CARDIFF METROPOLITAN UNIVERSITY

School of Management

Inter-Linkage between Macroeconomic factors and Stock Market: A comparative study between the U.S and India

Submitted by

Sanjana Nagpal

20071216

MSc Business and Financial Economics

BA (Hons) Accountancy & Economics

Supervised by

Professor Frank Forbes-Menson & Dr Viktor Manhov

Date of submission: 27th January 2022

Thesis submitted to Cardiff Metropolitan University in Partial fulfilment of the requirements for the degree of Doctor of Philosophy

TABLE OF CONTENTS

Table of Figures

Table of Tables

ABSTRACT

It is irrefutable that stock markets provide a barometer that can be relied upon to measure the economic condition of a country. As countries increasingly integrating, there is an urgent need for an ongoing and detailed study of the stock market. The stock market of a country plays a pivotal role in transferring funds from surplus units to deficit units. Any unfavourable news within the stock market may not only impact on market participants but also affect the entire economy. Hence, it is quite essential to recognise the factors that affect market favourably or unfavourably. The empirical literature has provided a set of exhaustive factors with either direct or indirect implications on the stock market. However, this research focusses on domestic Macroeconomic factors, which are projected through the application of the Arbitrage Pricing theory. The key macroeconomic drivers used for this research are Inflation, Interest rates, Treasury Bills, Money supply, GDP and stock returns. The study aims at reflecting upon the exogenous channels through which macroeconomic variables influence the stock market. The study seeks to investigate the relationship between the variables using econometric tests, like ARDL bound test, ARDL short-term and Long-term cointegration tests.

Additionally, CUSUM test and Variance decomposition statistical tests were adopted to ensure the stability of the model and to make inferences on the causal relationship among the variables. The analysis began with first differencing the variables, and the results from the tests indicated that all the macroeconomic variables explain the variability in US stock returns in the long run except INDPRO. Whereas LM3 and INDPRO can only explain changes in Indian stock returns in the long term. Both stock markets exhibit the opposite relationship with their own domestic economic variables to some extent. In contrast, the variables behave differently in the short run, and so their relationship with stock returns varies. TB and CPI are the two variables that explain the variation in US stock returns in the short term. Whereas LM3 influences the India stock returns and the rest of the variables demonstrate a weak relationship with stock returns in the short run. The study further extends by investigating the stock returns volatility using ARCH & GARCH techniques which suggested the past stock returns influence the future period stock returns volatility for US and India as well as the results indicated that there is a relationship between the volatility of stock market returns and short-run deviations of the macroeconomic variables for both the countries.

CHAPTER ONE
INTRODUCTION

1.1 Introduction

Over recent years, investing in the stock market has become even more challenging for investors all around the globe as determining the Intrinsic value of a stock, whether it is worth its price has become more complex, (Bhattacharya,2013) which is due to constant changes within the financial environment. Globalization and continuous integration of financial markets have puzzled investors and players of stock markets. Thus, there is a need for ongoing research to unveil the different elements of the stock market.According to Arestis et al. (2001), For any country, the stock market has become the core of its financial and economic growth. Omondi (2011) propounded that an efficient stock market acts as a barometer to economic growth, as policymakers rely upon the market estimates of volatility within the stock market as a barometer of the vulnerability of financial markets.

Stock markets are classified as intermediaries between savers and borrowers, besides banks and financial institutions which provide credit via debt financing as opposed to stock markets which provide credit via equity financing (Madura, 2012). According to Aduda et al. (2012), equity and debt financing are only possible if there is a sound platform available for both lenders and borrowers (capital market). The rate at which capital is accumulated in the market indicates the rate of growth in the economy. Therefore, an efficient capital market is a necessity within an economy.The stock market plays a fundamental role in the growth of the country through various channels (Dagar, 2014) and put differently, the state of the economy equally plays important role in the growth of capital markets. Therefore, significant attention is now being diverted to capital markets in most countries. Given the ability of capital markets to adapt to instantaneous changes in the economy, they are believed to be the heartbeat of the economy (Maku and Atanda, 2009).

Different groups of investors seek to earn returns or profit from their perceived mispricing in the stock market using different valuation techniques. Consequently, this perceived mispricing among investors induces them to place bets on stock prices using derivatives instruments, subsequently causing volatility in the market (Singh, 2016). Given the fact that stock markets

are not a strong indicator of market efficiency, it is therefore impossible to adequately evaluate the true value of a stock. This implies all information within a market, whether public or private, is not always accounted in a stock price and capital markets are not always efficient (Malkeil,2003). Furthermore, there have been several attempts by investors to apply different models or techniques to evaluate its intrinsic value and confirm their mispricing. This has ultimately resulted in investors betting against their mispricing and eventually causing volatility in the market. Here, intrinsic value is a value which investors perceive for a particular investment which is based on many factors. For instance, brand name, management expertise or hard assets etc. Moreover, this gives an idea to investors whether a stock is undervalued or overvalued. Apart from perceived mispricing, there are many more factors causing volatility in the market, which are explained in subsequent sections of this research. Due to such complexities, understanding the foundation of stock market volatility is hardly possible. However, it is possible to evaluate different sources of volatility in the stock market.

The stock returns are influenced by various factors such as macroeconomic factors, microeconomics factors, global factors, investor sentiments and many other unexplained factors. However, this research is looking to shed light on the macroeconomic aspects of the economy. The degree of influence of macroeconomic factors varies from country to country, and consequently, their stock markets respond differently. These variations help different investors and portfolio managers in constructing their respective portfolios to meet their set benchmarks. Over time, macroeconomic factors have become important in evaluating and managing the risk of different types of securities together with pricing derivative securities (Al-Qaisi,2011). Investors have relied upon numerous factors, including microeconomic and macroeconomic factors to fathom stock returns. Many researchers in the past and more recently tend to agree that macroeconomic factors have the biggest impact on stock returns, explaining nearly 75% of the variation in the overall stock volatility (Corradi et al., 2013).

This research will be assessing Indian and U.S stock markets, using macroeconomic factors which are endogenous variables in the model and analysing the changes in macroeconomic factors to explain the changes in stock returns. We are looking to differentiate stock market changes that vary geographically despite financial markets being well integrated globally. Researchers and market players have suggested that there are limited similarities between emerging and developed capital markets due to financial structures and investment returns (BlackRock Investment Institute, 2011). Regulatory controls constitute one of the major reasons why emerging and developed economies differ. According to Kawai and Prasad (2011)

that there are less regulatory controls in emerging markets and consequently, these markets are much more exposed to corruption, fraud, or possible theft. As reported by TIAA-CREF Prospectus (2013), Longtop Financial Technologies Inc., a financial software company in China which fabricated its revenues and cash in hand on the balance sheet with the help of local Chinese banker officials, became worthless overnight in 2011. Such events in emerging markets directly affect investors' sentiments, favouring risk-free investments with less returns over risky investments. Hence, investors' reactions and sentiments are more positive when investing in developed markets. Another difference between the two markets noted by Ellefsen (2004) is the level of market capitalization[1], which is far reduced in emerging markets, as opposed to developed markets. In relation to the worldwide stock market capitalization, the Economic Times Intelligence Group (ETIG) in 2005 reported US market capitalization at 39.5%, in comparison to India, which recorded 1.3%. Liquidity is another factor which distinguishes emerging and developed markets. Liquidity in any market is highly influenced by stock market exchanges and what sort of mechanisms are in place that can result in a series of interactions rather than a single event. Liquidity levels in emerging markets distinguish from themselves from those of developed markets due to many factors including depth and breadth of the market exchanges, market resilience, trade volume, bid-ask spreads and many other factors which varies across developing, developed and frontier capital markets (IOSCO,2007).

According to Rojas-Suarez (2014), another distinguishing factor between emerging stock markets and developed stock markets is adequate surveillance systems, to oversee the risks arising within developing economies. Emerging economies lack technical cooperation in their respective capital markets from multilateral organisations as well as bilateral arrangements with supervisory authorities from advanced economies. On the other hand, developed economies are the supervisory authorities and usually bring forth the technological advancements in global capital markets. Another critical factor that makes the stock market distinct is its Gross Domestic Product (GDP) which technically represents the economic growth of the economy. Recently, the IMF reported in a survey[2] that emerging countries are likely to experience faster growth than developed economies. Hence, the above distinctions imply that

[1] Market capitalization is a tool to measure the corporate size of the economy and often calculated as current stock price multiplied by the number of outstanding shares

[2] Available at : https://www.imf.org/en/News/Articles/2015/09/28/04/53/sopol040416b

both markets are structured differently and are expected to respond differently to any changes in macroeconomic factors.

The stock market is also greatly determined by how much access to information investors can have and how quick the stock prices respond to any news (Machmuddah et al., 2020). In financial economics, stock prices reflect all available information, as argued by Fama (1939), suggesting that stock prices trade at their fair value, leading to the discovery of Efficient-Market Hypothesis (EMH). The EMH has three market variants which include weak form efficiency, meaning future prices cannot be predicted by analysing prices from the past, semi-strong form efficiency which suggests that stock prices adjust to publicly available new information very rapidly and lastly, strong form efficiency which requires stock prices to reflect all information, public and private. According to EMH, if a stock market has a strong form of efficiency, there is no possibility to beat the market, which has never come into existence in any country. According to Keasey and Mobarek (2002), a weak form of efficient market hypothesis relates to developing economies while a semi- strong efficient market hypothesis generally relates to developed nations such as the US, Germany, etc. Hence, the stock market is an important indicator for everyone, including investors, politicians and researchers who are looking to assess the credibility of the country. Moreover, investors get the opportunity to have alternative avenues to invest their surplus funds (Naik and Padhi, 2012). The stock market helps to provide substantial and long-term capital through the issuing of shares for industries that need finance to expand their businesses (Elly and Oriwo, 2012).

Volatility in the stock market is another key area that requires attention, especially now that stock markets have witnessed rapid growth globally. Hence, increasing the need for risk management. This research will not only analyse the effect of macroeconomic factors on stock returns but will also examine India and US stock return volatilities. From small-scale investors to policymakers, everyone is keen on understanding the determinants of volatilities and its spillover effects on real activity among investors and within the global financial market. On the other hand, various valuation methods, different ideologies, theories and models have come into existence over time to reduce the gap between intrinsic value and market value of assets, giving opportunities to reduce volatility in the market. Over time, valuation models have used different inputs to explore which inputs give better results in narrowing the gap between intrinsic and market value of assets or stocks. Besides, these models have used factor/input volatilities to explain stock market volatilities. Many available models use latent factors to explain the dynamics of stock market returns and their volatility. For example, in the celebrated

Heston's (1993) model, stock volatility is exogenously driven by some unobservable factors correlated with the asset returns. However, unobservable factors do not have any economic interpretation. In contrast, Schwert (1989a, b), Hamilton and Lin (1996), and Brandt and Kang (2004) propounded that there is strong evidence that stock market volatility has a very pronounced business cycle pattern, being higher during recessions than during expansions. Changes in stock returns have become very significant to understand the determinants of systematic risks in financial markets. Engle (1982) and Bollerslev (1986) has made relevant contributions to empirical modelling of time-varying volatilities in financial markets. Studying the past performance of stock returns through composite index aids in concluding future performance.

Since the strengthening of new World Trade Organization reforms, factors such as foreign direct investment and the presence of multi-National companies have made stock market volatility more complex to study and hence, increasing the relevance of macroeconomic fundamentals in the study financial markets.

The gradual abolition of barriers in capital markets universally has led to emerging markets attracting investors around the world, hence making emerging markets a great area of interest for studying as well as provide a platform for global investors to diversify their portfolio (Conover,2011). Given the fact that advanced economies are generally ahead of emerging economies when it comes to exploring the benefits of mobilizing financial capital via stock markets, emerging markets still have a long way to go (Asaolu and Ogunmuyiwa, 2011). This results in less stabilization in emerging economies' capital markets in comparison to developed economies, making emerging capital markets more volatile (Engel and Rangel, 2005). Factors like deregulation, increasing skilled employment, removal of barriers to capital flows and growth in information technology have led to universal growth of capital markets in the world (Adesanmi,2016) This has made it a great area of interest to study how different emerging and developed economies respond to similar macroeconomic factors. This position was confirmed by Okoli (2012), suggesting that market integration has become an important factor to examine the relationship between macroeconomic factors and the stock market.

This research is based on the no-arbitrage assumption that stock market volatility is explicitly related to macroeconomic and unobservable factors. Under the arbitrage model, we assume that stock volatility is linked to macroeconomic factors by no-arbitrage restrictions, which is analytically correct considering normal market conditions wherein investors are risk-averse.

Additionally, there is another argument that investors perceiving financial markets with weak corporate governance standards will attract foreign investors who are happy to trade their shares at discounted rates (Khanna, 2009). This is more evident in developing financial markets, due to weak regulatory institutions and a lack of government control systems in place (Hearn and Piesse, 2010).

Bretton Wood's Structural Adjustment Programme (SAP) came into existence in the early 1980s to promote the stock market across the globe. Nevertheless, several researchers including Shleifer and Summers (1988) were against the idea of SAP as they believed SAP policies could result in counterproductive take-overs and ultimately blocking the growth of world economies especially in developing economies. This indicates that some researchers believe that there is a negative relationship between economic growth and the stock market. Consequently, this research aims to examine the relationship between macroeconomic factors which exhibit economic growth and stock returns. The relationship will indicate whether such a relationship is positive or negative, as well as short or long-term. Many studies from the early 1980s criticized the idea of the stock market and concluded that there is no relationship between financial or capital markets and economic growth, including Stern (1989).

However, contrary propositions have been put forth by recent studies, suggesting that stock markets provide one of the most efficient platforms to transfer idle surplus funds to areas where there are deficits, hence promoting growth (Naik and Padhi, 2012). This is further supported by Asaolu and Ogunmuyiwa (2011) who highlight the importance of the stock market in fostering economic growth and vice-versa.

1.2 Purpose of the study

As earlier discussed, the importance of the stock market, as well as several related studies, suggest that the stock market plays a vital role in the economy as it serves as an avenue where funds are transferred from savers to borrowers. Historical events such as the Great depression in 1929, Black Monday in 1987, Asian crises in 1997 and the global bubble burst in 2007 leading to global financial crises, illustrate the influence of the stock market on the world's economy (Allen and Carletti,2009). These past events ignited the need to research the stock markets for policymakers, financial analysts and macroeconomists, to grasp the dynamic behaviour of the stock market in response to changes in global macroeconomic factors.

Additionally, domestic investors are keen on knowing the factors that persistently cause movement and variability in stock and asset prices (Malik, 2004).

Put differently, the stock market provides a platform where surplus units can transfer their wealth to deficit units. Over the years, this intermediary platform has generated millions of dollars across different countries, hence it has become a vital part of the economy which requires constant scrutiny. The emergence of the stock market began with simple trading between banks and agricultural communities, eventually leading to the creation of one of the largest sectors in the world – the financial sector. During the 12th century in Europe, there was a major concern regarding debt management of agricultural farmers. As such, money lenders intervened and began to fill in the gaps left by banks. Consequently, these moneylenders started trading the debt among each other to reduce their exposure to perceived risk. For instance, a lender who is risk-averse and willing to replace a high-risk bearing loan with a low risk bearing loan and so exchange the high interest-paying debt with a lower interest paying debt.

Eventually, these lenders also started bringing in government debt issues to the market for lenders with less risk tolerance. This resulted in more access to capital for borrowers, henceforth leading to increased growth of small businesses and entrepreneurs. Soon enough, money lending trading businesses came into existence and grew within a short time frame. Subsequently, such money lenders began to sell debt issues to customers, leading to the first individual investors. At that point, the media (radio, television, newspapers) also started paying attention to the stock market and proceeded to write more on domestic stock markets within their respective countries. Global Stock markets have undergone significant changes since the 1960s, now dominating much of the financial headlines (Pilbeam, 2010).

Stocks do not operate in a vacuum, instead they behave in response to changes in Internal or external factors (Atipaga,2014). By external factors, we mean economic factors and this research will focus on the external factors i.e., macroeconomic factors. There has been extensive research focused on multi-factor models to predict movement of stock prices in emerging stock markets using financial ratios, microeconomic factors and domestic macroeconomic (Kadir and Arioglu, 2014; Narayan et al., 2014). In Finance, economic shocks and economic forces are classed under domestic macroeconomic factors. Economic shocks are unpredictable and affect the economy such as natural disasters, political instabilities, terrorism and wars (Rose, 2009). Meanwhile, economic forces relate to factors that determine the competitiveness of the companies which are listed on the stock market (Shanken and

Weinstein, 2006). Generally, these forces could be predicted and thereafter managed or controlled by the government. For instance, the level of interest rates, exchange rates, inflation rates, money supply, foreign reserves, oil prices and many more are controlled by the government. Eventually, these factors have either a direct or indirect impact on the stock market.

Investors are particularly concerned about the trend of the volatility of financial assets, and emerging markets have been identified as most volatile in comparison to the rest of the stock market (Engel and Rangel, 2005). This suggests that emerging markets are more prone to respond to slight changes in internal, external, political factors and macroeconomic factors. Investors in the stock market gauge past happenings due to changes in these factors and make future predictions on the movements of the stock prices and subsequently make investment decisions. Before the 2008 Global Financial Crisis (GFC), US investors held up to 30% of the world's investment portfolio assets, thus making it likely that changes in US monetary policies could impact the stock market around the world to a certain degree (Hayo et al., 2012).

After the 2008 GFC, the Federal Reserve adopted quantitative easing to restore the US economy, which refers to the central bank purchasing government securities or other securities from the market to lower interest rates and increase the money supply. This brought the interest rate near zero and more access to capital for investors at lower rates, eventually providing an opportunity to invest in emerging economies (Marwah et al., 2015). Emerging markets provide lucrative investments to global investors, global consumers and producers of commodities. As investments in emerging markets become a viable source of attention, this facet of the economy has inadvertently attracted more academics, individuals, and investors in capital markets in recent years. Consequently, this suggests a need to look beyond domestic factors.

Upon reviewing the Empirical Literature, the relationship between stock market and macroeconomic factors is well studied subject and majority of studies have indicated the relationship between the economic factors and stock market. This research aims to substantiate if there is a relationship between macroeconomic factors and stock markets for India and US and how two different economies respond to changes in the economic environment and to what extent. For the purpose of our research model, Stock returns and stock volatility will reflect the variations in stock markets, whereas Inflation, Gross domestic product, Treasury bills and Money supply will represent the macroeconomic factors and will be classed as independent variables for this research.

The US stock market has been chosen to represent advanced economies, while India represents the emerging economies. Out of all the world economies, US is considered as a major powerhouse and has one of the largest stock exchanges, namely New York as per market capitalization. (Wee, 2017). On the other hand, Bombay stock exchange based in India has been listed as one of the most emerging stock markets since 1980's and it is ranked eleventh per market capitalization (World Federation of Exchanges). This research presents a comparative study between India and US to differentiate the response of emerging and developed stock market to changes in macroeconomic factors and the extent of its effects in both markets.

