.7E-05)	(0.03949)	(0.01384)	(0.14710)	(43699.5)	(0.00063)
	[-0.43305]	[-0.16949]	[-2.17639]	[-0.93377]	[-1.17834]	[1.35239]	[-0.12385]	[0.05448]	[1.31104]	[0.51173]
D(UKM2(-11))	-0.556209	-1.124383	-0.000982	7.77E-06	-7.97E-05	-0.002544	-0.001965	-0.522053	23512.42	0.000529
	(0.66729)	(1.04782)	(0.00069)	(0.00058)	(6.7E-05)	(0.03915)	(0.01372)	(0.14581)	(43316.0)	(0.00063)
	[-0.83353]	[-1.07307]	[-1.42556]	[0.01340]	[-1.19528]	[-0.06499]	[-0.14320]	[-3.58035]	[0.54281]	[0.84213]
D(UKREMIT(-1))	1.39E-06	2.58E-06	-3.80E-09	6.79E-10	2.07E-10	4.90E-10	-2.87E-08	-1.61E-07	-0.011645	-3.52E-10
	(1.7E-06)	(2.7E-06)	(1.8E-09)	(1.5E-09)	(1.7E-10)	(1.0E-07)	(3.5E-08)	(3.8E-07)	(0.11191)	(1.6E-09)
	[0.80449]	[0.95193]	[-2.13489]	[0.45345]	[1.20181]	[0.00485]	[-0.81030]	[-0.42820]	[-0.10406]	[-0.21659]
D(UKREMIT(-2))	-1.48E-06	1.82E-06	-5.29E-09	-5.34E-11	-1.16E-11	9.41E-08	-2.24E-08	2.12E-07	0.027988	-2.58E-11
	(1.7E-06)	(2.6E-06)	(1.7E-09)	(1.4E-09)	(1.7E-10)	(9.8E-08)	(3.4E-08)	(3.6E-07)	(0.10812)	(1.6E-09)
	[-0.88711]	[0.69671]	[-3.07858]	[-0.03693]	[-0.06947]	[0.96244]	[-0.65429]	[0.58240]	[0.25885]	[-0.01643]
D(UKREMIT(-3))	2.55E-06	9.87E-07	-2.61E-09	-7.89E-10	5.40E-11	1.05E-07	-4.98E-08	-4.27E-07	0.015397	-3.90E-10
	(1.7E-06)	(2.6E-06)	(1.7E-09)	(1.4E-09)	(1.7E-10)	(9.8E-08)	(3.4E-08)	(3.6E-07)	(0.10815)	(1.6E-09)
	[1.53172]	[0.37725]	[-1.51771]	[-0.54511]	[0.32408]	[1.07845]	[-1.45395]	[-1.17283]	[0.14238]	[-0.24856]
D(UKREMIT(-4))	-6.50E-07	-5.25E-06	-1.46E-09	2.32E-09	-4.81E-11	8.67E-08	-1.14E-08	-2.48E-07	0.098085	-9.24E-10
	(1.6E-06)	(2.5E-06)	(1.6E-09)	(1.4E-09)	(1.6E-10)	(9.3E-08)	(3.2E-08)	(3.5E-07)	(0.10253)	(1.5E-09)
	[-0.41137]	[-2.11626]	[-0.89826]	[1.69249]	[-0.30489]	[0.93597]	[-0.35110]	[-0.71751]	[0.95661]	[-0.62077]
D(UKREMIT(-5))	-6.57E-09	3.35E-07	1.58E-09	-1.74E-09	-6.02E-11	3.20E-08	-1.93E-08	-8.55E-07	-0.015635	6.64E-10
	(1.6E-06)	(2.5E-06)	(1.6E-09)	(1.4E-09)	(1.6E-10)	(9.3E-08)	(3.2E-08)	(3.5E-07)	(0.10260)	(1.5E-09)
	[-0.00416]	[0.13504]	[0.97046]	[-1.26442]	[-0.38102]	[0.34548]	[-0.59240]	[-2.47593]	[-0.15239]	[0.44634]
D(UKREMIT(-6))	5.21E-07	1.73E-06	-2.23E-09	2.75E-09	-7.59E-11	1.62E-07	-8.35E-08	-6.78E-07	0.073894	8.20E-11
	(1.5E-06)	(2.4E-06)	(1.6E-09)	(1.3E-09)	(1.5E-10)	(9.0E-08)	(3.2E-08)	(3.4E-07)	(0.09976)	(1.4E-09)
	[0.33880]	[0.71855]	[-1.40748]	[2.06355]	[-0.49433]	[1.79460]	[-2.64135]	[-2.02035]	[0.74075]	[0.05665]
D(UKREMIT(-7))	-7.98E-07	-2.70E-06	-3.44E-09	6.76E-10	5.24E-11	1.25E-07	-4.62E-08	-2.75E-07	0.064317	1.73E-09
	(1.5E-06)	(2.4E-06)	(1.6E-09)	(1.3E-09)	(1.5E-10)	(9.0E-08)	(3.2E-08)	(3.4E-07)	(0.10003)	(1.5E-09)
	[-0.51811]	[-1.11378]	[-2.16035]	[0.50509]	[0.34015]	[1.38655]	[-1.45804]	[-0.81580]	[0.64298]	[1.18903]
D(UKREMIT(-8))	-1.47E-06	-1.09E-06	-3.59E-09	-1.52E-09	-2.39E-10	1.57E-07	-4.19E-09	-3.42E-07	0.052529	2.13E-10
	(1.5E-06)	(2.3E-06)	(1.5E-09)	(1.3E-09)	(1.5E-10)	(8.7E-08)	(3.1E-08)	(3.3E-07)	(0.09660)	(1.4E-09)
	[-0.98578]	[-0.46676]	[-2.33681]	[-1.17406]	[-1.60882]	[1.79837]	[-0.13682]	[-1.05160]	[0.54379]	[0.15202]
D(UKREMIT(-9))	1.10E-06	2.70E-07	-3.30E-09	-5.57E-11	8.37E-11	8.13E-08	-3.94E-08	1.81E-07	0.018737	8.28E-10
	(1.5E-06)	(2.4E-06)	(1.6E-09)	(1.3E-09)	(1.5E-10)	(9.0E-08)	(3.1E-08)	(3.3E-07)	(0.09940)	(1.4E-09)
	[0.71932]	[0.11240]	[-2.08969]	[-0.04190]	[0.54731]	[0.90466]	[-1.25105]	[0.54075]	[0.18851]	[0.57415]
D(UKREMIT(-10))	-1.88E-07	-2.54E-06	-2.15E-09	-5.32E-10	-2.60E-11	1.73E-07	-3.65E-08	3.37E-08	0.156408	1.67E-09
	(1.5E-06)	(2.4E-06)	(1.5E-09)	(1.3E-09)	(1.5E-10)	(8.8E-08)	(3.1E-08)	(3.3E-07)	(0.09746)	(1.4E-09)
	[-0.12531]	[-1.07776]	[-1.39018]	[-0.40826]	[-0.17309]	[1.96375]	[-1.18313]	[0.10285]	[1.60479]	[1.18125]
D(UKREMIT(-11))	1.51E-06	2.30E-07	-2.61E-09	-1.33E-09	8.71E-12	1.65E-07	-4.46E-09	-7.68E-08	0.052843	-2.94E-10
	(1.4E-06)	(2.3E-06)	(1.5E-09)	(1.3E-09)	(1.4E-10)	(8.5E-08)	(3.0E-08)	(3.2E-07)	(0.09395)	(1.4E-09)
	[1.04075]	[0.10125]	[-1.74821]	[-1.05481]	[0.06026]	[1.94086]	[-0.14985]	[-0.24288]	[0.56249]	[-0.21546]
D(UKTBR(-1))	-5.389999	1.099994	0.060129	0.007211	0.017822	-21.18611	3.943425	49.03739	-17407210	0.156588
	(97.8261)	(153.612)	(0.10095)	(0.08494)	(0.00978)	(5.73913)	(2.01155)	(21.3759)	(6350164)	(0.09215)
	[-0.05510]	[0.00716]	[0.59562]	[0.08489]	[1.82305]	[-3.69152]	[1.96039]	[2.29405]	[-2.74122]	[1.69932]
D(UKTBR(-2))	120.0749	-31.99083	0.010122	0.242104	-0.009044	-2.015546	-0.595244	-21.63220	-7449060.	0.219612
	(103.265)	(162.152)	(0.10656)	(0.08966)	(0.01032)	(6.05819)	(2.12339)	(22.5643)	(6703199)	(0.09727)
	[1.16279]	[-0.19729]	[0.09499]	[2.70012]	[-0.87637]	[-0.33270]	[-0.28033]	[-0.95869]	[-1.11127]	[2.25774]
D(UKTBR(-3))	62.79364	230.8390	-0.028622	-0.003114	0.011592	9.053607	-2.895898	-4.012623	7221485.	0.064568
	(108.694)	(170.677)	(0.11217)	(0.09438)	(0.01086)	(6.37671)	(2.23503)	(23.7507)	(7055634)	(0.10238)
	[0.57771]	[1.35249]	[-0.25518]	[-0.03299]	[1.06720]	[1.41979]	[-1.29569]	[-0.16895]	[1.02351]	[0.63064]
D(UKTBR(-4))	-35.45812	-11.93806	0.010204	-0.111100	-0.014476	0.089789	-0.909603	1.762822	3120700.	-0.072027
	(105.457)	(165.594)	(0.10883)	(0.09157)	(0.01054)	(6.18680)	(2.16846)	(23.0434)	(6845502)	(0.09934)
	[-0.33623]	[-0.07209]	[0.09376]	[-1.21331]	[-1.37363]	[0.01451]	[-0.41947]	[0.07650]	[0.45588]	[-0.72509]
D(UKTBR(-5))	-272.7128	56.58761	-0.127374	0.182633	0.005792	-0.116806	-4.104953	-8.953536	-4277642.	0.094002
	(100.442)	(157.720)	(0.10365)	(0.08721)	(0.01004)	(5.89261)	(2.06535)	(21.9476)	(6519987)	(0.09461)
	[-2.71512]	[0.35879]	[-1.22887]	[2.09409]	[0.57706]	[-0.01982]	[-1.98753]	[-0.40795]	[-0.65608]	[0.99355]