Also, this research aims to compare the volatility of both markets. Besides, academics and investors, this research will also assist portfolio managers in constructing their portfolios by first examining volatility and then proceeding to make their choices accordingly.

1.3 Statement of the Problem

The stock market is an essential segment of the financial sector in every country, and it defines the growth of a nation. Pilbeam (2010) argues that the stock market is continually changing and has undergone significant changes since the 1960s. According to the renowned financial magazine, - The Economist - emerging market investments are becoming increasingly lucrative, thereby attracting an increasing number of investors who are taking an interest in emerging markets over developed market investments. Hence, it is of considerable significance to know how emerging markets react towards macroeconomic shocks, opposed to developed stock markets. This research covers one of the most crucial periods of the last decade – the 2007-2008 global financial crisis. Brunnermeier (2009) suggests that poor risk management and financing policies ignited the global crises and eventually required government intervention. However, Reinhart and Rogoff (2009) argue that it is not clear whether there are significant differences between advanced countries and emerging economies with respect to the likelihood of experiencing a crisis. Specifically, they provide a clear reminder that while crises were a common feature of emerging markets in the years leading to 2000, advanced economies were equally involved in many crises before 1940. Therefore, covering this period will illustrate the behaviour of these two distinct financial markets during the crises and thereafter, government intervention which technically varies in line with macroeconomic factors.

The Arbitrage Pricing theory (APT), which is a widely renowned theory in finance, is a multifactor theory which is an advanced version of the Capital Asset Pricing Model (CAPM), a one-factor model. CAPM has been widely criticised because it is seen as a theory which is not very explanatory and assumes a single factor as a determinant of the market (Fernandez,2015). On the other hand, the APT theory goes in line with this research as it assumes that stock returns are determined by risk premium and many different macroeconomic factors. The APT approach has made it easy for researchers to study the stock market with potentially broad and undefined macroeconomic variables by providing a framework (Ikoku and Okany, 2014).

The present era has facilitated the development of advanced statistical software which can assist in investigating big data with greater ease. Software like EViews and Stata facilitate the inclusion of many variables simultaneously when performing regression or other related analysis. Due to the vast availability of data, researchers sometimes struggle to select a suitable number of variables, thereby leading to instances of data dredging (Jamal, 2014). Therefore, this research will use four essential independent macroeconomic variables together with stock returns as dependent variables for both India and USA. The uniqueness of this research lies in the fact that besides establishing the path that stock returns take in response to changes in macroeconomic factors, it will equally examine the nature of the relationship between the Indian and USA stock markets and their respective country's macroeconomic factors. This research will go further to uncover the risk/volatility of stock returns in two distinct markets. Consequently, this will be a comparative study between emerging and developed stock markets, followed by the author's recommendations for both markets, named as Policy recommendations in chapter seven.

1.4 Aim and Objectives of the Research

1.4.1 Research Aim

This research aims to establish whether fluctuations in macroeconomic factors have any relationship with stock returns in the U.S and India and consequently examine how risk levels in both markets differ, using multi-statistical analysis. The main aim of this research is to *critically compare the response of US and India stock markets to the same set of domestic macroeconomic factors using multi- statistical analysis,* with a view to identifying the

economic factors that have strong relevance in predicting stock market behaviour. ~~This research and its findings will serve as a valuable reference document for academics, corporate finance specialists, investment banking traders as well as other people from different backgrounds, including academics, investors, political parties, portfolio managers and so on.~~ The uniqueness of this research lies in its comparative nature, as it seeks to compare both markets. This research will establish to what extent macroeconomic factors influence stock returns as well as identify if sudden changes in macroeconomic factors are related to changes in the volatility of these respective stock markets. This research will employ various statistical methods and numerous tests such as Stationarity tests, ARDL bound test and ARDL tests to determine the relationship between macroeconomic factors and stock returns in long-run and short-run. This research will further adopt the Variance decomposition to trace the effects of macroeconomic shocks on stock returns. Consequently, we will follow it up with ARCH and GARCH tests to further determine the volatility of both markets.

Outlined below are the **research objectives** which this research seeks to examine, and the following order will be implemented to achieve results in a systematic form.

- Conduct an extensive review of the literature and critically review past research findings from developed and emerging economies, particularly research relating to India and the U.S.
- Evaluate various theoretical frameworks such as the Arbitrage Pricing Theory (APT), Efficient Market Hypothesis (EMH), Portfolio theory and the Dividend Discount model to formulate a conceptual framework for this research.
- Determine the relationship between selected macroeconomic variables and stock market returns of India and the US using an appropriate Co-integration technique.
- Analyse the stability of selected models and examine both stock markets' responses to shocks concerning selected macroeconomic variables to learn the inter-dependence between these variables.
- Assess the ARCH effect in the series and evaluate the volatility in both stock markets using ARCH and GARCH analysis.
- Proffer recommendations based on the findings of this study to all concerned parties, such as investors, fund and portfolio managers and regulators.

1.4.2 Research Questions

This research seeks to answer the following research questions. Establishing these research questions will enable the researcher to focus on the study and achieve the purpose of this thesis.

- Investigate the long -run and short-run relationship between stock market and macroeconomic variables for India and US?
- Identify if US and India stock market respond to shocks from their domestic macroeconomic indicators?
- Do past stock returns influence the volatility within the US and India stock Markets?
- Do macroeconomic factors contribute to stock return volatility in these respective countries?
- Do the two stock markets (India and US) differ or share a similar behaviour?

1.5 Organization of the study

Chapter 1: Introduction

The first chapter of this thesis will shed light upon the research subject and context while highlighting the importance of the stock market within an economy. This chapter will seek to justify the need of examining the relationship between macroeconomic returns and stock variables, while also providing a rationale for the comparison of both emerging and developed stock market volatilities. Regardless of previous research done on this subject, this research has established a gap in the literature, as mentioned in the Problem Statement. This chapter also points out the aim and objectives of the study alongside some research questions.

Chapter 2: Literature Review

This chapter begins with the historical background of the Bombay Stock Exchange (BSE) and the New York Stock Exchange (NYSE). It equally describes the evolvement of both exchanges. This chapter will examine existing literature comprehensively and discuss the empirical findings of different researchers while using the Harvard referencing technique. Several market theories relating to this research are also presented here. This chapter will help the author to

identify the gap in the literature and suggest ideas for further study. Different theoretical underpinnings relating to this research will also be discussed here.

Chapter 3: Conceptual Framework

This chapter defines each macroeconomic factor that is applied in this research as well as the broad perspective of how each macroeconomic variable is set to specify the model for estimation in this chapter. This chapter also presents a flow chart that will assist readers in the direction of this thesis. Within this research, stock returns form a dependent variable, whereas macroeconomic variables such as inflation, interest rate, money supply and GDP are considered as independent variables for this study.

Chapter 4: Research Methodology

This chapter is dedicated to explaining the research methods that are adopted in this research and the kind of econometrics tests used in ascertaining how the macro-economy and the stock markets in the USA and India relate. This chapter presents an elaborate description of the research design applied as well as the technique used for refining collected data. A step by step approach is explained here while justifying the research methodology techniques implemented.

Chapter 5: Data Analysis

This chapter is centred on the results derived from the application of techniques mentioned in Chapter four using statistical software. Here, the same approach is implemented; that is, a step by step approach as described in the previous chapter. This chapter presents a few charts and graphs along with the interpretation of those charts and graphs, based on econometric rules.

Chapter 6: Discussion

All the numerical results and findings obtained from the data analysis are elaborated and further explained here. It is then followed by a comparative study between India and the U.S. All the results highlighted within the previous chapter will be presented in detail to provide a detailed understanding of how emerging and developed markets behave. These results are then compared with previous empirical findings derived from other research. This chapter finishes off by establishing whether research objectives and hypotheses have been met.

Chapter 7: Summary, Conclusion and Recommendations

This chapter summarizes the results and overall findings of the research. It also provides suggestions to each research question and proffers practical implications of the research findings. Recommendations made are relevant to portfolio managers, foreign and domestic investors, as well as policymakers on what to consider in the decision-making process. This chapter also discusses possible opportunities for future research.

CHAPTER TWO

THEORETICAL FRAMEWORK AND REVIEW OF LITERATURE

2.1 Introduction

Several theoretical frameworks have been developed to examine the relationship between the macroeconomic environment and stock market prices as an aspect of financial economics. For this research, relevant theories which are directly related to this subject will be discussed in this chapter. The entire chapter is devoted to examining previous research and theories relating to this subject. The first section discusses relevant theories such as Efficient Market Hypothesis (EMH), Asset Pricing theories, Portfolio theory and Dividend Discount model. Applying EMH ensures that stock market prices are accurate and reflect all the relevant information, regardless of past information about stock market prices. Hence, new information is appropriate in explaining stock market movements (Fama, 1956). Some of the variants of Asset Pricing theories are Arbitrage Pricing Theory (APT), Dividend Discount Model (DDM), Capital Asset pricing model (CAPM) and the present value Model (PVM), which explain the dynamic relationship between stock market prices and economic fundamentals.

The following section is mainly subdivided into three sections, which are further divided into sub-sections. The first part of this chapter examines relevant theories on the subject, followed by a review of the historical background of these two major stock exchange markets, the Bombay Stock Exchange (BSE) and the New York Stock Exchange (NYSE) within the second section. Finally, the third section centres on existing studies relating to India, USA and other emerging and developed countries, as well as the analysis of previous empirical findings. As such, this section presents a comparative study of existing literature relating to the impact of selected macroeconomic variables on stock prices and their volatility. In line with the above discussion, this chapter ends with a conclusion.

2.2 Theoretical Underpinnings

The past empirical literature and financial theories seek to clarify the relationship between the macro-economy and stock market. This research has incorporated some of those theories as a foundation to establish the relationship between economic factors and stock market and explained them in the following sections which include Arbitrage Pricing model (APT), Efficient Market Hypothesis (EMH), Portfolio theory and the Discount dividend model (DDM).

2.2.1 Efficient market hypothesis (EMH)

The EMH is quite popular in the field of economics and finance and more specifically for the study of equity markets. According to EMH, security prices fully reflect all the available information, consequently, it is impossible to beat the market.

$$\Omega_t^* = \Omega_t \qquad (2.1)$$

The left side of the equation represents all the relevant information available to investors at the time *"t"*. On the other hand, the right side of the equation is used to determine the price of the asset. Both sides of the equation imply that EMH holds, and the market is efficient. According to Malkiel (2003), It is difficult for investors to earn abnormal returns under efficient markets unless investors are willing to accept above-average risks. The EMH takes account of random and unpredictable stock price movements, also known as 'Random walks. The EMH also suggests that investors in the financial markets will not be able to earn abnormal profits in long-run regardless of the access to information since there is an efficient allocation of resources. In the context of this hypothesis, "efficient" means that the market is competent to quickly the theory emphasises that it would be impossible to beat the market consistently (Pinto et al., 2015). According to the EMH, stock prices reflect the composite judgement of millions of participants. They are characterised by many distinct investors who are competing against each other, albeit with equal access to the same information and objectives.

In an efficient market, any announcement on earnings would quickly come into effect and will be reflected in stock prices. While this hypothesis holds in the market, it does not, by any means refute the profitability of investing in stock markets. It merely implies that profits gained in a highly competitive market will be fair to all investors for the given risk.

Mathematically, the return on securities that corresponds with the [i]EMH is expressed as below in the following equation.

$$R_{it+1} = E\left(R_{it+}\ \frac{1}{I_t}\right) +\ U_{t+1} \qquad (2.2)$$

Where R_{it+1} = expected rate of return on security in period $t+1$ at time t given the information available at time t (that isI_t).

U_{t+1} is the prediction error, that is, the difference between the actual return on security i at time $t+1$ and the expected return on security i at t.

The above equation indicates that the actual rate of return in security resembles to expected returns plus a random error which may be positive or negative. Fama (1970) distinguished between three types of EMH, which include weak-form efficiency, semi-strong efficiency and strong-form efficiency.

The concept of **weak-form efficiency** propounds the existing security prices reflects all past information such as past asset prices, past dividends paid, past trading volume. In other words, it is difficult to make excessive returns based on past information of price movements. This suggests that the EMH theory hypothesizes that asset prices evolve according to the "random walk model".

S**emi-strong efficiency** suggests that the existing security prices reflect all the information that I available to public. Hence it is unlikely to earn excess returns based on this notation. The Public information here suggests company performance, announcements on economic indicators and so on.

The **Strong-form efficiency** provides that current prices reflect more than current and past information. Under strong-form efficiency, current prices reflect even private information which is otherwise known as insider information.

Nevertheless, EMH has always been a debateful topic as Market players like Warren Buffet have consistently beaten the market. Additionally, some of the researchers like Seiler and Rom (1997) and Lo and MacKinlay (1998) denied the existence of Efficient Market Hypothesis, however, some researchers (Padhan;2009, Poshankwale 1996) have taken their stance in favour of Efficient Market Hypothesis. The EMH has always been extensively reviewed , more so especially when stock prices did not incorporate available information, including the stock market crash of 1987. The research paper from Lee et al. (2010) studied the stationarity of real stock prices in Thirty-two developed countries and twenty-six emerging countries and concluded that stock markets are inefficient. One of the most pioneering studies by Fama)1970)

to this date suggested that changes in macroeconomy are fully reflected the asset prices under an efficient market. Additionally, Nelson (1976), Fama and Schwert (1977) and many other scientific papers agreed with the study and concluded that macroeconomic indicators influence the stock prices and subsequently, the stock returns.

From an economic perspective, if this hypothesis proves true in the market, then there will be an efficient allocation of resources. However, in reality, markets are either weak-form or partly semi-strong, and this has been confirmed in many empirical studies because strong form efficiency is difficult to measure as well as the fact that there are high costs associated with acquiring private information (Timmerman and Granger, 2004). The EMH serve more as a guideline and the hypothesis are not taken as strict facts as suggested by Fama (1991)

2.2.2 Arbitrage Pricing theory

The Arbitrage pricing theory was introduced by Ross (1976) and is a sophisticated version of Sharpe's 1964 Capital Asset Pricing Model. Ross (1976) emphasized that the CAPM was challenging to test, and it assumes that security rates of return will be linearly related to one factor only, i.e. market return. However, APT is more flexible to the number of factors and advocates those multiple macroeconomic factors drive returns. The theory proposes that the security rate of return is a linear function of K factors. The APT can be expressed as below in the following equation.

$$E(R_i) = R_f + b_{i1}\,\widetilde{F_1} + \ldots . + b_{ik}\widetilde{F_K} + \widetilde{\epsilon_\iota} \qquad (2.3)$$

$$E(R_i) = The\ expected\ rate\ of\ return\ on\ the\ ith\ asset$$

$$b_{ik} = The\ sensitivity\ of\ the\ ith\ asset's\ return\ to\ the\ Kth\ factor$$

$$\widetilde{F_k} = The\ mean\ zero\ kth\ factor\ common\ to\ the\ returns\ of\ all\ assets$$

$$\widetilde{\epsilon_\iota} = a\ random\ zero\ mean\ noise\ term\ for\ ith\ asset$$

The APT assumes the markets to be competitive and returns on securities are expected to be frictionless. The theory emphasizes a direct relationship between the returns and their covariance with other vital factors and argues that returns are a function of many factors. Although, the theory stresses the multi-factor approach when assessing the asset returns but, the theory does not specify the key factors.

.2.3 Portfolio Theory

The theory developed by Markowitz (1952) centres around modelling the modern portfolio theory. Markowitz (1952) proposes that the mean and the variance of the asset returns in a portfolio should be the main determinants when combining assets to create a portfolio. The underlying principle of this theory is that it assumes investors are risk-averse and prefer small variances. The supporters of this theory with different choices in value are prepared to have a combination of mean and variance, and this combination is known as an attainable set. Basically, it means that in order to achieve an efficient combination, they must get a given variance or probably less for a mean and vice-versa. This implies more return for high risk and less return for low risk.

Below is a graphical presentation of Portfolio asset.

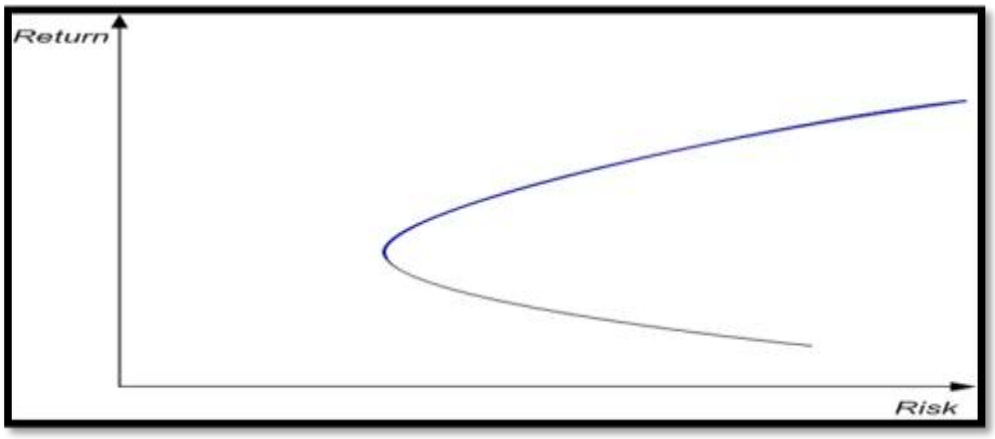


FIGURE 1: PORTFOLIO ASSET ILLUSTRATION

This graph represents the primary assumption of Portfolio theory which is the expected return for the given risk of given assets in a portfolio. The blue region represents the efficient frontier, and the area between the blue and black region is the minimum-variance frontier, while the black area is the mean-variance frontier. To achieve an efficient set, investors' assets in the portfolio must lie within the blue area. The theory also advocates for the use of the correlation between assets when constructing portfolios according to specific needs. If investors decide to increase the assets in a given portfolio, it will further decrease the variance due to a covariance effect.

Assets generally have individual diversifiable risks and market risks which is also called non-diversifiable. Another category of risk is the **unique or unsystematic risk** which is mainly

attributed to particular assets and can be diversified by increasing or decreasing the assets in portfolio. Another assumption the portfolio theory proposes is that investors have a certain amount of capital which they are willing to invest at a given time and various investment opportunities are available to investors to maximise their capital. Therefore, this theory advocates that investor make their decisions based on return and risk of their investment choices against portfolio risk and return. One of the significant drawbacks of this theory is that it never came into practice as a result of the enormous data requirement (Witt and Dobbins, 1979). Past studies have shown realised returns to be higher than the expected low-risk assets, which denotes the feeble relationship between risk and expected return. Therefore, no stable relationship exists between risk and return (Witt and Dobbins, 1979). Additionally, this theory does not clearly explain which portfolio investors should choose for given risk tolerance.