D(UKTBR(-6))	29.33790	-115.7266	-0.097959	0.225275	0.006528	9.987862	-3.981027	-33.00502	14636106	0.212290
	(104.850)	(164.641)	(0.10820)	(0.09104)	(0.01048)	(6.15120)	(2.15598)	(22.9107)	(6806105)	(0.09876)
	[0.27981]	[-0.70290]	[-0.90535]	[2.47445]	[0.62307]	[1.62373]	[-1.84650]	[-1.44059]	[2.15044]	[2.14947]
D(UKTBR(-7))	154.0454	107.1713	-0.115739	-0.196484	-0.018449	3.640734	0.939100	-13.06390	-5565396.	-0.004712
	(107.644)	(169.028)	(0.11108)	(0.09347)	(0.01076)	(6.31510)	(2.21343)	(23.5212)	(6987465)	(0.10140)
	[1.43107]	[0.63404]	[-1.04191]	[-2.10219]	[-1.71512]	[0.57651]	[0.42427]	[-0.55541]	[-0.79648]	[-0.04647]
D(UKTBR(-8))	21.63849	-69.27935	-0.159661	-0.047034	0.003023	-12.83689	2.871578	0.584551	-7212494.	0.233283
	(108.974)	(171.117)	(0.11246)	(0.09462)	(0.01089)	(6.39315)	(2.24079)	(23.8119)	(7073820)	(0.10265)
	[0.19857]	[-0.40487]	[-1.41976]	[-0.49707]	[0.27758]	[-2.00791]	[1.28150]	[0.02455]	[-1.01960]	[2.27264]
D(UKTBR(-9))	-70.27317	-178.2990	0.038715	0.119748	-0.004067	11.12592	1.513010	35.60758	11289716	0.134602
	(111.263)	(174.711)	(0.11482)	(0.09661)	(0.01112)	(6.52741)	(2.28785)	(24.3120)	(7222378)	(0.10480)
	[-0.63160]	[-1.02054]	[0.33718]	[1.23952]	[-0.36575]	[1.70449]	[0.66132]	[1.46461]	[1.56316]	[1.28432]
D(UKTBR(-10))	-35.03907	135.8217	0.102735	-0.168584	0.007916	16.06758	4.598331	-0.512825	12622599	-0.022665
	(111.851)	(175.634)	(0.11542)	(0.09712)	(0.01118)	(6.56191)	(2.29994)	(24.4405)	(7260552)	(0.10536)
	[-0.31327]	[0.77332]	[0.89006]	[-1.73585]	[0.70820]	[2.44861]	[1.99933]	[-0.02098]	[1.73852]	[-0.21512]
D(UKTBR(-11))	110.4252	63.02014	0.176971	0.075346	0.004879	-2.056459	3.528565	67.33569	3814159.	-0.106158
	(111.956)	(175.800)	(0.11553)	(0.09721)	(0.01119)	(6.56810)	(2.30211)	(24.4635)	(7267392)	(0.10546)
	[0.98632]	[0.35848]	[1.53177]	[0.77508]	[0.43608]	[-0.31310]	[1.53275]	[2.75249]	[0.52483]	[-1.00664]
C	52.22479	-28.40564	0.834976	-0.016316	-0.014843	-16.08987	7.473189	69.28477	-9074770.	-0.019652
	(93.8412)	(147.355)	(0.09684)	(0.08148)	(0.00938)	(5.50535)	(1.92962)	(20.5052)	(6091498)	(0.08839)
	[0.55652]	[-0.19277]	[8.62224]	[-0.20024]	[-1.58280]	[-2.92259]	[3.87289]	[3.37888]	[-1.48974]	[-0.22232]
R-squared	0.454505	0.507436	0.802202	0.650772	0.848966	0.595237	0.658658	0.682519	0.451411	0.557084
Adj. R-squared	-0.045907	0.055579	0.620750	0.330407	0.710415	0.223926	0.345526	0.391276	-0.051839	0.150772
Sum sq. resids	5948526.	14667265	6.334749	4.484780	0.059402	20473.50	2515.151	284021.4	2.51E+16	5.277988
S.E. equation	221.7236	348.1624	0.228808	0.192521	0.022157	13.00778	4.559208	48.44878	14392705	0.208853
F-statistic	0.908261	1.123002	4.421030	2.031342	6.127446	1.603069	2.103454	2.343471	0.896991	1.371074
Log likelihood	-1512.810	-1617.948	89.36846	129.6030	633.3626	-852.0490	-607.7720	-1158.434	-4094.636	110.6303
Akaike AIC	13.94687	14.84934	0.194262	-0.151099	-4.475215	8.275098	6.178300	10.90502	36.10847	0.011757
Schwarz SC	15.60573	16.50821	1.853130	1.507770	-2.816347	9.933967	7.837168	12.56389	37.76733	1.670625
Mean dependent	7.529313	-6.244592	0.186021	-0.019742	0.000321	2.231760	0.360172	10.20172	229984.2	-0.012747
S.D. dependent	216.8031	358.2607	0.371543	0.235273	0.041174	14.76562	5.635641	62.09731	14033556	0.226636

Determinant resid covariance (dof adj.)	1.86E+23
Determinant resid covariance	2.65E+20
Log likelihood	-8784.558
Akaike information criterion	85.10350
Schwarz criterion	101.8403
Number of coefficients	1130

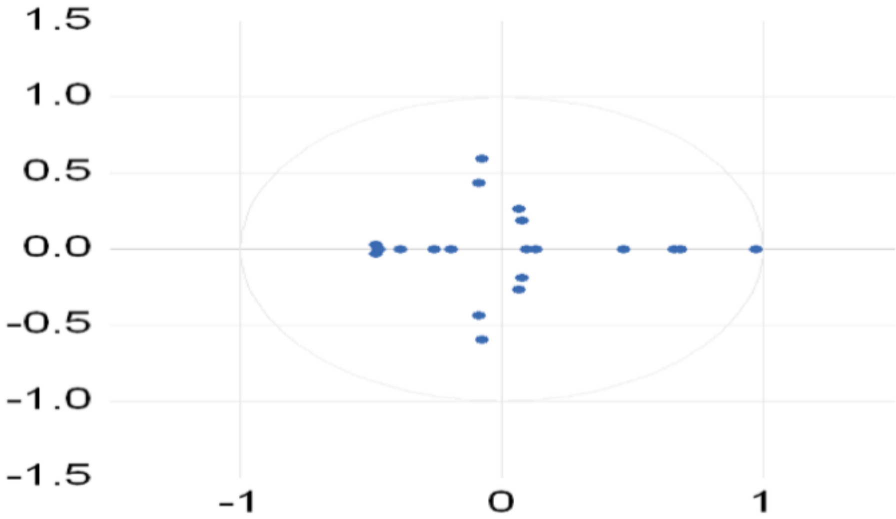
Chapter 8-BD LM-Test and AR

VAR Residual Serial Correlation LM Tests
Date: 10/18/18 Time: 15:38
Sample: 1998M01 2018M06
Included observations: 244

Null hypothesis: No serial correlation at lag h

Lag	LM-Stat	Prob.
1	386.4772	0.0000
2	269.3332	0.0229
3	293.3061	0.0015
4	221.1716	0.5596
5	239.9557	0.2354
6	251.0504	0.1122
7	233.0220	0.3427
8	195.0513	0.9262
9	240.3527	0.2299
10	231.0866	0.3761
11	158.9402	0.9997
12	284.4529	0.0044
13	236.7071	0.2830
14	83.66934	0.8803

Inverse Roots of AR Characteristic Polynomial



Chapter 8-BD T-Y Granger Causality

VAR Granger Causality/Block Exogeneity Wald Tests
Date: 10/20/18 Time: 20:45
Sample: 1998M01 2018M06
Included observations: 244

Dependent variable: DGEN

Excluded	Chi-sq	df	Prob.
BDBOT	26.09144	12	0.0104
BDCPI	23.06561	12	0.0409
BDDIR	22.06647	12	0.0368
BDEXR	13.38631	12	0.3416
BDIOP	18.77310	12	0.0942
BDM2	36.99641	12	0.0002
BDPCAPGDP	25.90888	12	0.9046
BDREMIT	27.35213	12	0.0069
BDTBR	18.24320	12	0.1085
All	256.5122	108	0.0000

Dependent variable: BDBOT

Excluded	Chi-sq	df	Prob.
DGEN	20.34181	12	0.0609
BDCPI	27.45814	12	0.0066
BDDIR	8.746328	12	0.7244
BDEXR	21.07523	12	0.0493
BDIOP	31.39198	12	0.0017
BDM2	16.34463	12	0.1760
BDPCAPGDP	19.45355	12	0.0782
BDREMIT	10.53267	12	0.5693
BDTBR	15.53751	12	0.2133
All	409.6640	108	0.0000

Dependent variable: BDCPI

Excluded	Chi-sq	df	Prob.
DGEN	15.50778	12	0.2767
BDBOT	13.97256	12	0.3025
BDDIR	42.34783	12	0.0000
BDEXR	16.04071	12	0.1894
BDIOP	8.711007	12	0.7274
BDM2	23.71747	12	0.0222
BDPCAPGDP	59.62490	12	0.0000
BDREMIT	29.91621	12	0.0029
BDTBR	11.53919	12	0.4834
All	303.3770	108	0.0000

Dependent variable: BDDIR

Excluded	Chi-sq	df	Prob.
DGEN	8.778399	12	0.7217
BDBOT	9.114868	12	0.6931
BDCPI	17.99805	12	0.1157
BDEXR	8.981322	12	0.7045
BDIOP	8.129546	12	0.7749
BDM2	7.442334	12	0.8271
BDPCAPGDP	17.98511	12	0.1161
BDREMIT	12.08960	12	0.4385
BDTBR	9.337332	12	0.6739
All	96.92595	108	0.7689

Dependent variable: BDEXR

Excluded	Chi-sq	df	Prob.
DGEN	9.362594	12	0.6717
BDBOT	15.24975	12	0.2281
BDCPI	10.16044	12	0.6019
BDDIR	7.431110	12	0.8279
BDIOP	14.98499	12	0.2423
BDM2	14.08726	12	0.2952
BDPCAPGDP	12.70393	12	0.3909
BDREMIT	16.46167	12	0.1710
BDTBR	1.986150	12	0.9994
All	152.9394	108	0.0029

Dependent variable: BDIOP

Excluded	Chi-sq	df	Prob.
DGEN	13.79341	12	0.0217
BDBOT	10.59881	12	0.5636
BDCPI	30.24651	12	0.0026
BDDIR	12.04765	12	0.4419
BDEXR	14.56690	12	0.2660
BDM2	46.23080	12	0.0000
BDPCAPGDP	39.34224	12	0.0001
BDREMIT	41.24128	12	0.0000
BDTBR	19.12205	12	0.0856
All	285.2588	108	0.0000

Dependent variable: BDM2

Excluded	Chi-sq	df	Prob.
DGEN	14.75739	12	0.2550
BDBOT	23.94420	12	0.0207
BDCPI	34.20033	12	0.0006
BDDIR	12.68184	12	0.3926
BDEXR	18.19478	12	0.1099
BDIOP	17.62762	12	0.1275
BDPCAPGDP	22.61900	12	0.0311
BDREMIT	38.76383	12	0.0001
BDTBR	13.05082	12	0.3654
All	358.3919	108	0.0000

Dependent variable: BDPCAPGDP

Excluded	Chi-sq	df	Prob.
DGEN	17.37431	12	0.0000
BDBOT	33.39946	12	0.0008
BDCPI	39.07147	12	0.0001
BDDIR	13.01681	12	0.3678
BDEXR	11.35779	12	0.4985
BDIOP	11.64993	12	0.4742
BDM2	17.78332	12	0.1224
BDREMIT	44.46525	12	0.0000
BDTBR	6.352039	12	0.8973
All	886.6009	108	0.0000