2.2.4 Dividend Discount Model

Another profound theoretical framework widely used is Dividend Discount Model i.e. DDM based on the discounted cash flow technique. According to this model, the price of shares equals to the present value of future expected dividends. DDM is widely used in real-life applications to value the stocks and derives the value of stocks based on the future projected dividends. The concept of valuing the stocks by implementing Discounting cash flow technique was first introduced by John Burr (1938) in his paper "The Theory of Investment Value". The study suggested that if the value derived from discounting future expected dividends is higher than the existing stock price, then the stock assumed to be undervalued. Similarly, if the value derived from discounting future expected dividends is lower than the existing stock price, then the stock is assumed to be overvalued. And lastly, if the value derived from discounting future expected dividends is equal to existing stock price, then the stock is fairly valued. Gordon and Sharpio (1956) later used the concept after the original publication in 1956 and came up with the following mathematical equation which is based on the concept of constant growth of dividend in perpetuity. The equation below was then named after this as Gordon growth model to value the stocks.

$$Price\ of\ a\ stock = \frac{DPS}{r-g} \tag{2.4}$$

$$DPS = Dividend\ Per\ share$$

$$r = cost\ of\ equity$$

$$g = expected\ growth\ rate\ in\ dividends$$

The model highlighted that the value of the company stock price is linearly related to next period's expected dividend growing in perpetuity. One of the challenges that are likely to be encountered when adopting this technique is to estimate the of the dividend growth rate and the required rate of return. Despite this, DDM is widely applied to impute it has also emerged beneficial as current stock prices are used to impute market assumptions for dividend growth and the expected return. On the other hand, expected returns are based on the Market Interest rates and any movements in the Market interest rates can influence the stock returns. Therefore, any movements in macroeconomic factors may influence the stock market through the impact of expected dividends, the discount rate or both (Chen et al., 1986). Ahmed (2008) argued that discounting models provide a robust theoretical framework linking the macro-economy to stock prices.

2.3 Historical Background

2.3.1 Introduction

This section provides a synopsis of past studies on the relationship between stock returns and macroeconomic factors and as well as empirical literature on the volatility of different stock markets. Many researchers had studied and explored the relationship between macroeconomy and financial markets using stock returns or stock prices from various countries including third world countries. These studies aimed to establish whether a long term or short-term relationship exists between the macroeconomic variables and stock returns as well as investigated the volatility of stock returns. This chapter begins with a historical background of the India and US stock markets (otherwise known as BSE and NYSE). It follows with theoretical underpinnings related to this thesis and rounds off with detailed previous empirical findings pertaining to India, US and other countries. Later, in subsequent section past empirical literature is discussed will enable the author to find out the significant economic factors that has major influence on stock markets from developed and developing countries. The literature review confirms a strong association between macroeconomic factors and stock markets among different countries (Hooker 2004; Bulmash and Trivoli 1991, and Wasserfallen 1989). The literature review covered in this research has similarities with variables being employed for the study.According to Booth and Booth (2005), Chen (2003) and Chen et al. (2005), inflation,

interest rates, money growth, industrial production and exchange rates have been highlighted as the most essential variables in explaining stock markets movements.

Any research must have a theoretical foundation as theories are the basis on which research assumptions are laid.Hence, market theories used for this research are critically reviewed to determine if the theoretical framework fits the BSE and NYSE. Also, this theory has guided the researcher on how to go about dealing with systemic risk selection in case of applying the Arbitrage Pricing theory. This chapter will equally provide an insight on how much research has been conducted within this particular area of Finance. Previous empirical findings serve as a foundation to confirm the relationship between the stock market and macroeconomic factors. These findings also help to tell us how volatility in stock markets differ. Therefore, it is essential to study both theoretical and empirical evidence before concluding this research.

2.3.2 Historical background of the Stock Exchange

India and U.S stock exchange (BSE and NYSE respectively) have secured their positions within the financial market over the last few years. Both stock exchanges have evolved over the previous few decades, particularly the BSE. This section will review the inception of both stock exchanges and how they progressed over the years. In the case of emerging economies, stock markets were fluctuant up until the 1990s and later gained momentum while developed economies have been stable except when sudden shocks happened. Over the recent years, emerging markets have attracted a lot of attention from investors in the international market which has influenced emerging country leaders to pursue policies and programmes that have helped emerging capital markets to catch up with developed capital markets. An overview of these two distinct stock exchanges below will provide an understanding of the progress of both stock markets over time.

Overview of Bombay Stock Exchange (BSE)

The BSE Ltd which was formerly known as the Bombay stock exchange was established in 1875 and was the first stock exchange of the country. East India Company was one of the first companies to trade in the market. Stockbroking was still a new concept in 1850’s, which was initiated by twenty-two individuals where they started trading with an investment of one rupee under a famous Banyan tree. Eventually, the Companies Act was passed. This followed with the rapid development of commercial enterprises, joint-stock companies with limited liabilities, which attracted the attention of the public and made shares investments famous. Soon after, the

number of these traders or so-called brokers jumped to sixty by 1860, and further skyrocketed to two hundred fifty. The Indian government recognized the Bombay stock exchange as the first stock exchange in the country in 1956 under the Securities Control Act.

Bombay stock exchange was one of the first exchange recognised in the whole Asia and was ranked as eleventh largest stock exchange as per its market capitalization figures i.e. valued at $2.2 trillion as of March 2018 (World Federation of Exchanges). The exchange has also collaborated with Singapore Exchange and Deutsche Bourse as its strategic partners. Over the years, the exchange had evolved and certainly not behind in pacing up with developed stock markets. Thus, it offers a variety of instruments listings on its exchange including mutual funds, open and closed funds, derivatives, debt securities etc. The Bombay stock exchange ranked as the number one exchange for providing a platform to several listings over 5000 companies. As of January 2013, the market capitalization of all the corporations listed on the exchange has a worth of $1.32 trillion (World Federation of Exchange). BSE is also known for its index options trading and reported as the third largest platform for options trading. Nevertheless, the exchange was also the first stock exchange for embarking centralized internet trading system, which gave access to investors to trade globally.

	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Market capitalization of listed domestic companies (% of GDP)	151.4	54.52	98.68	98.50	55.2	69.1	61.3	76.4	72.1	68.8	89.7
Listed domestic companies, total	4887	4921	4955	5034	5112	5191	5294	5541	5835	5820	5615
Stocks traded, total value (% of GDP)	95.19	77.96	82.37	65.25	35.4	33.7	28.9	35.8	36.7	35.2	45.6

TABLE 1: MARKET CAPITALIZATION DATA OF THE INDIA STOCK MARKET [3]

Since 1992, the exchange witnessed several policy reforms which brought massive structural and operational changes in the stock market. Before 1992, the stock market had a state-dominated development paradigm which was then shifted sharply towards a market-determined strategy leading to a change in the perception of financial systems towards the development of banks, financial instruments, and capital markets. Due to this, securities reforms were introduced based on Pherwani, Dave, Nadkarni and Narasimham Committees and the Standing High-Level Committee on Capital Markets, which included measures for its liberalisation, regulation, and development.

[3] Available at : World Bank open Data Accessed on 04/04/2016

Several events were associated in the formation and history of Bombay stock exchange, notably when a scandal led the government to set up National stock exchange (NSE) which established the electronic trading in 1994. This automated, screen-based trading platform called BSE On-line trading (BOLT) had a capacity of 8 million orders per day. Major corporations listed on the BSE include Tata Motors, State Bank of India, Bharat Petroleum, and HDFC Bank among others. It has several indices comprising the S&P BSE SENSEX, BSE small-cap, BSE mid-cap, and BSE 500. For this research, we have chosen the BSE Sensex index representing the BSE and consequently emerging markets. At present, the BSE is decentralised and managed by a panel of directors who are also representatives of the trading organisation and supervised under Managing Director. The BSE covers about 417 cities and some towns of India that currently fall within the scope of the Bombay stock exchange. Mumbai is the financial capital of India, and the BSE is the beating heart of Mumbai. BSE is a crucial financial organisation and plays a very vital role in the economy of India. Below is the graphical presentation of the BSE (Figure 3) with an upward trend which reveals that there has been tremendous growth over the last few years. The increased growth of Indian stock market (as shown in Figure 2) places BSE at 10th rank in terms of market capitalization which makes Indian capital market a best proxy to represent developing market. The figure below also reveals the most prominent periods i.e., surge and the drop in the financial market in chosen timeframe which will allow us to model our econometric analysis accordingly.

FIGURE 2: GRAPHICAL TREND OF THE BSE (Y-AXIS: ADJUSTED CLOSE PRICE AND X-AXIS: TIME PERIOD) [4]

[4] Available at: Yahoo finance database, accessed on 10/04/2016

Overview of the U.S stock market (New York stock exchange)

The New York Stock Exchange (NYSE) is one of the largest exchanges in the world by market capitalisation which began its inception back in March 1817. Initially, it started with twenty-four stockbrokers back in 1792 where stockholders gathered under buttonwood trees to sign an agreement that established rules for buying and selling of shares and bonds of companies which eventually instigated the establishment of the New York Stock Exchange. Currently, the NYSE is located on Wall Street, which is the leading money centre in the USA for international framework activities, and the first US location for wholesale financial activities. The NYSE was initially being named "New York Stock and Exchange Board" in 1817 and later renamed to "New York Stock Exchange" in 1863. By 1869, membership had to be capped and has sporadically increased since then. Due to this, there was a rapid growth in securities trading in the later part of the ninetieth century. Another major event happened in 2005 when the NYSE announced its plans to merge with Archipelago, before adopting the name- "NYSE Group" in 2006. The NYSE Euronext now operates the exchange since a merger between the NYSE and Electronic stock exchange, Euronext, took place on 4th April 2007. This formed the first transatlantic stock exchange, which is a cross-border exchange group. The NYSE Euronext has about 8,000 listed issues (excluding European Structured Products), NYSE Euronext's equities markets – the NYSE, NYSE Euronext, NYSE MKT, NYSE Alternext and NYSE Arca, which represent one-third of the world's equities trading. One fundamental feature of the NYSE is the trading floor bell. The opening and closing bells signal the commencement and end of trading respectively on each business day.

	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Market capitalization of listed domestic companies (% of GDP)	137.60	78.74589	104.5673	115.4973	100.7912	115.5558	143.9944	151.0855	138.3364	146.8616	165.6509
Listed domestic companies, total	5109	4666	4401	4279	4171	4102	4180	4369	4381	4331	4336
Stocks traded, total value (% of GDP)	295.9	320.9	237.9	240.7	264.5	200.2	199.1	223.6	228.4	225.8	205.1

TABLE 2: MARKET CAPITALIZATION DATA OF THE USA STOCK MARKET [5]

[5] Available at: World Bank open data, accessed on 04/04/2016

Again, NYSE had linked to numerous events in the past which resulted in either partial or complete shutdowns, consequently affecting the global financial markets. Examples of such events include the 1914 world war and the Wall Street bomb explosion in 1920. Moreover, recessions had occurred in the past, the Great Depression and most notably the recent subprime mortgage crisis, which severely affected the financial markets globally. Despite these events, NYSE had not failed to provide a platform for buyers, traders and sellers which is based on a continuous auction format and sometimes referred to as 'Big Board'. The auction process moved toward automation in 1995 using wireless hand-held computers. The system enabled traders to receive and execute orders electronically via wireless transmission. As of January 2007, a majority of NYSE stocks could be traded using hybrid market technology which allows to send orders for immediate execution or route the orders for trading. The NYSE has always worked alongside US regulators to manage its risk and to avoid any penalties and used mechanisms like circuit breakers and liquidity replenishment points for electronic trading. As mentioned earlier, the merger of the NYSE with Euronext led to the establishment of the NYSE Euronext in 2007, which was followed with the acquisition of the American Stock Exchange (AMEX). Later in 2012, the Intercontinental Exchange (ICE) proposed stock swap to NYSE Euronext shareholders. These notable events certainly highlight the fact that the NYSE has always been in demand and well-targeted for mergers and acquisition. Thus, it will serve as a great example to demonstrate how developed markets react towards changes within the macro-economy as well as the behaviour of volatility in the stock market. The graphical representation below in figure 4 shows the closing market price of the NYSE, which gives an idea of all notable events over the past few decades, and the figures depict an upward trend.

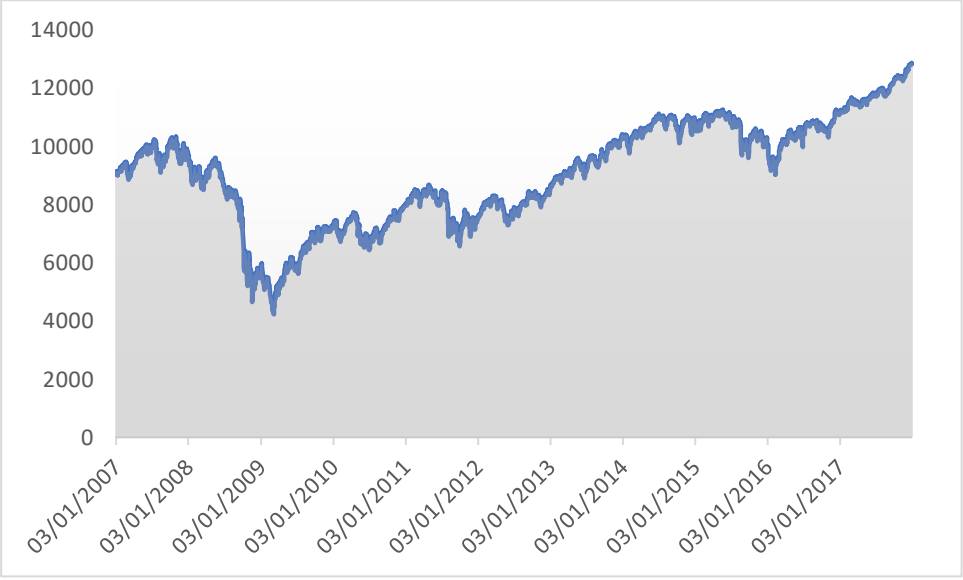


FIGURE 3: GRAPHICAL TREND OF THE NYSE (Y-AXIS: ADJUSTED CLOSE PRICE AND X-AXIS: TIME PERIOD)[6]

The above graph illustrates the upward trend of NYSE, which displays the increase in average trading volumes as well as increase in stock prices of listed companies on NYSE. The increased growth of NYSE stands out in ranking the US stock market worldwide as accounting for about 27 % of the total global market equity trade volumes which again serves as best proxy to represent the developed markets. The graph further reveals the most notable events in the chosen timeframe which allows the researcher to evaluate the structural breaks in the chosen timeframe and apply the econometric tests accordingly. The three globally renowned indices represent the New York Stock Exchange, namely Standard & Poor 500 (S&P500), Dow Jones Industrial average (DJIA) and the NYSE composite. DJIA and S&P 500 are the most widely followed indices across the globe. The key difference between the two indices is S&P 500 is a market value-weighted index, whereas DJIA is a price-weighted index of 30 components. And, the NYSE composite index covers all common stocks listed on the NYSE, comprising the American depository receipts, real estate investment trust, and some foreign listings. This research paper has adopted S&P 500 as one of the leading indicators representing the stock market behaviour in response to changes in domestic key factors for research purposes. The research has provided full justification of chosen variables in chapter four.

2.4 Empirical Literature

There have been substantial empirical findings on this subject, especially after emerging markets have attracted the attention of global investors. Examples of pioneering studies including Fama (1981, 1990), Gesek and Roll (1983), and Chen, Roll and Ross (1986). It has been identified that local economic factors have far more impact on stock return and their volatilities than global economic factors (Maysami et al., 2004). The empirical findings of different studies have not followed a particular pattern, and every research conclusion has been distinct from others, hence yielded conflicting results which could result in misleading policy recommendations. Consequently, there is a need to research on possible factors responsible for such differences in the findings. According to Godfrey (2013), variation in capital allocation, as well as differences within different countries' institutions, has increased the need for country-specific studies. Even though some researchers have conducted country-specific investigations in a particular country, other researchers have obtained conflicting results in the

[6] Available at: Yahoo Finance database, Accessed on 10/04/2016

same country. Therefore, results cannot be generalised. Contradictory results tend to cause misunderstanding among policymakers, investors, and consequently, it is vital to differentiate research based on sample size, data, frequency and methods.

Furthermore, stock market volatility has been well researched lately, particularly in emerging countries. For this research, we have investigated the relationship between stock return volatility and macroeconomic factors for both developed and developing country using recent data from the last decade. Hence, this further highlights the uniqueness of this research. Previous studies, including Sharma and Vipul (2016), Okoli (2012) and Caporale et al. (2016) employed GARCH models to understand the relationship between stock market volatility and macroeconomic variables. Conversely, researchers including Sopipan et al. (2012) and Kadir (2008) have equally suggested multiple regression to analyse the same relationship. Models like the OLS and Granger causality have also been employed in other studies (Alam and Uddin, 2009; Tursoy et al., 2009; Buyuksalvarci and Abdioglu, 2010 and Ahmed and Hasan, 2010).

These empirical findings in the literature demonstrate the fact that several statistical methods have been employed in previous studies. Some of these include Regression analysis, Ordinary Least Square (OLS) tests, Cointegration tests, Stationary and non-stationary tests, Granger causality tests, Impulse response function, Variance decomposition, Autoregressive Conditional Heteroskedasticity (ARCH) and Generalised Autoregressive Conditional Heteroskedasticity (GARCH). These statistical methods are briefly explained in Chapter four. One of the ways to establish the gap in the literature is by looking into the methodology and data of past empirical findings and making contributions accordingly.

Majority of the past studies relating to this topic had either focussed on the relationship between macroeconomic factors and stock returns/prices *or* focussed on the volatility of the stock market. (Semmler, 2006). This research will go a step further by researching both areas by looking into both perspectives. In the first part of this section, the researcher has presented empirical findings relating to macroeconomic factors and stock returns in India, USA and other countries' stock markets. In later chapters, a synopsis on stock return volatility has been outlined, followed with empirical findings on macroeconomic factors and stock return**s** volatility in India, USA and other countries.

2.4.1 Empirical evidence of the relationship between macroeconomic variables and the Indian stock market

Pethe and Karnik (2000) studied the relationship between macroeconomic variables and stock returns in India using monthly data from April 1992 to December 1997, with Sensex and Nifty as their stock indices. They employed the Cointegration and Error Correction models. Their findings concluded that there is no long-run relationship between the variables. There was also a weak causality from industrial production to stock indices. In summary, economic factors seem to have an impact on stock prices.

Another study was conducted the following year by Naka et al. (2001), analysing the relationship between macroeconomic variables and BSE Sensex. For this research, industrial production, consumer price index, a narrow measure of money supply and the money market rate represented macroeconomic variables. The study used monthly data from 1960 to 1995 and employed VECM and VAR modelling techniques. They concluded that macroeconomic variables were co-integrated and had a long-term relationship between them for that period. The study also observed that while domestic inflation was an obstruction to the Indian stock market's performance, GDP was a leading factor for stock market performance.

An attempt to study the causal relationship by Bhattacharya and Mukherjee (2002) using long term Granger causality test and a Cointegration technique was done. The study observed BSE Sensex, money supply, national income, interest rate inflation rate and Industrial production using monthly data from 1992-2000. The study suggested no causal relationship between stock prices and money supply, national income and interest rate while Industrial production showed a causal relationship with stock prices. On the other hand, there was two-way causation between stock prices and inflation rate.

Mukhopadhyay and Sarkar (2003) investigated the relationship between Indian stock market returns and macroeconomic factors post and pre liberalization period. They found a strong causal effect of output, inflation, money supply, and foreign direct investment on stock returns, especially in the post-liberalization period.

Another study done on this subject by Bhattacharya and Mukherjee (2006) found no causal relationship between macroeconomic variables and stock returns except inflation, which was bi-directional. They employed the VAR framework and Toda-Yamamoto non-Granger causality test from April 1992 to March 2001. Their macroeconomic variables were money

supply, index of industrial production, GNP, real effective exchange rates, foreign exchange reserve and trade balance.

Singh (2010) analysed the causal relationship between BSE Sensex and economic variables such as industrial production, World Price index and exchange rates using monthly data. Various statistical methods were used including correlation, unit root tests and Granger causality. The results of the statistical tests showed unit root in all the dependent and independent variables; hence the data was consequently first differenced. In summary, a Granger causality was found between Industrial production and Sensex, whereas World Price index demonstrated a unilateral causality as well as strong correlation.

Using quarterly data from January 1995 to December 2008, Pal and Mittal (2011) examined the long-run relationship between Indian capital markets and macroeconomic variables such as interest rates, inflation, exchange rates and gross domestic savings. They employed the Dickey-Fuller Stationary test, Cointegration and Vector Error correction techniques. They concluded that interest rates and foreign exchange rates have an impact on one capital markets, whereas GDP had an insignificant role in capital markets.

On the other hand, Kumar (2011) investigated the causal relationship between stock prices and macroeconomic variables in India using Johansen Cointegration and granger causality techniques. The study collected monthly data for NSE Index 'Nifty' and the macroeconomic variables, viz., Real effective economic rate (REER), Foreign exchange Reserves (FER), and Balance of Trade (BoT), FDI, IIP, WPI for the period of 01/04/2006 to 31/03/2010. The study concluded no cointegration between stock prices and macroeconomic variables except WPI and no granger causality was established between macroeconomic variables and stock prices and vice-versa.

Dasgupta (2012) also attempted to study the link between the Indian stock market and macroeconomic variables. The author studied two different markets of India - BSE and Sensex - using a world price index, industrial production, exchange rate and call money rates. The results of the investigation revealed the unit root in all the variables. Consequently, they were integrated at order one. The results concluded that long term relationships of BSE Sensex with indices of industrial production, call money rates and stock prices were also found positively related to interest rates and industrial production. In contrast, inflation proxy of World Price

index and exchange rates were indirect related to stock returns for both BSE and Sensex. On the other hand, the Granger causality test has found no short term unilateral or bilateral causal relationship between BSE Sensex and macroeconomic variables.

Similarly, Naik (2013**)** explored the inter-linkage between BSE Sensex and macroeconomy using wholesale price index, industrial production index, treasury bills rates, money supply, and exchange rates for the period of 1994-2011. The author applied the Vector Error Correction Model (VECM) and Johansen Cointegration for the analysis. The results suggested direct relationship between stock prices and money supply in the long-term, however there were no signs of causality between money supply and stock prices in short and long-run.

2.4.2. Empirical evidence of the relationship between macroeconomic variables and the USA stock market

Chen, Roll and Ross (1986) made the first attempt to investigate the relationship using APT modelling. The study incorporated seven macroeconomic variables, namely term structure, industrial production, risk premium, inflation, market return, consumption, and oil prices during Jan 1953-Nov 1984. The research concluded that there is a strong relationship between the macroeconomic variables and the expected stock returns during the tested period.

Another study was conducted by Sadorsky (1999), who examined the relationship between prices of oil shocks, Industrial production and the Interest rate on US stock market returns from 1947 to 1996. For this study, VAR was employed, and the results showed that positive oil shocks had a negative impact on the stock returns and that stock returns reacted positively to increase in interest rates and industrial production. Another significant conclusion was the fact stock returns were not always influenced with changes in oil prices as oppose to changes in interest rates. Also, oil price movements explain a large portion of the forecast error variance in real stock returns, particularly after 1986.

Flannery and Protopapadakis (2002) researched on the subject using the GARCH model of daily US equity returns in which both realized returns and their conditional volatility was examined concerning changes in macroeconomic factors using data from 1980 to 1996. They identified three nominal macroeconomic variables such as consumer price index, producer price index and monetary aggregate and three real variables, including employment, the balance of trade and housing starts. Summarising the findings, it suggested money supply and unemployment, trade balance, number of new homes and producer price index among

important macroeconomic factors. However, they could not confirm any link to share prices for GDP and the volume of industrial production.

Most of the studies done on this subject have focused on more than one market at a time. Binswanger (2004) analysed two distinct markets - US and Japan - and found that both stock markets move positively with economic variables and that the coefficient for economic fundamentals on equity returns tends to be larger for US data in comparison to Japanese data.

Ratanapakron and Sharma (2007) explored the long-term and short-term relationships between the US stock exchange and six macroeconomic variables using monthly data from 1975 to 1999. The analysis was performed using Johansen's Cointegration and Vector Error and Correction model (VECM) and results concluded stock prices were negatively related to the long-term interest rate. Also found that stock prices were positively related to the money supply, IP, inflation, the exchange rate, and the short-term interest rate. Additionally, the Granger causality test was performed, and the test indicated that macroeconomic variables caused stock price movements in the long-term but not in the short-term. Results of variance decomposition also support the finding that S & P 500 is exogenous in relation to the other macroeconomic variables.

Another study in the following year by Rahman and Mustafa (2008) investigated the short-term and long-term effects of two key macroeconomic variables - Money supply (M2) and price of oil on S&P 500 index - representing the US stock market. The study used monthly data from 1974-2006 and employed the Vector Error-correction model for analysis. The results indicated that negative monetary and oil price shocks depressed the U.S. stock market

Humpe and Macmillan (2009) analysed the interlinkage between macroeconomic variables and the U.S and Japanese capital markets using a Cointegration analysis from 1971 to 1990. The results of the analysis concluded that a single cointegrating vector exists in the US, suggesting there is a positive relationship between stock prices and industrial production and negatively related to the CPI and interest rate. The results also reveal that an insignificant but positive impact of money supply exists in the US market. The Japanese data revealed that there is a positive relationship between industrial production and stock prices and a negative relationship with the money supply.

Geetha et al. (2011) studied several macroeconomic factors including expected inflation rate, unexpected inflation rate, exchange rate, interest rate and GDP effects on the US, China and

Malaysia stock markets, using the Johansen test for cointegration and the Vector Auto-Regressive (VAR) testing technique. The study employed time series analysis using monthly data for the period of January 2000 - November 2009 and concluded a long-term relationship between expected and unexpected inflation with stock returns. Nevertheless, there is no short-term relationship between these variables for Malaysia and the US, even though it exists for China.

Sirucek (2012) reviewed the US market by exploring the impact of macroeconomic factors on two different indices of the US stock market, namely the S&P 500 and Dow Jones Industrial Average (DJIA). The author considered inflation, interest rates, money supply, Producer Price index, Industrial Production index, oil price and unemployment as their macroeconomic variables for the period beginning from 1999 to 2012. Based on the results of the linear regressive model compiled by adopting the OLS method, the impact of selected variables on DJIA appears to be true. Hence, there is a relationship between economic fundamentals and DJIA and S&P 500. The statistical tests also suggested that the most significant determinant of the S&P 500 index were interest rates and unemployment, while Producer Price index and unemployment, followed by changes to interest rates and oil prices, and had the biggest impact on DJIA. According to the author, the results of this research correspond to the economic theory and confirm that they are statistically significant.

Jareño and Negrut (2016) analysed the relationship between the US stock market and some relevant US macroeconomic factors, such as GDP, Consumer Price index, Industrial Production index, unemployment rate and long-term interest rates using data from 2008-2014. The statistical tests such as the Pearson correlation concluded that the US stock market is positively correlated to GDP and the Industrial Production Index variables and exhibits a negative correlation with a unemployment and interest rate variables and results found to be statistically significant.

2.4.3. Empirical evidence of the relationship between macroeconomic variables and the stock market in other countries

Hondroyiannis and Papapetrou (2001) examined the relationship between Macroeconomic variables and Greek stock returns using IP, interest rates, exchange rates, real foreign stock returns as represented by the S & P 500, and real oil prices as key economic indicators. The study employed a multivariate VAR model to examine the monthly data from 1984 to

September 1999. The tests results indicated macroeconomic activity, and foreign stock market changes only partially explained stock movements. However, oil price changes were able to explain stock price movements for that period.

Maghayereh (2003) co-integrated the Jordanian market with key macroeconomic variables, namely, M1, interest rates, inflation, IP, domestic export and foreign reserves for the period of 1987 to 2000. The tests indicated that the Jordanian stock price index was co-integrated with all macroeconomic variables. Therefore, the study concluded that all the variables were significant in explaining the movements in stock prices. These findings also indicated that the Jordanian capital market violated the theory of market efficiency.

Maysami et al. (2004) investigated the relationship between three sector indices namely, finance index, property index, and hotel index and key macroeconomic variables for the Singapore economy (CPI, IP, proxies for long and short-run interest rates, the money supply (M2), and exchange rates). Using Johansen's co-integration test, all three stock indices were reported to have significant relationships with these macroeconomic variables - both short and long term relationships - depending on different sector indices. The study challenged the efficiency hypothesis of Singapore's stock market, which indicated that stock prices do not incorporate all information available in the market.

Chaudhuri and Smiles (2004) examined the long-term relationship between real economic variables such as real GDP, real private consumption, broad money supply (M3), and the world oil price index and Australian stock prices using Johansen the Cointegration technique, Impulse Response Function (IRF) analysis and Forecast Error Variance Decomposition (FEVD) analysis for the period of 1960 to 1998. The Johansen Cointegration test confirmed long-term relationships between all variables. In contrast, IRF and FEVD analyses revealed weak evidence for the relationship between the Australian real stock price index and all variables.

Gan et al. (2006) analysed the dynamic relationship between the New Zealand stock market and a set of macroeconomic variables using Johansen Cointegration, Granger causality and Impulse Response Function testing methods. The independent and dependent variables employed for this research included NZSE 40, money supply (M1), short-term interest rate, long-term interest rate, inflation rate, CPI, exchange rates, GDP, and the domestic retail price of oil from 1990 to 2003. The tests revealed that the New Zealand stock market was consistently determined by interest rates, money supply and real GDP. However, the Granger

causality test results showed that New Zealand's stock index was not a leading indicator for changes in macroeconomic variables.

Research conducted by Robert (2008) on this subject employed a different model from those commonly referred to in the literature. The study investigated the relationship between BRIC countries namely, Brazil, Russia, India, and China and two macroeconomic variables - exchange rates and oil prices - using the Box-Jenkins ARIMA model for monthly data ranging from 1999 to 2006. Ray found no significant relationship between the respective exchange rates and oil prices and the stock market index prices in any of the emerging countries. Consequently, this explains why the ARIMA model is used when there is no co-integration between the variables.

Mahmood and Dinniah (2009) researched multiple countries using monthly data ranging from 1993 to 2002. The study analysed the relationship of six Asian Pacific countries (Malaysia, Korea, Thailand, Hong Kong, Japan and Australia) with three macroeconomic variables (foreign exchange rates, consumer price index and industrial production index). The study suggested a long-term equilibrium relationship between stock price and different macroeconomic variables in Japan, Korea, Hong Kong and Australia. A short-term relationship also existed in all countries except for Hong Kong and Thailand. Hong Kong stock price movements were only influenced by exchange rates, whereas Thailand reported a significant interaction between output and stock prices.

Akbar et al. (2012) examined the relationship between the Karachi stock exchange and macroeconomic variables such as money supply, short-term interest rates, inflation and foreign exchange reserves. For this research, the authors employed the Cointegration and VECM models from 1999 to 2008. The research revealed the long-term equilibrium relationship between the Karachi stock market and macroeconomic variables. The tests indicated a positive relationship between stock prices and money supply and short-term interest rates. On the other hand, it revealed a negative relationship between stock prices, inflation and foreign exchange reserves.

The relationship between exchange rate and stock prices for Pakistan was investigated by Jamil and Ullah (2013), using the co-integration technique and the Vector Error Correction Mechanism (VECM) from 1998 to 2009. The study investigated the short-term and long-term relationships between exchange rates and stock market returns. They concluded that the short-

term relationship was more positive than the long-term relationship, suggesting that investors would prefer short-term investments which liquidate within one year over long-term investments.

Ibrahim and Musah (2014) studied the Ghanaian stock market returns using money supply, exchange rate, inflation and index of industrial production as key macroeconomic variables. They employed the Johansen Cointegration approach, the Vector Error Correction Model (VECM) and the Granger causality over the period from September 2000 to September 2010. The analysis showed both short-term and long-term relationships between macroeconomic variables and stock returns. At the same time, it found no causality from any direction between the stock market index and macroeconomic variables.

2.5 Overview of Stock Market Volatility

What is Stock Market Volatility?

It is within the nature of any asset to move away from its actual price within a short-term period. The term "volatility" can be described as random variability or dispersion in the price of an asset per unit of time usually quoted as the standard deviation of asset price as well as *beta.* Financial market volatility is a quantity that is difficult to observe, which means that volatility cannot be observed directly. However, one can estimate volatility based on price movements daily or intraday price changes. In a broader market, volatility can be characterised as investor sentiments, and these sentiments are then passed on to stock market prices and eventually become a prime indicator for business investments, economic cycles and aggregate consumption (Lee et al., 2002).

According to Mullins (2000), volatility is the degree to which the price of a security, commodity, or market rises or falls within a short-term period. In his book, "*Financial Innovation and Market Volatility*", Nobel laureate Merton suggests that volatility refers to days when large market movements, particularly down moves, occur (Miller, 1991). These precipitous market-wide price drops may not always be traced to specific news events. One may argue this may not be the case in market for assets like shares as the share prices movements depends upon the investor's perception about company cash flow and ease of liquidity which is quite uncertain. The public takes a more deterministic view of stock prices; if the market crashes, there must be a specific reason. According to Reddy (1996), the market

is said to be volatile when the prices of securities or their returns fluctuate widely over a period. Conversely, in a stable market, prices tend to follow a smooth course and shift gradually from one equilibrium point to another as the information is gradually assimilated into prices.

Stock market volatility can be defined in many ways. However, it can be statistically expressed in standard deviation or beta, which is the deviation of the current price from its average price over a period. Greater deviation leads to greater volatility which also makes it difficult to estimate the future price of a given asset. According to Singh (2008), it is the standard deviation of daily stock returns around the mean value. Stock market volatility is the return volatility of the aggregate market portfolio. On the other hand, theoretically, it is explained as a change in the volatility of either future cash flows or discount rates, causing a change in the volatility of share prices. "Fads" or "bubbles" introduce an additional source of volatility (Schwert, 1989). Alan Greenspan (Chairman of Federal Reserve Board in Washington) referred to volatility as an 'irrational exuberance', in his speech December 1996. There are different definitions and explanations regarding volatility. Some have referred to volatility as speculative or boom effect, whereas others have described it as a 'herd behaviour'. Volatility may be perceived positively if it is stable over time. However, instable or high volatility has given sleepless nights to investors and regulatory bodies. High volatility of any instrument is often perceived as risky as it discourages participation and distorts investment decisions (Allen and Gale, 1994). Risky investments due to high volatility lead to higher costs of capital as investors require additional returns for taking additional risks

Causes of volatility

As discussed above, there are varying definitions of volatility. Likewise, causes of volatility have been explained differently by different researchers. Primarily, there are two schools of thought which have contrasting views on the causes of stock market volatility. According to the Fundamentalist school of thought, volatility occurs when new information is passed on to the market. Fundamentalists support this viewpoint by putting forward theories which confirm the idea that new information causes volatility, while also attempting to implement their theories to predict future price changes. According to fundamentalists, the Efficient Market Hypothesis (EMH) theory supports this position and is further explained within the theoretical framework section. This implies that new information has a direct effect on stock price movements, and constantly changes as any new information flows into the market. On the contrary, other studies have argued that volatility occurs as a result of investor reactions due to

personal sentiments, physiological or social beliefs. Such studies also suggest that volatility has nothing to do with external or economic factors, which altogether move the price and exert influence on the market as a whole. According to the popular EMH theory, investors tend to act inappropriately with the information they gather or receive. Therefore, easily accessible information may not necessarily be incorporated in stock prices; otherwise, the EMH theory would hold.

There is presently a vast amount of literature on causes of volatility and researchers have listed several factors such as changes in macroeconomic variables like inflation rate and interest rate as well as microeconomic factors like demand and supply, corporate earnings, dividend yield policies, arrival of new information, political and economic conditions and so on. Nevertheless, such factors may not necessarily affect securities in the same way. Every factor would have a different degree of impact on different securities. International factors which impact on domestic markets are regarded as exogenous. As markets become increasingly globalised, such exogenous factors tend to become more relevant in explaining stock market volatility. Concerning this research, one of the most relevant studies conducted was put forth by Shiller (1990), on market volatility. Shiller firmly believed in the efficiency of qualitative models to explain price fluctuations. In summary, the author proposed investor reactions due to psychological or sociological beliefs, to exert a great influence on the market, other than good economic arguments.

Another unwanted cause of Volatility is 'speculation'[7] which comes at the expense of others. In earlier years, speculators were either those who assisted in stabilising prices or those causing unnecessary price fluctuations (Smith, 1776; Mill, 1871; Friedman, 1953; Kaldor, 1960; Stein, 1961; Hart, 1977). The debate regarding speculation and volatility is quite controversial, whether speculators increase or decrease the short-term volatility in the market, or help in stabilising prices. Provision of more information may aid in bringing prices to their intrinsic value or create crowd behaviour in the market, thereby eventually leading to volatility.

What is the importance of volatility?

As earlier mentioned, volatility may either be a good or bad signal for investors, depending on whether the volatility is high or stable. High volatility represents a risk which may be a concern

[7] According to Arthur et al (2016) Speculation here refers to financial activities performed in short-term and attributed with high risk accompanied with either high or low gains or perhaps losses. The primary focus of speculators is to make monetary profit from price movements without corncerning the fundamental value of the asset.

for investors, market participants, regulators and researchers as one would like to know how much risk an investor or market participant exposed to. In case of regulatory bodies, it is their responsibility to ensure smooth functioning of financial markets without any large outbreaks. If there are any outbreaks anticipated, then they would like to be prepared beforehand before it causes a major impact. If high volatility is not controlled, it may potentially cause significant gains or losses. Therefore, regulations currently play a significant role in financial markets, and so it is vital to know the level of volatility of any trading platform. Volatility provides information on possible ranges of stock value on future dates, thereby enabling stakeholders to make informed choices accordingly. According to Zheng (2014), volatility helps in forecasting the stock market as well as predict investors' sentiments. Additionally, price volatility in the market allows firms in decision making to ascertain how much capital to issue, when to issue and the type of instrument to use.