Dependent variable: BDREMIT

Excluded	Chi-sq	df	Prob.
DGEN	18.15441	12	0.1111
BDBOT	10.97612	12	0.5310
BDCPI	50.47324	12	0.0000
BDDIR	12.30762	12	0.4213
BDEXR	16.60231	12	0.1652
BDIOP	13.68758	12	0.3211
BDM2	33.21622	12	0.0009
BDPCAPGDP	31.10383	12	0.0019
BDTBR	6.181093	12	0.9067
All	356.5706	108	0.0000

Dependent variable: BDTBR

Excluded	Chi-sq	df	Prob.
DGEN	12.00262	12	0.4455
BDBOT	13.88166	12	0.3083
BDCPI	8.851959	12	0.7155
BDDIR	4.781166	12	0.9649
BDEXR	14.55198	12	0.2669
BDIOP	6.045177	12	0.9138
BDM2	6.150877	12	0.9083
BDPCAPGDP	8.914128	12	0.7102
BDREMIT	7.661253	12	0.8110
All	101.2731	108	0.6635

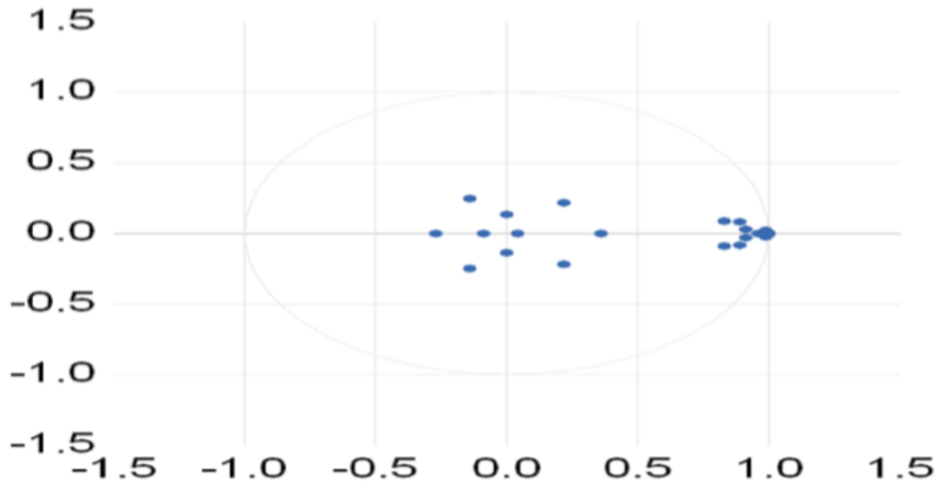
Chapter 8-UK LM-Test and AR

VAR Residual Serial Correlation LM Tests
Date: 11/02/18 Time: 11:09
Sample: 1998M01 2018M06
Included observations: 245

Null hypothesis: No serial correlation at lag h

Lag	LM-Stat	Prob.
1	226.5072	0.0000
2	152.7568	0.0005
3	158.2663	0.0002
4	114.7574	0.1485
5	129.9812	0.0236
6	111.8067	0.1974
7	127.0122	0.0354
8	96.64538	0.5764
9	105.0481	0.3453
10	122.0035	0.0667
11	108.3351	0.2674
12	131.6191	0.0187
13	94.69796	0.6310
14	108.3221	0.2677

Inverse Roots of AR Characteristic Polynomial



Chapter 8-UK T-Y Granger Causality

VAR Granger Causality/Block Exogeneity Wald Tests
Date: 11/04/18 Time: 08:47
Sample: 1998M01 2018M06
Included observations: 245

Dependent variable: FTSE100

Excluded	Chi-sq	df	Prob.
UKBOT	7.999800	12	0.7851
UKCPI	21.24981	12	0.0468
UKDIR	10.44404	12	0.5771
UKEXR	9.950139	12	0.6203
UKGDPCAP	10.09764	12	0.6074
IOP	16.82811	12	0.1562
UKM2	13.78180	12	0.3149
UKREMIT	10.31656	12	0.5882
UKTBR	17.58410	12	0.1289
All	110.4450	108	0.4167

Dependent variable: UKBOT

Excluded	Chi-sq	df	Prob.
FTSE100	9.001562	12	0.7028
UKCPI	7.292901	12	0.8377
UKDIR	4.645444	12	0.9688
UKEXR	10.00595	12	0.6154
UKGDPCAP	9.414832	12	0.6671
IOP	9.323350	12	0.6751
UKM2	7.612644	12	0.8146
UKREMIT	13.11777	12	0.3605
UKTBR	11.03116	12	0.5262
All	102.5860	108	0.6290

Dependent variable: UKCPI

Excluded	Chi-sq	df	Prob.
FTSE100	4.416939	12	0.9747
UKBOT	17.81369	12	0.1215
UKDIR	10.84101	12	0.5426
UKEXR	16.00026	12	0.1912
UKGDPCAP	8.756112	12	0.7236
IOP	19.18385	12	0.0842
UKM2	25.58019	12	0.0123
UKREMIT	5.714566	12	0.9298
UKTBR	10.38127	12	0.5826
All	176.9784	108	0.0000

Dependent variable: UKDIR

Excluded	Chi-sq	df	Prob.
FTSE100	12.82778	12	0.3817
UKBOT	7.071976	12	0.8528
UKCPI	18.95501	12	0.0896
UKEXR	6.575965	12	0.8843
UKGDPCAP	9.372545	12	0.6708
IOP	27.43391	12	0.0067
UKM2	7.373577	12	0.8320
UKREMIT	6.112284	12	0.9103
UKTBR	23.97051	12	0.0205
All	183.9760	108	0.0000

Dependent variable: UKEXR

Excluded	Chi-sq	df	Prob.
FTSE100	8.108273	12	0.7766
UKBOT	9.611938	12	0.6500
UKCPI	8.159529	12	0.7725
UKDIR	9.764842	12	0.6366
UKGDPCAP	6.804925	12	0.8702
IOP	6.233517	12	0.9039
UKM2	266.8391	12	0.0000
UKREMIT	7.255959	12	0.8402
UKTBR	9.920040	12	0.6230
All	587.8698	108	0.0000

Dependent variable: UKGDPCAP

Excluded	Chi-sq	df	Prob.
FTSE100	9.482448	12	0.6613
UKBOT	15.70197	12	0.2053
UKCPI	25.90623	12	0.0111
UKDIR	26.27871	12	0.0098
UKEXR	8.707946	12	0.7277
IOP	23.19608	12	0.0261
UKM2	9.991194	12	0.6167
UKREMIT	7.797773	12	0.8007
UKTBR	34.52704	12	0.0006
All	159.9808	108	0.0009

Dependent variable: IOP

Excluded	Chi-sq	df	Prob.
FTSE100	21.41463	12	0.0446
UKBOT	22.22504	12	0.0351
UKCPI	14.42056	12	0.2747
UKDIR	9.547039	12	0.6556
UKEXR	15.29091	12	0.2259
UKGDPCAP	13.16315	12	0.3573
UKM2	23.08461	12	0.0270
UKREMIT	11.54506	12	0.4829
UKTBR	24.55869	12	0.0171
All	189.9662	108	0.0000