Furthermore, it is crucial to estimate volatility when predicting asset return series and forecasting confidence intervals which help researchers to conduct statistical tests needed to produce the result. Volatility has been greatly linked with market performance (Okwuchukwu,2015). There is a negative relationship between stock markets and volatility; a rise in stock markets is a sign of low volatility and vice-versa (Dimitrios and Simos, 2011). A Crestmont research report (2011) investigated the relationship between stock market performance and the volatility of the market using past data, where average daily range of S&P prices were used as a proxy of volatility .Their findings concluded that higher volatility corresponds to a higher probability of a declining market and vice versa. Hence, volatility serves as a benchmark for investors to determine market risk. According to Yadav (2017), volatility is a significant parameter which is incorporated across financial applications, derivative valuation to asset management and risk management in portfolio constructions. According to Engle et al. (2012), Volatility also takes in account of the size of the errors made in modelling returns and other financial variables. They discovered that for vast classes of models, the average size of volatility is not constant but changes with time and is predictable. In conclusion, volatility is an important aspect when studying financial markets.

2.5.1. Empirical evidence of the relationship between macroeconomic variables and stock market Volatility in India

A multi-country study conducted by Muradoglu et al., (2000) considered 19 emerging countries including India, using monthly data from 1976 to 1997 to investigate a possible relationship

between macroeconomic factors (exchange rates, interest rates, inflation, and IP) and stock market volatility. Interestingly, the study revealed that macroeconomic factors could influence volatility. Also, such influence could vary, based on the country and its integration with global capital markets.

Batra (2004) investigated the causes of volatility and also attempted a detailed analysis on this subject by considering 19 different indices, with one index representing each of the 17 countries and two indices representing India for the period 1979-2003. The study employed different models and statistical tests, including the augmented GARCH model, skewness and kurtosis to ascertain volatility. In summary, it was concluded that sudden patterns in volatility were due to significant changes in macroeconomic activity or political instability. Also, developed and emerging markets showed distinct patterns in returns and volatility behaviour. Both daily returns and standard deviation were higher for emerging markets over developed markets.

Kumar and Tamimi (2011) investigated the relationship between the economic growth rate and stock market volatility by applying the AR (1) GARCH (1, 1) model. The economic growth rate is otherwise referred to as GDP from one period to another in percentage; this classified under macroeconomic variables. The study examined BSE 100 index data from 1996 to 2007. The study predicted that high volatility is associated with low economic growth rate, while low volatility is associated with high economic growth rate.

Tripathy (2011) conducted study for the period of January 2005- January 2011 to examine the impact f macroeconomic variables on Indian stock market volatility using ARCH, GARCH, EGARCH, TARCH, PGARCH and Component ARCH models. The study concluded macroecnomic variables plays important role and can be utilized to predict the Indian stock market volaitility. Further the study concludes that asymmetric GARCH models provide better prediction result than the symmetric GARCH model

Lairellakpam and Dash (2012) attempted to study the causes of volatility in Indian stock markets. For this research, the key macroeconomic variables considered were exchange rates of INR/USD[8], crude oil prices, FII, Gold prices, and Dow Jones index, while using monthly data of Nifty and other variables from January 2000 to June 2011. The study used Vector Autoregressive techniques and Granger causality tests to determine the impact of each factor on S&P CNX Nifty volatility. The study concluded that there is no Granger causality from

[8] INR: Indian rupee whereas USD : US dollars . The INR/USD implies one rupee to US dollar.

selected macroeconomic factors to CNX Nifty returns except exchange rates. Additionally, it was reported that change in Nifty returns has unidirectional Granger-causality with INR/USD exchange rates only.

Majumder and Nag (2013) investigated the linkages between the volatility of the Indian stock market returns and flow of foreign institutional investment, which is also classified under macroeconomic variables, using daily time series data for the period January 2008 to February 2012. The study revealed that the flow of foreign institutional investment had no significant effect of inducing volatility in the stock market.

Adhikary and Saha (2013) studied the conditional volatility of the Indian stock market represented by BSE Sensex for the period 1990 to 2012 by employing the ARCH and GARCH models. The results of these tests suggested strong evidence of time-varying volatility, volatility clustering and a high persistence and predictability of volatility. There was equally clear evidence of a shift in volatility over the specified period. It was reported that time-varying movements in stock returns were due to strong economic fundamentals.

Following up with their previous study, Adhikary and Saha (2015) extended their research on the same subject, by focusing on the impact of global financial crises on Indian stock market volatility. The study mainly focused on inter-temporal effects of volatility on market returns in the context of global financial meltdowns using an asymmetric GARCH model. The study covered the period from 1st January 2003 to 05th November 2010, based on the most prominent domestic market index, which was the Bombay Stock Exchange (BSE). The findings concluded that stock returns volatility was at its highest during the financial crises period from 8th January 2008 to 09th March 2009, and surprisingly, the mean return was at its lowest point during this period. In summary, the Indian stock market was influenced by the US financial meltdown during the crises period, resulting in volatility within the Indian stock market.

Kumari and Mahakud (2015) studied the interlinkage between macroeconomic variables uncertainty and stock return volatility for the period 1996 to 2013. The study employed univariate Autoregressive Conditional Heteroskedasticity models, multivariate VAR model, Impulse response function (IRF), Block exogeneity and Variance decomposition. The key variables used within this research were output, foreign institutional investments, exchange rates, short-term and long-term interest rates, broad money supply, and inflation as macroeconomic variables and BSE Sensex and NSE Nifty representing the Indian stock

market. The findings revealed a relationship between macroeconomic volatility and equity market volatility.

A recent study conducted by Saha (2017), investigated the stock market volatility in India using a monthly frequency running from January 1993 to September 2016. The research employed the AR (1)-GARCH-S (1, 1) model to ascertain the volatility of stock market returns due to variation of macroeconomic variables. Key macroeconomic variables used for this research were growth rate of broad money supply, short-term interest rate, inflation, industrial production, foreign investment, gold price, world oil price, U.S. stock returns and exchange rate. The results concluded a significant positive relationship between industrial production, exchange rate and the volatility of Indian stock market returns. In contrast, foreign investment and gold price were reported to have a negative relationship with volatility in Indian stock returns. Also, the results suggested an insignificant relationship between the rest of the macroeconomic variables and the volatility of the Indian stock market for the selected period.

2.5.2. Empirical evidence of the relationship between macroeconomic variables and USA stock market Volatility

Connolly and Wang (2002) examined the co-movement between returns and volatilities for the US, UK and Japanese markets, conditional on a representative set of macroeconomic news announcements from these three countries for the period 1985-1996. The results showed that the US market was the first one to respond to domestic macroeconomic news and consequently exerts the most significant influence on both the UK and Japanese markets. Nevertheless, the UK market has a more substantial impact on the US market compared to the Japanese financial market.

Beltratti and Morana (2006) analysed the interlinkage between macroeconomic variables and S&P 500 volatility for the period 1970 ranging to 2001. The study confirmed persistent volatility in stock markets, which is mostly influenced by macroeconomic volatility. However, the S&P 500 volatility had a minor influence on macroeconomic volatility.

Falkberg (2012) analysed the impact of seven macroeconomic variables, such as default spread, inflation, industrial production, the slope of the yield curve, implied volatility and 3 months treasury bills on the volatility and returns of S&P 500 index using monthly data ranging from 1957 to 2011. The empirical findings suggested no relationship was found between the

macroeconomic variables and stock market volatility as well as showed the presence of seasonal patterns and asymmetric volatility. These conclusions were obtained from VAR, Granger causality and other econometric techniques.

Corradi, Distaso and Mele (2013) analysed the relationship between the macroeconomics determinants of stock volatility and volatility premiums using the VIX index for the period of 2007-2009. They applied a no-arbitrage model where stock market volatility is explicitly related to several macroeconomic and unobservable factors. The research equally mentioned that stock volatility might be further explained by business cycle factors and some unobservable factors that explain minor variations in volatility.

2.5.3 Empirical evidence of the relationship between macroeconomic variables and stock market Volatility in other countries

Engle and Rangel (2008) modelled equity volatilities as a combination of macro-economic effects and time series dynamics covering nearly 50 countries over selected periods using daily data. The study concluded that stock return volatility is greater when macroeconomic factors, such as GDP, inflation, and short-term interest rates are more volatile or when inflation is high, and output growth is low. Additionally, volatility was perceived to be higher not only for emerging markets, markets with small numbers of listed companies and market capitalization relative to GDP but also for large economies.

Yaya and Shittu (2010) concluded that past inflation rates have significant effects on conditional stock market volatility. The study indicated that changes in inflation rates play a more significant role in predicting the stock market volatility in Nigeria. These results confirm the Fisher Effect theory on international stock markets.

Aliyu (2010) analysed the impact of inflation on Nigeria and Ghana stock market returns and their volatility using monthly data. The results indicated that the inflation rate and its three months average were found to have a significant effect on stock market volatility in both countries. The study suggested that if inflation is controlled and stable in Ghana and Nigeria, it would certainly reduce stock market volatility and boost investors' confidence.

Chinzara (2011) modelled macroeconomic uncertainty and stock market volatility for South Africa, and the results concluded uncertainty in economic factors describes the volatility with

in the financial markets and pointed that financial crises had raised the bar of volatility. According to Chinzara, volatilities in exchange rates and short-term interest rates greatly impact on stock market volatility while volatilities in oil prices, gold prices and inflation play minor roles in affecting stock market volatility.

In another study, Choo, Lee and Ung (2011) explored the relationship between macroeconomic uncertainty and stock market volatility in Japan using GARCH models. The result revealed that macroeconomic variables have no impact on the volatility of Japanese stock markets.

Kadir et al. (2011) examined whether interest rate volatility and exchange rate volatility could predict the Kuala Lumpur Composite Index (KLCI) volatility from January 1997 to November 2009. The study employed two models[9] based on GARCH (1, 1). The results indicated an insignificant relationship between stock return volatility and selected macroeconomic variables, even though positive for the exchange rate and negative for the interest rate. The study revealed that the variables could predict the movements of KLCI returns to a certain degree, but the variables have weak volatility prediction.

Engle et al. (2013) revisited the relationship between stock returns volatility and macroeconomic variables for several countries, using a new class of component models that distinguish short-term from long-term movements. The study suggested that the long-term component of volatility is driven by inflation and industrial production growth. Additionally, it reported that inputting economic fundamentals into volatility models plays a massive role in long-horizon forecasting. Hence, the researchers concluded that macroeconomic fundamentals play a significant role even at short horizons.

According to Omorokunwa and Ikponmwosa (2014), while inflation rates mainly determine stock price volatility, exchange rates and interest rates have weak effects on stock price volatility in Nigeria. The study was empirically examined using the Generalised Autoregressive Conditional Heteroskedasticity (GARCH) model, covering the period 1986 to 2011. It concluded that rising prices tend to cause stock prices to move rapidly within the market, hence causing volatility. The authors conducted explicit research on relevant literature as well as an analysis of a theoretical framework to form the basis for their study.

[9] Where one model included Exchange rate and Interest rate and the other model excluded Interest rate and exchange rate in the GARCH modelling technique.

Hussain et al. (2015) examined the relationship between macroeconomic variables, and stock returns volatility in the Pakistan stock market using monthly data ranging from 2001 to 2011. The study employed the Auto Regressive Distributed Lag (ARDL) method, and the results showed that macroeconomic variables are influential factors in explaining stock returns volatility. The study equally indicated that inflation, real exchange rates and oil prices are positively related to stock volatility. In contrast, industrial sector output and real money supply are negatively related to stock returns volatility.

Surbakti et al. (2016) explored the impact of macroeconomic factors on the Johnson Controls International plc (JCI) stock return volatility in pre and post 2008 global economic crises, from 2002 to 2014. The study employed international macroeconomic variables such as Dow Jones Industrial index (DJI) and gold price while taking into consideration exchange rates, interest rates and inflation rates for domestic macroeconomic variables. Using the ARCH and GARCH methods, the study revealed that DJI and exchange rates have significant positive effects on JCI's return volatility. In contrast, gold price, interest rates and inflation rates have no significant impact on JCI's return volatility.

2.6: Recent Developments

This section highlights some of the recent developments in light of the chosen research topic. As financial markets are evolving, the study of the financial markets is becoming more complex. This section seeks to explore the different techniques or methodologies adopted in recent times to study the stock markets. The relationship between stock markets and macroeconomy can be investigated from various angles. In this section, the focus is particularly on the study of stock markets from different perspectives and different methodologies adopted in recent times regardless of the time employed due to limited literature.

Abbas et al., (2019) examined the relationship between the returns and the volatilities of the stock market and macroeconomic fundamentals by using monthly data ranging from July 1995 to June 2015 and employed the Diebold and Yilmaz (2012) spillover index approach under the generalized VAR framework. The empirical results of total spillover index indicate no significant differences in the return and volatility connectedness between stock market and macroeconomic variables for China. The directional return and volatility spillover impact is comparatively stronger from stock market to the macroeconomic variables. The return and

volatility spillovers in either direction, changed significantly after the global financial crisis of 2008.

Bhuiyan and Chowdhury (2020) examined the relationship between macroeconomic variables and stock market indices, both composite and sectoral, for the US and Canada. The results concluded an asymmetry in the US and Canada in terms of how macroeconomic variables influence stock market returns using Cointegration and Vector Error Correction Models using monthly data over the 2000–2018 period. The sectors examined in the study include energy, financials, real estate, industrial, healthcare, consumer discretionary, and consumer staples. The study adopted cointegration analysis is applied to model the relationship between industrial production, money supply, long-term interest rate, and different sector indices. The Results suggest that there is a stable long-term relationship between the macroeconomic variables used in the study and different sector indices for the US but not for Canada. However, US money supply and interest rate can explain the Canadian stock market. The results suggest important insights for private investors, pension funds, and governments as long-term investors often base their decision to invest in equities on the stated macroeconomic variables.

Nguyen et al., (2020) grounded on the propositions of Kaleckian–Post-Keynesian macroeconomic framework to explore the dynamic impacts of SME (Small and Medium Enterprise) stock market developments and innovation on key macroeconomic variables in Hong Kong, Singapore, Thailand, and Malaysia. For the reported empirical analysis, a Structural Vector Error Correction (SVEC) model and an impulse response function (IRF), Granger causality were adopted using seasonally- adjusted monthly data for the period of July 2009 to December 2016. The SME stock market development promotes economic growth through the combination of the following channels: private investment, savings and productivity in Hong Kong, Singapore, and Thailand. Innovation, on the other hand, fosters growth through the combination of these channels and the employment channel in all four countries and causality tests indicated the causation is two-ways i.ee causation flows economic growth to SME stock Market.

Pham and Phuoc (2020) employed both qualitative and quantitative research methods by adding three macroeconomic determinants/risks (the U.S. prime rate, the U.S. government long-term bond rate, and the exchange rate of USD/EUR) to the original CAPM to explain the nexus between the risks and the U.S. stock returns. The study suggested MAPM, a non-traded factor model, is more flexible than the CAPM and quite easy to employ as the data is readily

available. Unlike the other traded factor models, this MAPM[10] is based on the macroeconomic theory and models. The study examined and compared the performance of both CAPM and MAPM on the S&P 500 stocks from 2007-2019. This study found the MAPM worked with more U.S stocks than the CAPM, whilst consistently yielded a statistically significant greater forecasting, explanatory power, and model adequacy compared to the CAPM. The study concluded both the U.S. government long-term bond rate and exchange rate of USD/EUR had a statistically significant positive effect on the S&P 500 stock returns for the chosen period.

Shang and Zheng (2021) identified the macroeconomic volatility as a source of stock volatility for both Chinese and US stock markets using SV- MIDAS modelling technique for the period of January 3, 1994, to June 30, 2015. The study examined the relationship using daily stock indices and low frequency macroeconomic variables, such as Composite Leading Indicator, CPI, and M1. The results suggested SV-MIDAS model and its extension can describe the time-varying stable component, which is useful to study the volatility mechanism and improve volatility forecasting and concluded that the volatility of the macroeconomic fundamentals has a positive effect on this time-varying stable component.

Keswani and Wadhwa (2021) studied the association of India stock market with Macroeconomic indicators which included Economic growth, inflation, Foreign Investment and Youth employment rate and Nifty as dependent Variable for the period of 2006-2016. The VECM findings showed that in the Indian stock market, a significant long-term link is established with disposable income, FII, development (GDP) and stock returns, which can be seen by increasing disposable income, economic growth (GDP) and FII as a positive outlook for the Indian stock market. Second, the long-term link among the stock return and inflation and the youth unemployment rate was significant but weak, implying that if youth unemployment and inflation change, then stock returns would be adversely impacted in the long term. Therefore, an improvement in a chosen element can affect stock market volatility.

[10] The MAPM Modelling incorporates various factors to explain the stock returns unlike CAPM which employs one factor.
$R_{iT} - RF_t = \alpha_i + \beta_i\,(RM_t - RF_T) + \gamma_i(US_t - RF_t) + k_i(LTB_t - RF_T) + \lambda_i EX_t + \varepsilon_{it}$
Where , R_{iT}: the return on the stock i at the time t ; ; RF_t: the risk − free rate at the time t ;
α_i: Jensen's alpha coefficient (alpha)of the stock ; γ_i: the interest risk coefficient (gamma)that the stock i is bearing;
β_i: the stock i's sensitivity to the market portfolio (beta); US_{iT} : the U.S. prime rate at the time t ; λ_i : the exchange rate risk coefficient (lambda) that the stock i is bearing ; LTB_t: the government long-term bond rate at the time t ; EX_t : the exchange rate of USD/EUR at the time t; ε_{it}: the random error term that has mean zero and variance σ2

Hussain and Omrane (2021) analyzed the impact of US macroeconomic news announcements on the Canadian benchmark stock index return and volatility using high-frequency data. The study employed intraday 5-min price data for Canadian benchmark stock index (i.e., S&P/TSX composite index) from Olsen data. The data covers the period January 5th, 2007 through December 31st, 2013. The findings revealed that several US macroeconomic news releases exert a statistically significant influence on the Canadian stock market return and volatility. Moreover, the study highlighted that during the 2008 US recession, the economic news exhibited significant impacts on the Canadian equity returns, with relatively pronounced effects. The results supported previous findings by suggesting that US macroeconomic fundamentals form a linkage between Canadian and US financial markets.

2.7 Summary

This chapter has covered several sections aimed at providing a brief outlook on the subject. The first part of this chapter extensively covered theories relating to this subject, followed by historical background of two main stock exchange markets of the selected countries chosen for this research. The author has critically reviewed previous empirical findings. Theories such as APT have indicated the existence of a relationship between stock returns and macroeconomic variables but have not described which variables are useful or most influential. Such review of literature has helped the researcher to determine the inclusion of variables required for this research. Previous empirical findings have been elaborately discussed relating to India and the US over different periods while employing different variables and contrasting methodologies which are appropriate for this research.

Moreover, this chapter has been a great source of insight to identify the current gaps in academics as well as determining the statistical tests required for an empirical study of this nature. Although this subject has been extensively reviewed by researchers in several areas such as research covering multiple countries and the usage of numerous macroeconomic variables within a single research paper. However, there are hardly studies that have investigated stock returns and their volatilities simultaneously. Omorokunwa and Ikponmwosa (2014) confirm that most available literature focuses on the determinants of stock returns and not their volatility.

Consequently, this research aims to fill this gap by focusing on stock returns and their volatilities, conditional upon macroeconomic factors within two different countries representing developed and emerging economies. Hence, this research seeks to fill several gaps in the literature.

Finally, previous empirical findings have indicated vital factors to consider within the process of choosing relevant statistical tests to determine the relationship between the variables. These studies have suggested that the VAR and VECM frameworks, co-integration tests, Granger causality tests, ARCH and GARCH models are commonly used to examine the relationship between macroeconomic variables and stock returns and their volatilities. However, the econometrics does not provide any guideline for choosing the appropriate model. Chapter four of this research will cover the methodology employed within this study, as supported by previous empirical methodologies. These will serve as a guideline for the researcher. However, the above discussed econometric models will only be applied in this research where appropriate. Subsequent chapters will be devoted to the analysis of empirical results obtained from this study, followed by policy recommendations and conclusion.

CHAPTER THREE

CONCEPTUAL FRAMEWORK

3.1 Introduction

The preceding chapters have provided an extensive review of existing literature relating to both India and US stock markets, as well as research on other countries. Besides establishing a conceptual framework, this chapter will examine the broad concepts of different theoretical assumptions and determine which theories will be most relevant for this research. Indeed, the stock market is very vast and has been widely investigated by many researchers. Such research is ongoing.

As established in the previous chapter, the behaviour of the stock market may be affected by several factors. However, this research will focus on the impact of macroeconomic factors on the stock market. In the preceding chapter, theoretical models such as APT have been silent on the number of macroeconomic factors and failed to establish which factors have the most influence on the stock market. This allows the researcher to independently review and choose the variables they perceive as the most influential in determining stock market behaviour. Consequently, researchers have investigated the impact of several macroeconomic factors on the stock market, resulting in conflicting conclusions (Bhayu and Rider, 2012).

As such, this chapter is set to investigate the impact of relevant macroeconomic variables on the stock market, using graphical illustrations to establish critical factors as well as the presumed relationships that exist between these variables. Another complex area of this research entails studying the stock market to ascertain how to use stock returns or stock prices as a proxy for stock markets. Izedonmi and Abdullahi (2011) employed stock prices for their study, while Okpara and Odionye (2012) considered stock returns in their investigation. The stock price index is the price a seller gets out of selling stock while stock returns refer to the dividends and other benefits derived for holding a stock.

This study will incorporate stock returns to establish the impact of macroeconomic variables on stock returns and volatilities. The findings of this research will be relevant to investors and policymakers within the context of stock returns and stock prices.

This chapter aims to establish a conceptual framework that will illustrate relevant variables for India and US stock markets. The study also focuses on domestic macroeconomic factors as they tend to have a more significant impact on the stock market than international factors (Al-Qenae, Li & Wearing 2002). Here, the author does not deny the importance of global factors, this research will focus on the impact of domestic factors on stock returns for India and the US. Subsequently, this study will examine the linkage between these two distinct markets based on their empirical results and follow-up with comparative analysis in Chapter seven. Thereafter, key findings and conclusions will be discussed in detail.

This section will illustrate the framework employed to design this research. To obtain a better understanding of this section, the figure below connects macroeconomic factors to stock returns and their volatilities, using arrow direction. As earlier mentioned, this research has used domestic macroeconomic factors to describe stock returns and their volatilities. Even though factors like war, terrorism and political instability equally contribute towards volatility in the stock market, these factors are not quantifiable (Gunay, 2016; Essaddam and Karagianis, 2014). Therefore, this study will presently focus on examining measurable factors, with the possibility of incorporating unquantifiable elements within future research. The conceptual framework will provide a better understanding of the relationship between macroeconomic variables as defined by Olweny and Kimani (2011), including the impact of macroeconomic factors on stock returns and their volatility within the Nairobi stock exchange. In this study, the researcher has adopted a conceptual framework which is similar to the framework developed by Olweny and Kimani (2011). The researcher will equally investigate the effects of independent macroeconomic variables on dependent variables such as stock returns and stock returns volatility which are the dependent variables.

3.2 Review of research variables

Macroeconomic factors are generally statistical in nature indicate the situation of a country at any given time (Rogers,1998). These variables are a historical data issued by state institutions that indicate the welfare of a country (Mohr, 1998; Darnay, 1998; Ciegis et al. 2009; Kumpikaite and Ciamiene, 2008). The first word war initiated the calculation of economic

variables to establish the strength of their enemies. The first attempt to collect the data on economic variables could be dated as far back as the First World War when warring countries wanted to measure the strength of their enemies. Nowadays, data issued by agencies companies and institutions are recorded and calculated for variety of needs. Rogers(1998) distinguished the macroeconomic indictors in the following groups.

- **Procyclical macroeconomic indicators** has a direct relationship with the economic condition of the country which suggests that procyclical variables increase as economy boost. Gross domestic product is considered as a classic case of procyclical macroeconomic variables.
- **Countercyclical macroeconomic indicators** move in the opposite direction in response to changes in economic environment. These variables increase when the nation is facing a recession and falls when the nation is booming. Another excellent example is unemployment as it tends to increase when the economy is in recession and vice-versa.
- **Acyclic macroeconomic indicators** have little significance and has no association with economic indicators.

The National Bureau of Economic Research offers another classification, which is based on the timing of changes in the macro-indicators (Moore and Shishkin, 1967).

- **Leading macroeconomic variables** are those that changes before any changes occurs within the economy. A good example of this would be Stock market returns as the returns starts to drop before recession approaches, and the returns begins to increase before the country starts to pull out of a recession.
- **Lagged macroeconomic variables** which respond to changes in economy after few quarters. The unemployment rate is a lagged economic indicator as unemployment tends to increase for 2 or 3 quarters after the economy starts to improve.
- **Coincident macroeconomic variables** are indicators which simply change at the same time the economy does such as the GDP, which is attributed to this group of indicators.

Leading macroeconomic variables are usually preferred by researchers, including the author of this study as they tend to signal future events and facilitate predictions (Chen, 2009; Dua, 2004). A single macroeconomic variable may not precisely capture diverse economic conditions and as such, there is a need to study a set of such variables. Hence, the subsequent

section of this work will provide explanations of all selected variables which serve as a foundation for this thesis.

3.2.1 Stock returns and stock volatility

A stock market is a place where shares of public companies are traded and listed for the first time, depicting the behaviour of a free market which entails free access of capital in exchange of ownership in the enterprise. Such ownership represents equity, claimed by owners of a firm (Bodie et al., 2009). It is an avenue to raise capital for new enterprises and existing publicly traded companies through sales of shares (Arcot et al., 2007). Therefore, stock markets create an opportunity for small entrepreneurs or companies who require capital to start up their businesses and in turn, helps those investors who are looking to make good use of their wealth. Investors in stock returns make money through dividends and get to participate in the profits of those companies (Mishkin and Eakins, 2009). The stock price of a company signifies the market price of that single share that represents the equity in the company. Stocks are traded in the stock exchange where buyers place bid prices, and sellers sell such shares at ask prices. In an efficient market, stock prices respond quickly to new information hence reducing the gap between bids and ask prices. Another feature of stock prices is that it reflects the future performance expectations of the company. Therefore, the stock price or index of a company is a significant indicator of economic activities. The dynamic relationship between macroeconomic variables and stock returns and their volatilities may be used to develop a country's macroeconomic policies (Mysami, Howe and Hamzah, 2004).

Stock returns represent earned profits from investments in stock which could be in the form of dividends, profit/loss in the trading, and such returns may be positive and negative. The main motive behind investing in stocks is to get returns higher than the risk-free rate. According to the Efficient Market Hypothesis (EMH), investors are unable to earn abnormal returns if the market is efficient and using past information. Regardless of the claims made by the EMH concerning market efficiency, past literature suggests seasonal anomalies both in developed and emerging markets. The existence of time anomalies is contradictory to the EMH. This research will test the EMH by using publicly available information, which influences stock returns. An example of such information is macroeconomic data which is readily available and published following any announcements.

On the other hand, stock volatility indicates how much and how quickly the price of stock changes. According to Olveny (2012), high volatility can be defined as a condition of market

disruption wherein stocks are not priced fairly, and during which the financial market is not functioning well due to either domestic or international factors. The origin of stock market volatility has long been a topic of considerable interest and concern to policymakers and financial analysts who are keen on learning about time-varying volatility. Policymakers have their interest vested in the main determinants of volatility and its spillover effects on real activities. Policymakers recognise the vulnerability of financial markets by considering market estimates of volatility. Karoyli (2001) highlighted that the existence of excessive volatility, or "noise," in the stock market undermines the usefulness of stock prices as a "signal" about the true intrinsic value of a firm.

3.2.2 Money supply

Monetary aggregates can be used to measure nation's money stock and money supply (Walter,1989). M1 [11]is the most narrowly defined monetary aggregate, which is the sum of dollar amounts of currency, nonbank traveller's cheques in circulation and checkable deposits. M2[12] is broader than M1 as it contains all the elements of M1 as well as savings and small-time deposits , overnight Eurodollar deposits ,overnight repurchase agreements, general-purpose and broker/dealer fund balances and money market deposit accounts. M3 is the sum of M2 in addition to term repurchase agreements, term Eurodollar deposits, large time deposits and balances in money market funds employed solely by institutional investors. Here, money supply signifies M3, which is the comprehensive form of the money supply. Within the context of this thesis, M3 has been incorporated for research purposes. The definition of M3 [13]emphasizes money as a store of value more than a medium of exchange, and it includes less-liquid assets in M3. Economists refer to M3 as the entire money supply within an economy, used by governments to direct policy and control inflation over medium and long-term periods.

Walter (1989) also mentioned that changes in inflation and changes in interest rates result from changes in monetary supply. However, Reilly and Brown (2003) argue that disequilibrium in the money supply over a short-term period can impact the ease of capital markets. Also, sudden changes in money supply tend to affect the nominal risk-free rate. A tightening in monetary

[11] Available at: https://www.federalreserve.gov/releases/h6/Current/

[12] Available at: https://www.federalreserve.gov/releases/h6/Current/

[13] Available at: https://www.federalreserve.gov/releases/h6/Current/

policy indicates a decrease in money supply growth and consequently, a decline in supply of capital and an increase in interest rates. Rise in interest rates will cause an increase in savings and a decrease in the demand for capital. Eventually, it will push the market back to equilibrium.

Numerous studies have linked monetary policies to stock markets, and some studies found a stock price movement as result of past movements in money supply and expected changes within monetary policies (Maitra and Mukhopadhyay, 2011). The Keynesian model suggests that IS-LM framework dictates the movements of stock returns resulting from changes in a monetary and fiscal policies . Antwi, Mills and Zhao (2013) suggest that changes in fiscal or monetary policy instantly translated into market interest rates which induces investors to re-evaluate their portfolio decisions which eventually affects the stock market.

The contrary school of thought suggested fiscal policies and activities does not influence Stock market. Barnor (2014) advised that changes in the money supply have been considered as one of the risk factors to stock returns. Additionally, he proposed that investment profits could be maximised by exploiting relevant published monetary data. Jensen and Mercer (2002) propound that security prices immediately reflects the investor's expectations on money supply without having to wait for new monetary policies in effect. Nevertheless, there has been contradicting views of monetary policies on the stock market. Another way of viewing the linkage between monetary policy and stock market is via changes in interest rates (prime rates) as proposed by Pierdzioch, Rulke and Stadtman (2011). The central bank implements the monetary policies by using Market Interest rate as the mechanism to increase or decrease the supply of money within the nation, hence change in Interest rates induces investors to adjust their portfolios, which can eventually affect the prices of the stocks accordingly. On the other hand, Tobin (1969) discovered a direct linkage between monetary policy and stock market activity and stressed on the importance of stock returns as a connection between the real and financial sides of an economy. The Efficient Market Hypothesis (EMH) is a theoretical underpinning for this research. Considering the two countries used for this research (India and US), they both publish their data about money supply. Using past data to predict changes in money supply will allow stock prices to adjust accordingly i.e. the stock prices will reflect the new information before official announcement as suggested by Dovern and Welser(2011).

3.2.3 Inflation

Neo-classical economists defined inflation can be defined as an increase in price levels. As prices increase or inflation occurs, individual purchasing power decreases as there are fewer goods and services with each unit of income. Based on the premise that consumer price index measures inflation, Talla (2013) stated Inflation can either have direct or indirect relationship with stock market. Additionally, the study confirmed that either unexpected or expected inflation governs the direction of the relationship between the stock market and inflation. A typical scenario which depicts the relationship between stock prices and inflation would be an instance wherein demand exceeds supply, in which case companies tend to increase their prices. Consequently, this increases their earnings, leading to an increase in dividends paid, resulting in an increase in demand for the firms' stocks and ultimately increasing their stock value.

Also, when inflation rises, nominal interest rates tend to grow. The increasing nominal interest rate will reduce the present value of income generated by companies as the discount rate used to calculate the intrinsic value increases, which will result in a decrease in stock prices. Furthermore, if the price elasticity of demand for any company's product is high, the rise in price will push the sales down hence negatively affecting the stock price of that company. On the other hand, unexpected inflation leads to an increase in costs of living which ultimately leads people to consume more and invest less. Consequently, this reduces the demand for stocks for investment purposes.

Economic theories indicate the existence of a relationship between inflation rates and stock market returns. However, some studies have suggested the weak causal link between inflation and stock returns as discussed in chapter two. On the other hand, A well-known Fisher Hypothesis proposed in Fisher (1930) asserted that the nominal interest rate consists of a real rate plus the expected inflation rate. The expected real interest rate is driven by real factors such as productivity of capital and time preference of savers. If the hypothesis is correct, then there may be no change in inflation and nominal stock returns since stock returns can hedge against inflation. Moreover, Poon and Tong (2009) suggested that the movement in inflation has weak predictability on stock returns and stock volatility. This poses dilemma for author and yearn to establish whether any relationship exist between the two or not.

Patra and Poshakwale (2006) suggested three different possibilities of inflation and stock returns association which can vary from country and different time periods. Firstly, the study

suggested that there is no correlation between inflation and stock market returns. Secondly, the authors highlighted negative correlation between inflation and stock returns, which contrasts with the generalized Fisher hypothesis. Thirdly, the study reveals a positive relationship between stock market returns and inflation which is consistent with the generalized Fisher hypothesis. According to Al-Khazali (2004), the generalised Fisher hypothesis within the context of stock returns is real rates of return on common stocks and the expected inflation rate, which are independent. Also, nominal stock returns vary in a one-to-one correspondence with the expected inflation rate. Schwert (1989) concluded inflation and real output have a very less or weak contribution in explaining the changes in stock market in his classic paper which investigated the relationship between stock market volatility and volatility of real and nominal macroeconomic variables.

Most studies reveal that inflation had a negative impaction on stock returns. Liljeblom et al. (1997) also propounded that the Finnish stock market was affected by inflation. According to Rapach et al. (2005), predictability of inflation is limited. Conversely, Yaya and Shittu (2010) suggest that previous inflation rates have significant effects on conditional stock market volatility. Despite each of these researches signifies a clashing relationship between inflation and stock returns, the literature strongly asserts that inflation plays a role in determining the movement of stock returns and that there is some connection between the two variables. Such a link could be either negative or positive as it varies with different data as well as indicates the impact of inflation on stock market volatility.

3.2.4 Gross Domestic Product (GDP)

Gross Domestic Product (GDP) represents the value of all goods and services produced in a nation per year and indicates the economic health of a country. The total value of services and goods produced over a period represents the GDP and GDP is usually expressed as a comparison to previous year. When companies have lower earnings, it translates into lower stock prices. Alongside policymakers, Investors also closely monitor the movements of GDP when making investment decisions. Investors, big corporations, policymakers desperately wait for GDP reports as they provide the most comprehensive description of the overall health of the economy. A positive GDP meaning the strong economic conditions and vice-versa, and the growth GDP reflects growth in corporate profits, which is eventually reflected in stock market performance. According to Supply-side models, the GDP growth of the underlying economy flows to shareholders in three steps. Firstly, growth in GDP transforms into corporate profit

growth which results in high earnings per share (EPS) growth and ultimately increases stock prices. Several studies have examined whether countries with higher long-term real GDP growth also had higher long-term real stock market returns and they confirmed the relationship between stock returns and GDP (Dimson et al., 2002; Ritter, 2005). At times, growth in economy is not always transmitted into increased stock return and despite that, there is a still positive correlation between them because Growing economies give confidence to people and make them feel better in general which promotes more spending and borrowing which is then reflected in higher stock prices.

Economists have classified GDP into two categories which are real and nominal GDP. Nominal GDP measures the country's economic output without making any adjustment to inflation and Real GDP measures economic output after adjusting for inflation which is basicallcalculated by dividing the nominal GDP by implicit price deflator or GDP deflator[14]. When the prices of goods and services increasing, Real GDP is lower than the nominal GDP which is due to increasing price of goods and services. To measure the increase in production, we need to eliminate increase in price from the calculation. Hence, for this reason, real GDP is preferable over nominal GDP.

Carlstrom et al. (2002) stated that stock prices and future Real GDP growth are related, as an announcement on future Real GDP tends to cause price changes within the stock market today. Several Researchers confirms that GDP (Increasing or decreasing) defines the state of the economy (strong or weak) which is a fundamental factor in driving the corporations profitability (High or low) by influencing the expected earnings and dividend pay-outs (high or low) which then result in stock price fluctuations (Fama, 1990; Liua and Sinclair, 2008; Oskooee, 2010). This explanation suggests that while stock prices are used to predict future economic activity, the actual causality is from GDP growth in current stock prices. According to Rousseau and Vuthipadadorn (2005), the relationship between financial markets and GDP growth highlights the fact that the development of the financial sector can be driven by the increase in the demand for financial services due to economic growth. Inadvertently, this implies growth in GDP. Hence, it will be relevant to include GDP as one of the explanatory variables to predict stock returns and their volatility. Thus, it will be interesting to establish the

[14] includes government goods, investment goods, and exports rather than the traditional consumer-oriented basket of goods

behaviour of stock volatility in India and the US with changes in macroeconomic factors such as GDP.

In relation to stock return volatility, Diebold and Yilmaz (2008) established a unidirectional causality from GDP volatility to stock market volatility. While Leon and Filis (2008) indicated that GDP shocks offset stock market volatility and highlighted that in some instances volatility in financial market can result in increased shocks in GDP. In the same light, Ahn and Lee (2006) further suggested that high volatility in the stock market usually drives the volatility in the output sector and vice versa. Consequently, this study will confirm previous findings within the analysis section of Chapter five using the ARCH and GARCH models.