Dependent variable: UKM2

Excluded	Chi-sq	df	Prob.
FTSE100	12.46812	12	0.4089
UKBOT	16.55425	12	0.1671
UKCPI	24.52913	12	0.0172
UKDIR	19.59503	12	0.0751
UKEXR	17.69389	12	0.1253
UKGDPCAP	12.87670	12	0.3781
IOP	8.289670	12	0.7621
UKREMIT	12.89395	12	0.3768
UKTBR	24.78642	12	0.0159
All	205.4510	108	0.0000

Dependent variable: UKREMIT

Excluded	Chi-sq	df	Prob.
FTSE100	15.23606	12	0.2288
UKBOT	5.837807	12	0.9240
UKCPI	7.516000	12	0.8217
UKDIR	4.669907	12	0.9681
UKEXR	12.49936	12	0.4065
UKGDPCAP	5.537939	12	0.9376
IOP	10.52171	12	0.5703
UKM2	3.845498	12	0.9861
UKTBR	4.261098	12	0.9783
All	63.84183	108	0.9998

Dependent variable: UKTBR

Excluded	Chi-sq	df	Prob.
FTSE100	9.239012	12	0.6824
UKBOT	10.25152	12	0.5939
UKCPI	7.470720	12	0.8250
UKDIR	34.50467	12	0.0006
UKEXR	20.01818	12	0.0667
UKGDPCAP	15.59696	12	0.2104
IOP	4.665226	12	0.9682
UKM2	8.522042	12	0.7431
UKREMIT	12.74790	12	0.3876
All	132.8787	108	0.0524

Chapter 6-BD Run Test

Runs Test

	Daily DSEGEN
Test Value[a]	2816.00000
Cases < Test Value	3004
Cases >= Test Value	2189
Total Cases	5193
Number of Runs	37
Z	-53.472
Asymp. Sig. (2-tailed)	.000

a. Median

Runs Test

	Weekly DSEGEN
Test Value[a]	2464.48390
Cases < Test Value	579
Cases >= Test Value	470
Total Cases	1049
Number of Runs	15
Z	-21.564
Asymp. Sig. (2-tailed)	.000

a. Median

Runs Test

	Monthly DSEGEN
Test Value[a]	1667.60000
Cases < Test Value	147
Cases >= Test Value	76
Total Cases	223
Number of Runs	8
Z	-13.928
Asymp. Sig. (2-tailed)	.000

a. Mean

Chapter 6-UK Run Test

Runs Test

	Daily FTSE 100
Test Value[a]	5087.00000
Cases < Test Value	2392
Cases >= Test Value	3166
Total Cases	5558
Number of Runs	72
Z	-72.616
Asymp. Sig. (2-tailed)	.000

a. Mean

Runs Test

	Weekly FTSE 100
Test Value[a]	5097.70000
Cases < Test Value	489
Cases >= Test Value	648.000000
Total Cases	1137
Number of Runs	454
Z	-6.318
Asymp. Sig. (2-tailed)	.000

a. Mean

Runs Test

	Monthly FTSE 100
Test Value[a]	5103.50000
Cases < Test Value	113
Cases >= Test Value	149.000000
Total Cases	262
Number of Runs	18
Z	-14.073
Asymp. Sig. (2-tailed)	.000

a. Mean

Chapter 6-BD Ljung Box Daily

Date: 11/30/18 Time: 01:03
Sample (adjusted): 1/01/1998 6/30/2018
Included observations: 2928 after adjustments

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.021	0.021	1.3036	0.000
		2	-0.064	-0.064	13.172	0.001
		3	-0.045	-0.043	19.134	0.000
		4	0.018	0.016	20.118	0.000
		5	-0.001	-0.007	20.120	0.001
		6	-0.017	-0.017	20.992	0.002
		7	-0.020	-0.019	22.213	0.002
		8	0.031	0.030	25.104	0.001
		9	0.096	0.092	52.453	0.000
		10	0.019	0.019	53.549	0.000
		11	-0.042	-0.028	58.635	0.000
		12	0.012	0.023	59.058	0.000
		13	-0.777	-0.084	76.324	0.000
		14	0.010	0.013	76.599	0.000
		15	0.042	0.040	81.813	0.000
		16	0.041	0.037	86.751	0.000

Chapter 6-BD Ljung Box Weekly

Date: 11/30/18 Time: 01:37
Sample (adjusted): 1/05/1998 6/29/2018
Included observations: 484 after adjustments

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.211	0.211	21.280	0.000
		2	0.036	-0.009	22.280	0.000
		3	0.018	0.013	22.443	0.000
		4	-0.013	-0.020	22.523	0.000
		5	0.099	0.110	27.302	0.000
		6	0.029	-0.016	27.712	0.000
		7	-0.028	-0.035	28.108	0.000
		8	0.063	0.078	30.096	0.000
		9	-0.075	-0.105	32.855	0.000
		10	-0.038	-0.011	33.579	0.000
		11	-0.040	-0.035	34.364	0.000
		12	0.015	0.049	34.479	0.001
		13	0.060	0.030	36.251	0.001
		14	0.039	0.035	37.020	0.001
		15	0.075	0.076	39.819	0.000
		16	0.054	0.018	41.305	0.001

6-BD Ljung Box Monthly

nents

	AC	PAC	Q-Stat	Prob
1	0.050	0.099	0.2729	0.601
2	0.104	-0.037	1.4529	0.484
3	0.137	0.001	3.5105	0.319
4	0.083	-0.024	4.2779	0.370
5	0.146	-0.051	6.6812	0.245
6	0.103	-0.004	7.8890	0.246
7	0.015	-0.006	7.9142	0.340
8	-0.205	0.199	12.804	0.119
9	0.120	0.034	14.482	0.106
10	-0.050	-0.012	14.776	0.140
11	-0.006	0.140	14.780	0.193
12	-0.093	-0.140	15.832	0.199
13	-0.164	-0.087	19.128	0.119
14	-0.035	-0.033	19.277	0.155
15	-0.156	-0.149	22.310	0.100
16	-0.141	-0.026	24.824	0.073

Chapter 6-UK Ljung Box Daily

Date: 12/02/18 Time: 15:09
Sample (adjusted): 1/01/1998 6/30/2018
Included observations: 5558 after adjustments

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.024	-0.010	3.3194	0.068
		2	-0.041	-0.041	12.707	0.000
		3	-0.062	-0.039	33.839	0.000
		4	0.020	0.016	36.098	0.000
		5	-0.020	-0.026	38.330	0.000
		6	-0.041	-0.040	47.793	0.000
		7	0.004	0.026	47.887	0.000
		8	0.030	0.013	52.750	0.000
		9	0.005	0.002	52.910	0.000
		10	-0.003	0.004	52.962	0.000
		11	-0.000	-0.009	52.963	0.000
		12	0.006	0.006	53.141	0.000
		13	-0.004	-0.013	53.225	0.000
		14	-0.025	-0.013	56.714	0.000
		15	0.002	0.011	56.728	0.000
		16	0.023	0.021	59.650	0.000

K Ljung Box Weekly

2018
tments

	AC	PAC	Q-Stat	Prob
1	-0.581	-0.384	384.46	0.000
2	0.005	-0.254	384.50	0.000
3	0.147	-0.168	409.13	0.000
4	-0.110	-0.052	422.85	0.000
5	0.101	0.068	434.57	0.000
6	-0.117	-0.072	450.33	0.000
7	0.044	-0.116	452.52	0.000
8	0.086	0.006	461.05	0.000
9	-0.148	0.075	486.22	0.000
10	0.096	0.001	496.69	0.000
11	-0.041	-0.143	498.58	0.000
12	0.020	0.033	499.04	0.000
13	0.022	0.059	499.59	0.000
14	-0.031	0.039	500.70	0.000
15	0.040	0.012	502.57	0.000
16	-0.058	0.007	506.48	0.000

Chapter 6-UK Ljung Box Monthly

Date: 12/02/18 Time: 15:50
Sample (adjusted): 1998M01 2018M06
Included observations: 262 after adjustments

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.022	-0.055	0.1268	0.722
		2	-0.016	-0.035	0.1962	0.907
		3	-0.012	0.014	0.2371	0.971
		4	0.146	0.092	5.9291	0.205
		5	-0.015	0.036	5.9864	0.308
		6	-0.027	-0.055	6.1764	0.404
		7	0.003	0.015	6.1792	0.519
		8	0.081	0.075	7.9720	0.519
		9	0.015	0.037	8.0374	0.530
		10	0.005	-0.078	8.0450	0.624
		11	-0.040	-0.034	8.4843	0.669
		12	0.072	0.073	9.9296	0.622
		13	0.045	-0.013	10.785	0.654
		14	-0.050	-0.041	11.170	0.673
		15	0.008	0.023	11.186	0.739
		16	0.067	0.064	12.462	0.712

Chapter 6-BD Lo-Mackinlay Daily

Homoskedasticity

Null Hypothesis: DSEGEN is a random walk
Date: 12/08/18 Time: 20:58
Sample: 1/01/1998 6/30/2018
Included observations: 2928 (after adjustments)
Standard error estimates assume no heteroskedasticity
Compute variances assuming zero mean
User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max lzl (at period 8)	4.308242	2928	0.0001

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.091487	0.018484	4.308230	0.0000
4	1.100168	0.034580	2.540119	0.0100
8	1.207280	0.054675	3.300182	0.0000
16	1.363059	0.081360	3.893101	0.0000

Heteroskedasticity

Null Hypothesis: DSEGEN is a martingale
Date: 12/08/18 Time: 21:39
Sample: 1/01/1998 6/30/2018
Included observations: 2928 (after adjustments)
Heteroskedasticity robust standard error estimates
Compute variances assuming zero mean
Use biased variance estimates
User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max lzl (at period 8)	3.042146	2928	0.0094

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.091338	0.073505	2.873299	0.0000
4	1.100197	0.129602	1.721137	0.0850
8	1.206453	0.181847	2.366083	0.0180
16	1.363089	0.252071	3.042321	0.0000

Chapter 6-BD Lo-Mackinlay Weekly

Homoskedasticity

Null Hypothesis: WEEKLY_DSEGEN is a random walk
Date: 12/08/18 Time: 22:03
Sample: 1/05/1998 6/29/2018
Included observations: 484 (after adjustments)
Standard error estimates assume no heteroskedasticity
Compute variances assuming zero mean
User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max |z| (at period 2)	4.149049	484	0.0001

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.144390	0.045502	2.891298	0.0000
4	1.314043	0.085126	3.362370	0.0000
8	1.546148	0.134595	3.704847	0.0000
16	1.912379	0.200284	4.149360	0.0000

Heteroskedasticity

Null Hypothesis: WEEKLY_DSEGEN is a martingale
Date: 12/08/18 Time: 23:17
Sample: 01/05/1998 06/29/2018
Included observations: 484 (after adjustments)
Heteroskedasticity robust standard error estimates
Compute variances assuming zero mean
Use biased variance estimates
User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max |z| (at period 2)	3.889733	484	0.0004

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.144058	0.088379	2.219375	0.0300
4	1.314214	0.159076	2.796128	0.0000
8	1.546428	0.238345	3.335039	0.0000
16	1.912194	0.342309	3.889318	0.0000

Chapter 6-BD Lo-Mackinlay Monthly

Homoskedasticity

Null Hypothesis: DGEN is a random walk
Date: 12/08/18 Time: 23:59
Sample: 1998M01 2018M06
Included observations: 223 (after adjustments)
Standard error estimates assume no heteroskedasticity
Compute variances assuming zero mean
User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max lzl (at period 2)	4.465103	223	0.1181

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.049196	0.063758	0.506716	0.6120
4	1.231203	0.119280	1.268072	0.2050
8	1.623352	0.188598	2.158097	0.0310
16	1.384293	0.280642	0.894932	0.3708

Heteroskedasticity

Null Hypothesis: DGEN is a martingale
Date: 12/09/18 Time: 01:07
Sample: 1998M01 2018M06
Included observations: 223 (after adjustments)
Heteroskedasticity robust standard error estimates
Compute variances assuming zero mean
Use biased variance estimates
User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max lzl (at period 2)	2.088001	223	0.1393

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.049305	0.175977	0.501356	0.6160
4	1.231424	0.291563	1.210832	0.2259
8	1.623069	0.409582	2.088352	0.0368
16	1.384272	0.543281	0.893418	0.3720

Chapter 6-UK Lo-Mackinlay Daily

Homoskedasticity

Null Hypothesis: DAILY_FTSE_100 is a random walk
Date: 12/10/18 Time: 13:37
Sample: 1/01/1998 6/30/2018
Included observations: 5558 (after adjustments)
Standard error estimates assume no heteroskedasticity
Compute variances assuming zero mean
User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max lzl (at period 8)	4.896315	5558	0.0000

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.975836	0.013281	-1.801301	0.0717
4	0.892120	0.024847	-4.298583	0.0000
8	0.805709	0.039287	-4.896315	0.0000
16	0.767544	0.058461	-3.936778	0.0001

Heteroskedasticity

Null Hypothesis: DAILY_FTSE_100 is a martingale
Date: 12/10/18 Time: 14:13
Sample: 01/01/1998 06/30/18
Included observations: 5558 (after adjustments)
Heteroskedasticity robust standard error estimates
Compute variances assuming zero mean
Use biased variance estimates
User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max lzl (at period 8)	3.103197	5558	0.0076

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.975661	0.019677	-1.183155	0.2367
4	0.891639	0.037531	-2.773022	0.0056
8	0.804694	0.061486	-3.103197	0.0013
16	0.765472	0.091212	-2.523997	0.0112

Chapter 6-UK Lo-Mackinlay Weekly

Homoskedasticity

Null Hypothesis: WEEKLY_FTSE_100 is a random walk
Date: 12/10/18 Time: 14:57
Sample: 1/05/1998 6/29/2018
Included observations: 1137 (after adjustments)
Standard error estimates assume no heteroskedasticity
Compute variances assuming zero mean
User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max lzl (at period 2)	19.56968	1137	0.0000

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.419377	0.037609	-19.569683	0.0000
4	0.207943	0.070360	-14.269591	0.0000
8	0.093774	0.111249	-10.325754	0.0000
16	0.054900	0.165543	-7.236792	0.0000

Heteroskedasticity

Null Hypothesis: WEEKLY_FTSE_100 is a martingale
Date: 12/10/18 Time: 15:39
Sample: 1/05/1998 6/29/2018
Included observations: 1137 (after adjustments)
Heteroskedasticity robust standard error estimates
Compute variances assuming zero mean
Use biased variance estimates
User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max lzl (at period 2)	13.67466	1137	0.0000

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.419008	0.094917	-13.674662	0.0000
4	0.207394	0.167581	-10.903731	0.0000
8	0.093196	0.261026	-8.491073	0.0000
16	0.054175	0.382499	-5.985213	0.0000