3.2.5 Interest Rate

Reilly and Brown (2003) define the interest rate as the rate of exchange between future and current consumption. The difference between the rate on borrowing money and rate on receiving money from savings is referred to as the pure time value of money. Where investors perceive an increase in inflation, implying future prices will increase, then investors will demand higher rates of return which will comprise of the pure time value of money and expected inflation rates. Additionally, investors need interest rates on top of the pure time value of money, plus the expected inflation rate to counterweigh the uncertainty. Interest rate is classed as a key macroeconomic variable and has a significant role in determining economic growth. Finance theory explains the interest rate as a measurement of the time value of money, which is one of the main determinants of stock prices. As such, interest rates may be influenced by stock prices through several channels.

Firstly, movements in interest rates have a direct effect on the discount rate, which is used in standard equity valuation models, ultimately affecting share prices. Secondly, interest rate fluctuations affect the cost of financing. This implies that for a borrower, the interest rate is basically the cost of borrowing money, while for a lender, the interest rate is the gain from lending money. Investors are very keen on knowing what future interest rate changes are likely to happen, which can help them forecast stock prices. Understanding any changes in interest rates allows investors to manage their positions in portfolios. Policymakers closely monitor stock market reactions due to interest rate changes and such reactions serve as a barometer to understand future stock market activity. Changes in interest rate can affect investor’s returns as stocks prices react very quickly to changes in interest rates. Additionally, understanding the

changes in economic environment provides academic scholars with extra information on the application of the methodology to identify the dynamic relationship between variables.

Theoretically, interest rates have a negative association with stock prices or stock returns. For instance, when banks increase their interest rates, investors tend to move their funds from the capital market to the banks. This eventually decreases the demand for shares and vice-versa. Another instance depicting a negative relationship between stock prices and interest rates is when banks increase their rates, denoting an increase in borrowing rates which will have a negative impact on investment as corporations would find it expensive to invest. Hence, the stock prices of such corporations will decrease and vice-versa. Similarly, the Neoclassical theory suggests that an increase in interest rates will increase the cost of loans for investment. Therefore, investments within the economy will drop , also suggested the same by Khan and Mahmood (2013).

Many studies have confirmed this inverse relationship, and the empirical findings have reported an interest rate sensitivity to stock market returns (Barnor, 2014). In contrast, some studies have reported a direct relationship between stock returns and interest rates (Titman and Warga, 1989). It has been observed that while the relationship between interest rates and the bond market is direct, interest rate sensitivity to stock returns has been inconsistent and indirect (Park and Paul Choi 2011). The sensitivity of stock prices and stock returns due to interest rates has been widely documented and studied both theoretically and empirically in many countries. Major Findings have revealed that stock market is influenced by interest rate changes to a great extent by applying single factor methodology as well as multivariate approach.

3.3 Broad Model

This section will illustrate the selected framework used to design this research. As seen below in Figure 5, macroeconomic factors connect to stock returns and stock return volatilities using arrow direction. This research examines domestic macroeconomic factors to ascertain stock returns and their volatilities. Though factors such as wars, terrorism and political instability also contribute towards volatility in stock markets, these factors are not quantifiable (Gunay, 2016; Essaddam and Karagianis, 2014). Therefore, this study will currently focus on measurable factors and possibly incorporate unquantifiable elements for future research.

Previously, some researchers have compiled large numbers of explanatory variables that affect stock returns. However, this research has narrowed down the model by using four macroeconomic variables to avoid contradictory findings, as established in the literature review. For instance, Kadir (2008) concluded that industrial production, money supply, and oil prices show no significant influence on stock returns in Turkey. On the contrary, Semra and Ayhan (2010) suggest that industrial production shows a significant short and long-term impact on the stock market within the same country.

Therefore, this research proposes four in-house variables which are also known as key indicators that portray the current status of a nation. Any announcements and events on these factors are monitored by almost everyone in the financial market and ultimately affects the stock market significantly. It is essential to highlight the fact that the foundation of this study's conceptual framework has relied on the Arbitrage Pricing Theory (APT), which proposes that the expected return of a financial asset can be modelled as a linear function of various factors.

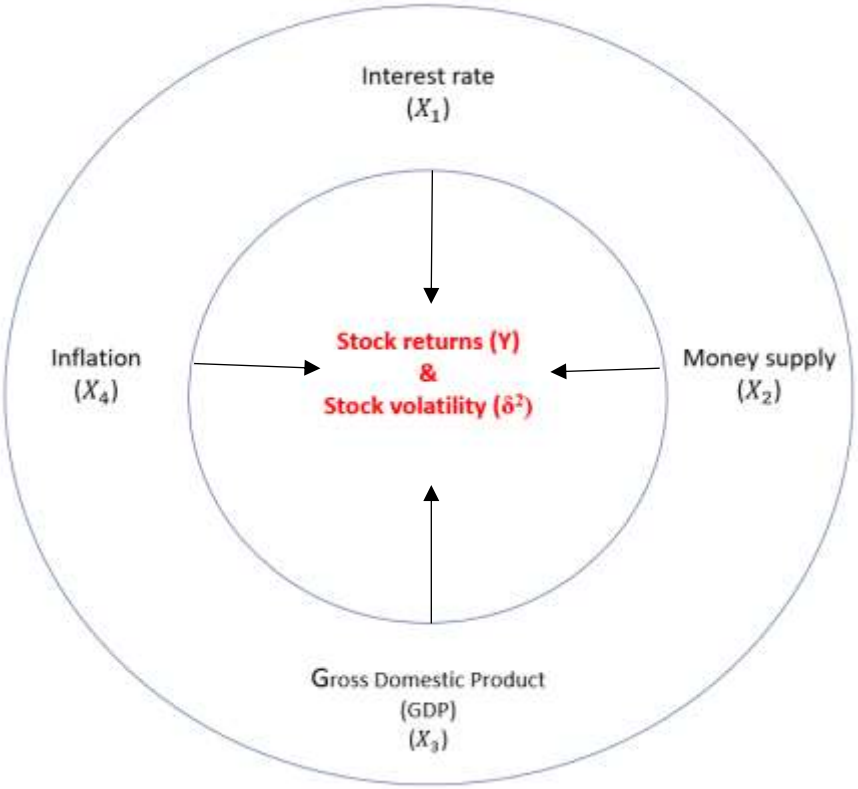


Figure 4: Graphical representation of the linkage between stock returns and stock volatility with MACROECONOMIC VARIABLES

Although causation flows bi-directionally i.e. Stock market has an impact on the real economy as suggested by McKinnon Supply leading theory (1973), this study, however, aims to focus on unidirectional i.e. the impact of macroeconomic variables on the stock market as suggested by the arrows directly pointing to the dependent variables It must be noted that causality flows among the explanatory variables and appropriate measures have been adopted to increase the reliability of statistical tests in section 5.9. However, the study aims to focus on the impact of economic variables on the stock market. The above Figure 4 demonstrates four intervening independent variables (X_1, X_2, X_3, X_4) which represent domestic macroeconomic variables, whereas (Y) and $(\delta^2)$are dependent variables representing stock returns and stock volatility, respectively. The model above suggests the equation below:

$$Y = f(X_1, X_2, X_3, X_4) \quad (3.1)$$

$$\delta^2 = f(X_1, X_2, X_3, X_4) \quad (3.2)$$

Where Y represents stock returns and δ^2 represents stock volatility of India and USA. Here, (δ^2) is a variance of stock returns which is also used as a measure of volatility (Saha, 2017).

f Denotes function of

X_1 Represents interest rates of India and US

X_2 Represents Money supply of India and US

X_3 Represents Gross Domestic Product of India and US

X_4 Represents Inflation of India and US

The equation 3.1 has enabled the researcher to develop a research hypothesis presented below, which will further help to determine the relationship between the selected variables using ARDL technique. The dynamic influence of independent variables on other variables occurs over multiple periods instead of a single period, therefore ARDL model has been adopted to address the changes in the distributed lags of macroeconomic factors and the associated impact on stock returns. The model has been extensively explained in chapter four under section 4.6.5 and subsequently Statistical analysis is covered in chapter five under section 5.10.

On the other hand, Volatility in financial markets is not constant, instead it is always changing which is not well explained by the standard random walk models, therefore it requires more sophisticated models to capture the time-varying volatility. In equation 3.2, the stock returns' volatility is captured using GARCH technique where Volatility is a function of macroeconomic variables in our model. The statistical model captures the time-varying volatility based on its lagged values as well as the combined effect of macroeconomic variables in explaining the volatility of India and US stock markets. We have specified the GARCH model as well as the p and q parameters of GARCH model in chapter four (4.9.4) and subsequently findings from GARCH modelling is presented 5.15

H_{01}: Macroeconomic variables do not contribute to Stock returns Volatility

H_{A1}: Macroeconomic variables contribute to stock return Volatility.

H_{02}: Macroeconomic variables do not influence the Stock return movements.

H_{A2}: Macroeconomic variables influence the stock return movements.

3.4 Summary

As illustrated above, this chapter has examined how macroeconomic variables, stock returns and stock volatility are conceptualised. A graphical representation of the linkage between these variables has equally been provided. Moreover, variables which influence stock returns and their volatility have been briefly examined within this section as well as reasons for maintaining such a model. The following chapter will discuss the research philosophy of this study, justification of variables and selected methodology that will be used to unveil the relationship between these macroeconomic factors.

CHAPTER FOUR

RESEARCH METHODOLOGY

4.1 Introduction

The preceding chapters have provided an extensive review on stock market behaviour in India, the US and a few other countries. The theoretical and conceptual framework of this research has equally been presented. More specifically, this research aims to empower analysts with the ability to predict the behaviour of two distinct markets (India and the US) which is likely to be affected by the change in macroeconomic variables. This will assist investors in decision-making when purchasing or selling their shares based on the movement of macroeconomic variables. Therefore, to study the impact of macroeconomic variables on stock returns and stock volatility, it is imperative to employ tools and techniques using time series econometrics. This chapter will highlight the quantitative methodology employed by the researcher in chronological order.

Another important aspect of this research is the choice and rationale of selected macroeconomic variables, all of which will be covered within this chapter. As earlier mentioned, the APT framework has been silent on the selection of macroeconomic variables. Hence, the researcher has independently reviewed the variables and provided justifications below. However, the Discounted Cash flow (DCF) framework helps in the selection of macroeconomic variables to a certain extent. According to the DCF theory, asset prices are a function of cash flows and discount rates which provide direction to the researcher. This chapter is mainly divided into two sections. The first section of this chapter will outline the selected research design which consists of the research philosophy, research approach, choice of methods, time horizon, justification of variables and various techniques adopted for this research. In the later sections, distinct econometric tests will be employed, including data collection and analyses which are required for this type of research.

It is crucial to establish the research design as it projects the methodology of a study which guides the researcher in addressing the research aims and objectives and make it convenient for readers to grasp the research approach. Thus, there is a need to outline the selected

framework to guide the research work to completion. The research framework comprises of the research philosophy, approach, time horizon, as well as the relevant techniques. Here, the research philosophy will justify the choice of research technique employed.

4.2 Research Philosophies

Research philosophy is a way of seeing the world that frames a research topic and influences the way one thinks about a subject (Hughes, 2001). This chapter provides a brief description of two ontological positions, namely, constructivism and positivism. Bryman (2012) describes positivism as empiricism, while constructivism is interpretivism. The choice of research philosophy suitable for research depends solely on the knowledge that the study seeks to reveal.

4.2.1 Constructivism

This research paradigm was introduced by a group of German philosophers, namely, Wilhelm Dilthey and Edmund Husserl. In their study called Hermeneutics, which was mainly an interpretative understanding of a subject. Later, this idea was adopted by researchers to understand historical documents and information which the author intends to communicate while recognising the cultural context within which such documents were drafted.

In summary, Hermeneutics is a way of interpreting the meaning of something from a particular viewpoint. According to Schwandt (2000), this paradigm assumes that any new knowledge proposed is socially constructed and thus requires an active research process. He propounds that ‘research is a product of the value of a researcher; hence researchers cannot be independent of it’. On the other hand, Lincoln and Guba (1989) suggested, ‘Constructivism does not support the existence of an objective reality, as it assumes that realities are merely social constructions of the mind and there are as many constructions as there are human minds and some constructions are shared’. The fundamental belief of different authors serves as the basis for constructivism as it emphasizes the personal interrelationship between participants and the researcher.

4.2.2 Positivism

This philosophical idea was introduced by a French philosopher, Auguste Comte in the 19th century who proposed that scientific knowledge is the only means to reveal the truth about reality. Comte emphasized reason and observation as a means of understanding human behaviour (Murzi, 2010). Later in the 20th century, this theory was formally established, as a dominant scientific method. The underlying belief of positivism is quantifiable observations which often require statistical analysis. Positivists assert that real events can be explained using logical analysis after an observation is done empirically. In other words, positivists are similar to empiricists who assume that knowledge is derived from human experiences. According to this theory, positivists perceive researchers as independent groups of people whose study is not affected by human opinions and interests. Here, independence is referred to as minimal or no interaction with others while research is on-going. According to Crowther and Lancaster (2008), positivists employ a deductive approach, which is basically "developing a hypothesis (or hypotheses) based on existing theories, and then designing a research strategy to test the hypothesis". Based on this philosophical position, this research is hinged on facts that are derived from data collection through the application of statistical techniques.

4.3 Research Approach, Strategy, Time horizon and Data type

As mentioned in the preceding section, this research is hinged on the concept of Positivism and employs a deductive approach. In line with this research approach, this study will formulate hypotheses/questions based on existing theories and will go further to develop a plan which will be tested (Silverman, 2013). Consequently, the structure of the thesis takes into account the deductive approach and positivist theory which is concerned with investigating whether an observed phenomenon matches expectations when compared to previous research on the same subject. A deductive approach is another form of Positivism as it allows statistical testing and research hypotheses to be formulated to an accepted level of probability. According to Kothari (2004), a deductive approach could enable the researcher to move from general to specific knowledge as well as test acquired knowledge-based theories.

In line with Robson (2002), the selected research strategy has been described below for readers' convenience:

- Deduce testable question/hypothesis about the relationship between variables
- Express how variables can be measured

- Test the variables using one or more techniques
- Examine specific outcomes of the inquiry to confirm the theory or to suggest a modification
- Modification of theory and verification by going over the cycle again

Concerning the time frame within which this research has been conducted, a **longitudinal approach** was adopted during the data collection process as the data was repeatedly collected over an extended period. The researcher examined the same data set for any changes over a period of time, and this ultimately enables the researcher to analyse any changes in the variables. The data type selected for this research is secondary data, which is basically derived from other people's archives or opinions and is not collected directly by the research user (Newman, 1998). Secondary data is mainly derived from organisational records, government archives, organisations' annual progress reports and search engine platforms. As used in this research, collecting secondary data helps researchers to save time and focus on other things as the data is readily available from data streams, which would otherwise have been impossible for the researcher to obtain directly from countries and government offices.

4.4 Data base

The data selected for this research was conducted by studying a part of the population. In other words, the researcher used a sample of the population for quantitative analysis, even though studying the whole population is equally important. However, the researcher implemented purposive sampling, which consists of deliberately selecting the sample period. The decade, 2007-2017 witnessed complex economic conditions such as Global Crisis, US Biggest Presidential Election in 2012, Eurozone Debt crisis in 2012 which created a havoc in the world economy etc which highlights the importance of gauging the impact on Financial Markets. Following the Great Recession in late 2007, the stock market made a tremendous comeback by 2012, and the financial markets were slowly regaining its momentum. Therefore, this period is of significant interest to the researcher as it is highly relevant within the context of this study. Also, this study seeks to fill existing gaps in the literature by covering the selected period. The main rationale behind employing the monthly data from January 2007- December 2017 to capture the effect of structural changes during this period and during this period- which was due to he increased government intervention to calm down the aftereffects of Global crisis. On the other note- this period fulfils the criteria to employ time-series analysis. Green (1991)

suggested a guideline which uses as formula *(N > 50+8K)* to calculate the ideal number of observations for time series analysis. Here, *K* is the number of predictors which is 4 and *N* is 120. According to the guideline, by substituting this formula, (120 > 50 + (8 x 4) which is (120 > 82), the number of observations is ideal and suggests that the results from monthly observations would not have deviated significantly within the time frame of one month in the case of more frequent observations (weekly or daily). The period gives us total of 120 observations which fulfils the criteria to employ time series analysis such as ARDL, GARCH modelling and other econometric tests.

Given the fact that data on financial and economic variables can only be accessed through secondary resources, this study has examined secondary data sources. The tables below (3 and 4) have specified the source of each macroeconomic variable and stock return for India and the US. All the variables gathered will be converted into a natural logarithm form except US Treasury Bills and interest rates and money supply for India. Given the fact that this research is centred on evaluating stock returns, it is appropriate to use monthly data for the variables. Although stock returns can be obtained on weekly and daily frequency. The study has adopted the stock return data monthly would make more sense for this research as most of the data on macroeconomic variables are recorded on a monthly, quarterly or yearly basis.

VARIABLES	**SYMBOL**	**DESCRIPTION**	**SOURCE**	**FORM**
S&P 500	RETURNS	Weighted index of 500	Available at: Bloomberg Professional https://www.bloomberg.com/professional/	Percentage
Consumer Price Index	CPI	Also named as Inflation	Available at: Federal Reserve Bank of St Louis http://research.stlouisfed.org	Percentage

Money Supply	LM3	It is the Total currency in circulation including savings	Available at: Federal Reserve Bank of St Louis http://research.stlouisfed.org	Natural Logarithm
Industrial Production	INDPRO	It is the real output or Gross domestic Product	Available at: Federal Reserve Bank of St Louis http://research.stlouisfed.org	Natural Logarithm
Treasury Bill	TB	It is used to measure Interest rate movements and rate paid on government securities.	Available at: Federal Reserve Bank of St Louis http://research.stlouisfed.org	Percentage

TABLE 3: SUMMARY OF VARIABLES, DESCRIPTION AND SOURCES AND FORM FOR USA

VARIABLES	**SYMBOL**	**DESCRIPTION**	**SOURCE**	**FORM**
BSE Sensex	RETURNS	Free float market weighted index of 30	Available at: Bloomberg Professional https://www.bloomberg.com/professional/	Percentage

Consumer Price Index	CPI	Also named as Inflation	Available at: Federal Reserve Bank of St Louis http://research.stlouisfed.org	Percentage
Broad Money supply	LM3	Total currency in circulation	Available at: Federal Reserve Bank of St Louis http://research.stlouisfed.org	Natural Logarithm
Industrial Production	I P	It is the real output or Gross domestic product	Available at: Federal Reserve Bank of St Louis http://research.stlouisfed.org	Natural Logarithm
Interest Rate	IR	Discount Rate	Available at: Federal Reserve Bank of St Louis http://research.stlouisfed.org	Percentage

TABLE 4: SUMMARY OF VARIABLES, DESCRIPTION AND SOURCES AND FORM FOR INDIA

4.5 Selection of Macroeconomic Variables and the Rationale behind

4.5.1 Standard and Poor 500 (S&P 500)

This index is one of the renowned index which captures the overall US stock market. The index is market-weighted index of large-cap 500 companies, whose shares are actively traded in the U.S. Within the global market, S&P 500 is regarded as a leading indicator reflecting the risk/return associated with domestic US markets as well as international investments worldwide. Hence, this index serves as an appropriated index to represent a developed economy which will further help to accomplish one of the objectives of this research, to provide a comparative study between developed and developing economies. Given the fact that this research is looking to investigate the relationship between US stock returns and macroeconomic variables, there is a need to use the indices of the New York Stock Exchange and S&P 500 is one of them. According to Atipaga (2014), most of the academic papers on the

US stock market employed S&P 500 as the index as illustrated within Chapter two of this study. Besides, several empirical studies have been conducted to this effect (Hondroyiannis and Papapetrou, 2001; Ratanapakorn and Sharma, 2007; Rahman and Mustafa, 2008; Sirucek, 2012).