Chapter 6-UK Lo-Mackinlay Monthly

Homoskedasticity

Null Hypothesis: FTSE_100 is a random walk
Date: 12/10/18 Time: 16:23
Sample: 1998M01 2018M06
Included observations: 262 (after adjustments)
Standard error estimates assume no heteroskedasticity
Compute variances assuming zero mean
User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max |z| (at period 4)	1.220551	262	0.6341

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.986542	0.064018	-0.217417	0.8279
4	0.968827	0.119768	-0.269197	0.7878
8	1.105082	0.189369	0.573910	0.5660
16	1.332550	0.281790	1.220551	0.2223

Heteroskedasticity

Null Hypothesis: FTSE_100 is a martingale
Date: 12/10/18 Time: 16:57
Sample: 1998M01 2018M06
Included observations: 262 (after adjustments)
Heteroskedasticity robust standard error estimates
Compute variances assuming zero mean
Use biased variance estimates
User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max |z| (at period 4)	0.824548	262	0.8785

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.982762	0.070503	-0.233144	0.8156
4	0.957691	0.132132	-0.308860	0.7574
8	1.075437	0.204679	0.355925	0.7219
16	1.075444	0.298120	0.824548	0.4096

Chapter 6-BD Chow-Denning Daily

Homoskedasticity

Null Hypothesis: DSEGEN is a random walk
Date: 12/14/18 Time: 15:47
Sample: 1/01/1998 6/30/2018
Included observations: 2928 (after adjustments)
Standard error estimates assume no heteroskedasticity
Compute variances assuming zero mean
User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max lzl (at period 8)	4.308242	2928	0.0001

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.091487	0.018484	4.308230	0.0000
4	1.100168	0.034580	2.540119	0.0100
8	1.207280	0.054675	3.300182	0.0000
16	1.363059	0.081360	3.893101	0.0000

Heteroskedasticity

Null Hypothesis: DSEGEN is a martingale
Date: 12/14/18 Time: 16:28
Sample: 1/01/1998 6/30/2018
Included observations: 2928 (after adjustments)
Heteroskedasticity robust standard error estimates
Compute variances assuming zero mean
Use biased variance estimates
User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max lzl (at period 8)	3.042146	2928	0.0094

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.091338	0.073505	2.873299	0.0000
4	1.100197	0.129602	1.721137	0.0850
8	1.206453	0.181847	2.366083	0.0180
16	1.363089	0.252071	3.042321	0.0000

Chapter 6-BD Chow-Denning Weekly

Homoskedasticity

Null Hypothesis: WEEKLY_DSEGEN is a random walk
Date: 12/14/18 Time: 16:57
Sample: 1/05/1998 6/29/2018
Included observations: 484 (after adjustments)
Standard error estimates assume no heteroskedasticity
Compute variances assuming zero mean
User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max |z| (at period 2)	4.149049	484	0.0001

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.144390	0.045502	2.891298	0.0000
4	1.314043	0.085126	3.362370	0.0000
8	1.546148	0.134595	3.704847	0.0000
16	1.912379	0.200284	4.149360	0.0000

Heteroskedasticity

Null Hypothesis: WEEKLY_DSEGEN is a martingale
Date: 12/14/18 Time: 17:36
Sample: 01/05/1998 06/29/2018
Included observations: 484 (after adjustments)
Heteroskedasticity robust standard error estimates
Compute variances assuming zero mean
Use biased variance estimates
User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max |z| (at period 2)	3.889733	484	0.0004

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.144058	0.088379	2.219375	0.0300
4	1.314214	0.159076	2.796128	0.0000
8	1.546428	0.238345	3.335039	0.0000
16	1.912194	0.342309	3.889318	0.0000

Chapter 6-BD Chow-Denning Monthly

Homoskedasticity

Null Hypothesis: DGEN is a random walk
Date: 12/14/18 Time: 18:11
Sample: 1998M01 2018M06
Included observations: 223 (after adjustments)
Standard error estimates assume no heteroskedasticity
Compute variances assuming zero mean
User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max |z| (at period 2)	4.465103	223	0.1181

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.049196	0.063758	0.506716	0.6120
4	1.231203	0.119280	1.268072	0.2050
8	1.623352	0.188598	2.158097	0.0310
16	1.384293	0.280642	0.894932	0.3708

Heteroskedasticity

Null Hypothesis: DGEN is a martingale
Date: 12/14/18 Time: 18:57
Sample: 1998M01 2018M06
Included observations: 223 (after adjustments)
Heteroskedasticity robust standard error estimates
Compute variances assuming zero mean
Use biased variance estimates
User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max |z| (at period 2)	2.088001	223	0.1393

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	1.049305	0.175977	0.501356	0.6160
4	1.231424	0.291563	1.210832	0.2259
8	1.623069	0.409582	2.088352	0.0368
16	1.384272	0.543281	0.893418	0.3720

Chapter 6-UK Chow-Denning Daily

Homoskedasticity

Null Hypothesis: DAILY_FTSE_100 is a random walk
Date: 12/20/18 Time: 18:57
Sample: 1/01/1998 6/30/2018
Included observations: 5558 (after adjustments)
Standard error estimates assume no heteroskedasticity
Compute variances assuming zero mean
User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max lzl (at period 8)	4.896315	5558	0.0000

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.975836	0.013281	-1.801301	0.0717
4	0.892120	0.024847	-4.298583	0.0000
8	0.805709	0.039287	-4.896315	0.0000
16	0.767544	0.058461	-3.936778	0.0001

Heteroskedasticity

Null Hypothesis: DAILY_FTSE_100 is a martingale
Date: 12/20/18 Time: 19:32
Sample: 01/01/1998 06/30/18
Included observations: 5558 (after adjustments)
Heteroskedasticity robust standard error estimates
Compute variances assuming zero mean
Use biased variance estimates
User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max lzl (at period 8)	3.103197	5558	0.0076

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.975661	0.019677	-1.183155	0.2367
4	0.891639	0.037531	-2.773022	0.0056
8	0.804694	0.061486	-3.103197	0.0019
16	0.765472	0.091212	-2.523997	0.0116

Chapter 6-UK Chow-Denning Weekly

Homoskedasticity

Null Hypothesis: WEEKLY_FTSE_100 is a random walk
Date: 12/20/18 Time: 20:09
Sample: 1/05/1998 6/29/2018
Included observations: 1137 (after adjustments)
Standard error estimates assume no heteroskedasticity
Compute variances assuming zero mean
User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max |z| (at period 2)	19.56968	1137	0.0000

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.419377	0.037609	-19.569683	0.0000
4	0.207943	0.070360	-14.269591	0.0000
8	0.093774	0.111249	-10.325754	0.0000
16	0.054900	0.165543	-7.236792	0.0000

Heteroskedasticity

Null Hypothesis: WEEKLY_FTSE_100 is a martingale
Date: 12/20/18 Time: 20:53
Sample: 1/05/1998 6/29/2018
Included observations: 1137 (after adjustments)
Heteroskedasticity robust standard error estimates
Compute variances assuming zero mean
Use biased variance estimates
User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max |z| (at period 2)	13.67466	1137	0.0000

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.419008	0.094917	-13.674662	0.0000
4	0.207394	0.167581	-10.903731	0.0000
8	0.093196	0.261026	-8.491073	0.0000
16	0.054175	0.382499	-5.985213	0.0000

Chapter 6-UK Chow-Denning Monthly

Homoskedasticity

Null Hypothesis: FTSE_100 is a random walk
Date: 12/20/18 Time: 21:47
Sample: 1998M01 2018M06
Included observations: 262 (after adjustments)
Standard error estimates assume no heteroskedasticity
Compute variances assuming zero mean
User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max |z| (at period 4)	1.220551	262	0.6341

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.986542	0.064018	-0.217417	0.8279
4	0.968827	0.119768	-0.269197	0.7878
8	1.105082	0.189369	0.573910	0.5660
16	1.332550	0.281790	1.220551	0.2223

Heteroskedasticity

Null Hypothesis: FTSE_100 is a martingale
Date: 12/20/18 Time: 22:31
Sample: 1998M01 2018M06
Included observations: 262 (after adjustments)
Heteroskedasticity robust standard error estimates
Compute variances assuming zero mean
Use biased variance estimates
User-specified lags: 2 4 8 16

Joint Tests	Value	df	Probability
Max |z| (at period 4)	0.824548	262	0.8785

Individual Tests

Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.982762	0.070503	-0.233144	0.8156
4	0.957691	0.132132	-0.308860	0.7574
8	1.075444	0.204679	0.355925	0.7219
16	1.075444	0.298120	0.824548	0.4096

Bangladesh

VAR Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Date: 06/15/18 Time: 11:21
Sample: 1998M01 2018M06
Included observations: 246

Component	Skewness	Chi-sq	df	Prob.
1	-0.028183	0.030977	1	0.8603
2	0.108761	0.461328	1	0.4970
3	0.253825	1.366976	1	0.2423
4	0.020290	1.766345	1	0.1838
5	0.186628	1.358367	1	0.2438
6	0.262073	1.688447	1	0.1938
7	0.083869	0.274325	1	0.6004
8	0.352068	0.224997	1	0.6352
9	0.236944	2.189548	1	0.1390
10	-0.205973	1.654566	1	0.1983
Joint		11.0118	10	0.3569

Component	Kurtosis	Chi-sq	df	Prob.
1	3.203424	0.403470	1	0.5253
2	3.420733	0.918830	1	0.3377
3	2.972721	2.530886	1	0.1116
4	3.369371	1.560846	1	0.2115
5	2.943311	0.031333	1	0.8595
6	3.160908	1.788750	1	0.1801
7	3.646843	4.079452	1	0.0434
8	3.422897	2.559571	1	0.1096
9	3.076230	0.056657	1	0.8119
10	2.917517	1.222011	1	0.2689
Joint		15.1518	10	0.1266

Component	Jarque-Bera	df	Prob.
1	0.434447	2	0.8048
2	0.141531	2	0.9316
3	2.153152	2	0.3407
4	2.739945	2	0.2451
5	1.389700	2	0.4991
6	1.848981	2	0.3967
7	4.353778	2	0.1134
8	3.784811	2	0.1507
9	2.246206	2	0.3253
10	3.862474	2	0.1451
Joint	18.955	20	0.5221

United Kingdom

VAR Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Date: 06/23/18 Time: 20:27
Sample: 1998M01 2018M06
Included observations: 246

Component	Skewness	Chi-sq	df	Prob.
1	0.005817	0.001309	1	0.9711
2	0.243842	2.299078	1	0.1295
3	-0.009589	0.003555	1	0.9525
4	0.386896	2.787955	1	0.0945
5	-0.478432	1.850703	1	0.1737
6	0.291854	2.245251	1	0.1344
7	-0.007176	0.001991	1	0.9644
8	-0.176457	1.203971	1	0.2725
9	0.474920	1.721234	1	0.1896
10	-0.471580	1.599000	1	0.2060
Joint		14.71404	10	0.1431

Component	Kurtosis	Chi-sq	df	Prob.
1	3.551586	2.941058	1	0.0864
2	3.688230	1.496112	1	0.2222
3	3.112699	0.122777	1	0.7260
4	3.963339	1.970881	1	0.1604
5	3.647855	1.774312	1	0.1833
6	3.799851	2.358351	1	0.1244
7	2.951997	0.022275	1	0.8814
8	3.087142	0.073405	1	0.7864
9	2.691269	2.744016	1	0.9781
10	3.517454	2.259118	1	0.1345
Joint		15.762	10	0.1076

Component	Jarque-Bera	df	Prob.
1	2.942366	2	0.2297
2	3.795214	2	0.1503
3	0.126333	2	0.9388
4	4.758841	2	0.0903
5	4.625015	2	0.0992
6	2.603572	2	0.2725
7	0.024266	2	0.9879
8	1.277377	2	0.5280
9	2.465232	2	0.2922
10	3.858125	2	0.1458
Joint	27.476	20	0.1228

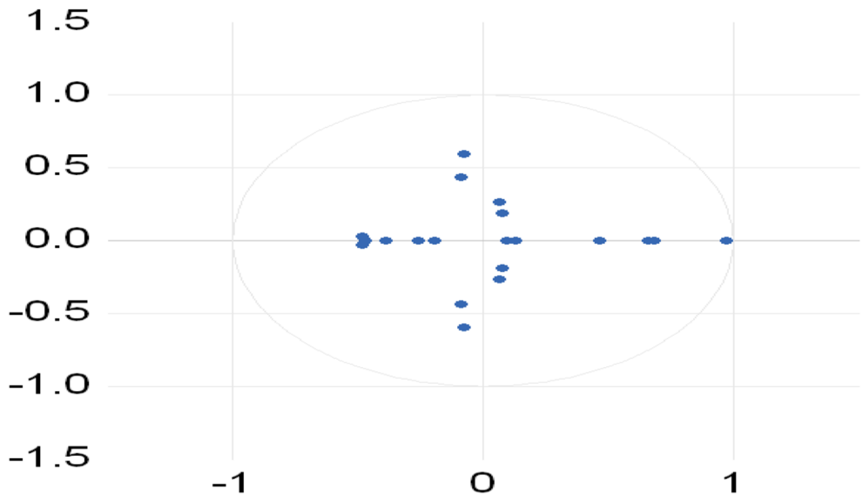
Bangladesh

VAR Residual Serial Correlation LM Tests
Date: 10/18/18 Time: 15:38
Sample: 1998M01 2018M06
Included observations: 234

Null hypothesis: No serial correlation at lag h

Lag	LM-Stat	Prob.
1	386.4772	0.0000
2	269.3332	0.0229
3	293.3061	0.0015
4	221.1716	0.5596
5	239.9557	0.2354
6	251.0504	0.1122
7	233.0220	0.3427
8	195.0513	0.9262
9	240.3527	0.2299
10	231.0866	0.3761
11	158.9402	0.9997
12	284.4529	0.0044
13	236.7071	0.2830
14	83.66934	0.8803

Inverse Roots of AR Characteristic Polynomial



United Kingdom

VAR Residual Serial Correlation LM Tests
Date: 11/02/18 Time: 11:09
Sample: 1998M01 2018M06
Included observations: 249

Null hypothesis: No serial correlation at lag h

Lag	LM-Stat	Prob.
1	226.5072	0.0000
2	152.7568	0.0005
3	158.2663	0.0002
4	114.7574	0.1485
5	129.9812	0.0236
6	111.8067	0.1974
7	127.0122	0.0354
8	96.64538	0.5764
9	105.0481	0.3453
10	122.0035	0.0667
11	108.3351	0.2674
12	131.6191	0.0187
13	94.69796	0.6310
14	108.3221	0.2677

Inverse Roots of AR Characteristic Polynomial