4.5.2 BSE Sensex

BSE Sensex is a free float market-weighted index of 30 well established and financially sound companies which are actively traded stocks representing several industrial sectors within the Indian economy. According to Saha (2017), the BSE Sensex is regarded as the pulse of the domestic stock market in India since 1st January 1986. The index uses monthly closing/average prices. This index is officially known as S&P BSE Sensex, also referred to as BSE30 or simply Sensex. The base value of the S&P BSE Sensex is taken as 100 since the 1st April 1979, and it's base year as 1978–79. As mentioned earlier, the index values are calculated using a free-float weighted methodology, which is a widely followed index methodology and used by several global equity indices such as the MSCI, FTSE, and Dow Jones. According to Atipaga (2014), booms and busts of the Indian equity market can be identified through the S&P BSE SENSEX. This index is not only the oldest in India but has equally become one of the most prominent brands in the country.

4.5.3 Money Supply (M3)

The concept of broad money supply will serve as a proxy for monetary policies which is a fundamental macroeconomic variable in an economy. This portfolio theory suggests that increasing the money supply will shift the portfolio from non-interest-bearing money assets to financial assets like shares or equities which will result in a demand for shares and consequently the share prices will increase. The relationship between money supply and stock prices has been widely discussed in previous literature on economics. Despite extensive reviews on this topic, the relationship between stock returns/stock prices and money supply is yet very unclear as every study suggests contrary conclusions. Saha (2017) suggested Broad Money (M3) has been considered as a proxy for money supply. In economics, the broad money supply is a suitable indicatory to represent monetary policy as it more than just physical money such as currency and coins (also known as narrow money). It generally comprises demand deposits at commercial banks, and any cash held in easily accessible accounts. Several studies have used

money supply in their investigation to represent monetary supply (Fama, 1981; Mukherjee and Naka, 1995; Maysami et al., 2004; Ratanapakorn and Sharma, 2007; Humpe and Macmillan, 2007; Rahman et al., 2009).

4.5.4 Interest rate

Here, discount or borrowing rates will be used as a proxy for interest rates. According to Alam and Uddin (2009), interest rates may be considered from either the lender or borrower's point of view. To a borrower, it is the fee that lenders pay to borrow money over a period of time and the fee is referred to as the borrowing rate. On the other hand, it is the fee that is charged by a lender for lending money which is also known as the lending rate. As interest rates increase, companies have to pay higher interest rates on their debts which eventually influences company profits and impacts on the shareholder's wealth. The cost of borrowing tends to increase when there is an increase in interest rates, which further reduces the expected returns of the firm. When interest rates decrease, the cost of borrowing serves as an incentive for companies to expand and concentrate on profitability, thereby increasing the expected returns of the firm. the 91day Treasury bill will represent the Interest rate for US as treasury bill rate are percieved as a good measure of interest rates because it serves as an opportunity cost for holding shares (Atipaga, 2014). Many researchers employed Treasury Bill rate as a proxy of Interest rate , for instance Chen et al. (1986) and Fifield et al. (2002) provided evidence on the relationship between stock market returns and interest rates using Treasury bill rates to represent interest rates. On the other hand, a short-term interest rate has been employed for India, which is a weighted average of call money rate. Again, this rate accounts for all fundamental changes in the economy (Saha 2017). According to Bernanke (2003), an increase in interest rates tends to lower stock prices as investor use interest rates to discount future dividends. Also, higher interest rates will subsequently provide less value to future dividends which results in share price to drop. Nevertheless, increase in Interest rate will entice investors to shift their investments to fixed term securities which will reduce the prices of stocks.

4.5.5 Inflation

The relationship between stock markets and inflation has always been a contradictory debate, both theoretically and empirically (Pradhan et al. 2015). The impact of inflation on stock prices is empirically mixed in nature. A negative correlation has been highlighted between inflation

and stock market prices or returns (Fama, 1981; Chen, Roll and Ross. , 1986; Mukherjee and Naka, 1995; Pal and Mittal, 2011). Fama (1981) propounds that real activity has a positive relationship with stock returns and has a negative relationship with inflation due to the money demand theory. Another explanation of the negative relationship between inflation and stock returns can be justified using the dividend discount model. According to the model, stock prices are seen as discounted future dividends and increase in inflation tends to increase the nominal risk-free rate and eventually discount rate results in a drop in stock prices. This induces investors to shift their portfolios from equity investments to real estates, where inflation increases higher than expected (Hatemi-J and Morgan, 2009). Ratanapakorn and Sharma (2007) have confirmed contrary opinions in their empirical studies that there is a positive relationship between inflation and stock returns suggesting that equity acts as a hedge against inflation. The empirical evidence on the hypothesis that the stock market is a complete hedge against inflation is mixed. This research will incorporate the consumer price index (CPI) to represent inflation. CPI is calculated by comparing the price of a fixed basket of goods and services of two different periods. The investors use Consumer price index which reflects inflation to estimate their expected future nominal returns to meet their financial goals. (Kaifosh, 2018).

4.5.6 Gross Domestic Product (GDP)

The past studies have suggested that GDP acts as a leading indicator of stock market movements, meaning that growth in GDP leads to stock market growth in subsequent periods (Glen, 2002; Taulbee, 2001; Bilson et al., 2001; Ritter, 2004). The traditional measure of real economic activity is GDP and is regarded as a crucial determinant of stock market returns. Economic growth is the sum of real economic activities that increases based on the values of real assets and how it affects stock markets positively (Saha, 2017). One of the shortcomings of considering the GDP in this research is the frequency of data as GDP figures are published quarterly. Hence, we will use the Index of Industrial Production (IIP) as it measures the performance of the economy over a period and represents GDP. The increase in IIP indicates the rise in economic growth, consequently affecting stock prices positively due to a rise in corporate earnings. This results in companies paying higher dividends. With the expectation of higher dividend, investors get encouraged to buy shares at higher prices. This leads to an increase in investment within the stock market which ultimately enhances stock prices. The opposite will cause a fall in the IIP. Several studies have found a positive relationship between

IIP and stock prices (Chen, Roll and Ross, 1986; Maysami and Koh, 2000; Rahman et al., 2009; Ratanapakorn and Sharma, 2007). Findings from these studies suggest that IIP is a viable proxy for GDP. Also, a positive relationship is expected between stock prices and IIP, based on past empirical studies.

4.6 Econometric Methodology

An analysis on the impact of selected macroeconomic variables shall be conducted on the stock market, using Time series data. We need to apply several tests which are explained in detail within this section. One of the most essential tools used by economists is regression analysis which is used to understand the relationship between two or more variables. The test is beneficial when many variables and their interactions are examined and widely used by researchers. Simple regression analysis is used in exploring the relationship between two variables, where one variable is dependent and the other explanatory. On the other hand, multiple regression involves more than one explanatory variable. Another method is the Ordinary Least Square (OLS), which is the most common estimator of the regression model. The OLS model has been criticized by Liu and Kuo (2016), who argued that OLS estimation ignores three major statistical problems, namely, predictor endogeneity, persistence, and heteroskedasticity. This position was later confirmed by Phan et al. (2015a), who explained that other models such as VECM and VAR produce different results. If the development of regression analysis had addressed the problems in Economics and Finance, there would be no need for statisticians and econometricians to develop new methods to serve the same purpose. Therefore, this research will incorporate multiple statistical and descriptive tests to analyse the relationship between the variables to conclude.

This research strictly applied the Time series model, which is mainly used for forecasting and making predictions from past observations. In addition to Time series data, there are two other types of data sets which are cross-sectional and panel data. Cross-sectional data involves data on many subjects at the same time while Panel data comprises of observations of multiple phenomena taken over various periods for the same subjects. This research is based on the principle of ‘forward-looking’, which describes the ability to predict the future or make assumptions about future periods based on historical data which can only be obtained using Time series data. One of the challenges faced in the process of using Time series data is that Time series observations are expected to contain seasonality, consisting of cyclical movements

that recur monthly or quarterly which need to be taken care of through adjustment processes. Thus, there is a need for the removal of such cyclical movements from the series to create a new time series without cyclical effects.

4.6.1 Descriptive statistics

Jarque-Bera Test

Lomnicki (1961) and Jarque and Bera (1987) proposed a test for non-normality based on testing the skewness, the sample mean, standard deviation and kurtosis of a distribution. Denoting the ε_t^s, the standardized true model residuals (i.e. $\varepsilon_t^s = \varepsilon_t \,/\, \sigma_s$), the test checks the following Hypothesis:

H_o: E (ε_t^s)^3 = 0 and H_o: E (ε_t^s)^4 = 3 (4.7.1 a)

H_a: E (ε_t^s)$^3 \neq 0$ and H_a: E (ε_t^s)$^4 \neq 3$ (4.7.1 b)

The test proposes that non-normality be checked if the third and fourth moments of standardizes residuals are consistent with the standard normal distribution. The test static for Lomnicki–Jarque–Bera (LJB) test is stated below

$$LJB = \frac{n}{6}[\, E(\hat{\varepsilon}_t^s)^3]^2 + \frac{n}{24}[\, E(\hat{\varepsilon}_t^s)^4 - 3]^2 \qquad (4.7.1\ c)$$

Here, n represents the number of observations, whereas E($\hat{\varepsilon}_t^s$)^3 measures the skewness of the distribution and [E ($\hat{\varepsilon}_t^s$)^4 measures Kurtosis. The null hypothesis is rejected if LJB is large. If H_o is rejected, the normal distribution is clearly rejected. LJB tests the skewness and kurtosis jointly, hence joint hypothesis is tested. To achieve normal distribution, then skewness = 0 and kurtosis =3. When kurtosis is less than 3, then the distribution is not normal, which implies that a variable distribution on a bell-shaped curve is flat and is known as a Platykurtic distribution. On the other hand, when kurtosis is greater than 3, the variable distribution on a bell-shaped curve is thin and is known as a Leptokurtic distribution.

The standard deviation results reveal the level of variability among macroeconomic variables and stock returns for India and US, as well as the normal distribution of explanatory variables would be checked using p-values at 1%, 5% and 10% level of significance.

Correlation Matrix

The correlation matrix highlights the statistical relationship between variables. The term correlation refers to the statistical association, though it commonly refers to the degree to which a pair of variables are linearly related. We have presented a correlation matrix in our analysis to highlight the rough relationship between variables before performing econometric tests. If the correlation is 1, it implies a perfect direct (increasing) linear relationship (correlation). Conversely, −1 implies a decreasing (inverse) linear relationship between the variables. If the value is closer to zero, it indicates a weak relationship between the variables. The closer the coefficient is to either −1 or 1, the stronger the correlation between the variables. The correlation estimation is presented as follows:

$$\rho X,Y = Correlation\ (X,Y) = \frac{Covariance\ (X,Y)}{\sigma_X \sigma_Y} = \frac{E[(X-\mu_X)((Y-\mu_Y)}{\sigma_X \sigma_Y} \qquad (4.7.1\ d)$$

Here, E is the expected value. According to Pearson, correlation is defined if both standard deviations are finite and positive.

4.6.2 Unit root and stationarity tests

Regressing a time series to another time series by applying Ordinary Least Square (OLS) model could result in a high R^2 and may indicate an insignificant relationship between the time series. Therefore, before any further statistical tests are performed, there is a need to examine the stationarity (unit root) of each time series. In general, most macroeconomic data are non-stationary, which means the series can exhibit a deterministic or stochastic trend. A **stationary (time) series** is one whose statistical properties such as the mean, variance and autocorrelation are all constant over time, while a **non-stationary series** is one whose statistical properties change over time. Since regression analysis requires stationarity in series, it is, therefore, essential to first determine whether the series used in the regression process is a difference stationary or a trend stationary.

The two most common models of non-stationarity are the Random walk model with drift

$$y_t = \mu + y_{t-1} + \mu_t \qquad (4.7.2\ a)$$

and the Trend stationary process

$$y_t = \alpha + \beta_t + \mu_t \qquad (4.7.2\ b)$$

Here μ_t *is* a pure white noise

Most of the economic time series data are non-stationary in their original form and possess trends, cycles, random walk and non-stationary behaviour. The application of logarithms or deflating the series converts the series to a stationary series, and such modified series are referred to as trend stationery. While some time series remains non-stationary despite lagging or deflating, considering different periods tends to solve the non-stationary issue. Possibly, where the time series initially has a time-varying mean, variance and covariance, it will possess statistical characteristics which are constant between periods after de-trending. Such time series is referred to as difference stationery. Where possible, if the time series initially has a time-varying mean, variance and covariance, it will possess statistical characteristics which are constant between periods after de-trending.

Some of the most common unit root tests in econometrics are the Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP), aimed at checking if time series is stationary or not. The ADF and PP tests check the null hypothesis that there is a unit root against the alternative of stationarity of a data generating process that may have a nonzero mean term, a deterministic linear trend, and perhaps seasonal dummy variables.

Augmented Dickey-Fuller (ADF) test

This test is a more general form of the Dickey-Fuller (DF) test, and it is mainly applied when a time series sample is large and complicated. The basic Dickey-Fuller test is only used in the AR (1) process, while the ADF is employed to capture *p* lags. Therefore, it is essential to choose an appropriate lag length for the ADF test. The ADF equation represented below has been applied to the time series.

$$\Delta y_t = \alpha + \beta t + \Upsilon y_{t-1} + \delta_1 \Delta y_{t-1} + \ldots\ldots\ldots + + \delta_p \Delta y_{t-p} + e_t \qquad (4.7.2\ c)$$

Here, α *is* constant while β is the coefficient on a time trend and p is the lag order of the autoregressive process.

Under a null hypothesis, the unit root is realised when $\Upsilon = 0$ and the alternate hypothesis is $\Upsilon < 0$

$$H_o : \Upsilon = 0 \qquad (4.7.2\ d)$$

$$H_1 : \Upsilon < 0 \qquad (4.7.2\ e)$$

The test statistic for this statistic is

$$D\,F_t = \frac{\hat{\Upsilon}}{S\,E\,\hat{\Upsilon}} \qquad (4.7.2\ f)$$

The null hypothesis of a unit root cannot be rejected if the ADF test statistic (*t*-stat) is less than Mackinnon critical *t*-value in absolute form. Hence, this suggests that the time series is non-stationary. Fuller (1976) highlighted critical values and Dickey and Fuller (1981) subsequently developed additional tests. Dickey and Fuller (1979) suggested three different regression equations to test the presence of unit roots which are pure random walk, intercept or drift and thirdly, a model which includes both drift and linear time trend.

Phillips-Perron Test (PP)

The PP test is a modified version of the DF test, based on a non- parametric approach which implies that a serial correlation does not affect its asymptotic distribution. Below is the PP test regression equation.

$$\Delta y_t = \Upsilon y_{t-1} + e_t \qquad (4.7.2\ g)$$

Here, e_t is *I (0)* and may be heteroscedastic. Although PP tests generally produce similar results to ADF, statistical tests of PP are more complex than ADF tests. Nevertheless, PP tests are interpreted in a same manner as ADF tests.

4.6.3 Lag selection criteria

It is necessary to specify the chosen lag order, particularly when running analyses using the VAR model. The procedure for choosing the appropriate lag order is similar to a univariate model. This refers to a model with some pre-specified maximum lag length $p_{max,}$ where a sequential testing procedure is used to determine a suitable order. On the other hand, lag lengths may be chosen using a generalized version which is widely known as Information criteria methods such as Akaike information criterion (AIC), Schwarz-Bayesian information criterion (SIC) and the Hannan-Quinn information criterion (HQIC). Criteria for a VAR (p) model includes the following;

$$AIC(P) = \ln \det\left(\widehat{\sum}_u (p)\right) + 2\,pk^2 / T \qquad (4.7.3\ a)$$

$$SIC(P) = \ln \det\left(\widehat{\sum}_u (p)\right) + pk^2 \ln T / T \qquad (4.7.3\ b)$$

$$HQIC(P) = \ln \det\left(\widehat{\sum}_u (p)\right) + 2pk^2 \ln \ln T / T \qquad (4.7.3\ c)$$

Here $\hat{\sum}_u (p) = \sum_l^T \hat{u}_l \hat{u}_l' / T$ is the residual covariance matrix estimator for VAR (*p)*

The above methods require fitting VAR *(p)* models with order $p= 0,1\ldots\ldots p_{max.}$ They also require choosing an appropriate order for *p* to which the chosen criteria yields the minimum value. It is believed that while *AIC* methods asymptotically overestimate the order with positive probability, *SIC* and *HQIC* estimate the order consistently under quite general conditions thereby producing true orders. According to Paulsen (1984), the results attained through this criterion could be used for co-integrated series I (0) as well as I (1). Research has proposed for some experiment to be conducted on the series with a wide limit of lag numbers, since choosing a short lag may result in misspecifications. However, choosing a long lag may result in losing a degree of freedom. The appropriate lag length is when SBC and HQIC show the lowest values.

4.6.4 Cointegration methodology: Concept

It is widely known that time-series data evolves over time, and as a result, its mean and variance values are not constant (Nelson and Plosser, 1982). Relying on such data may result in spurious conclusions wherein the data may suggest a relationship between two while in reality, it does not result in a type II error. For instance, if y_t and x_t are non-stationary, then a spurious relationship may exist unless the linear combination of the two variables is stationary. It is crucial to de-trend the data or difference the non-stationary data before analysing it. This results in stationary variables but may cause a loss of significant long-term information and may create omitted variables bias (Madala, 2001). However, there is an effective method called the Granger's Representation Theorem (GRT), used to analyse non-stationary data without losing any information due to de-trending and differencing. It is widely known as co-integration.

The idea of cointegration is simple. In a case where y_t and x_t are integrated of order one, then these variables are said to be cointegrated if the linear relationship obtained from regression analysis is integrated at the order of zero, i.e. if they are stationary. Hence, if the condition is met, then y_t and x_t move together in the long run such that they cannot drift arbitrarily far apart from each other as time passes on . According to GRT, short term disequilibrium reletionship between cointegrated time series can be expressed in the error correction model from which it may be seen as a force pushing the residual errors back towards the equilibrium.

The cointegration process requires all the variables to be integrated of order one. The cointegration testing begins with checking the order of integration for all the variables participating in the research analysis. The standard unit root tests explained above (ADF and PP tests) are then applied to each of the macro and financial variables to infer their order of cointegration if the test results indicate that variables are integrated at order one/I(1). In other words, to test for co-integration in a model, the stationarity test is first performed on the error term ε_t, and this is observed using the least square residuals of the error term ($\Delta\hat{\varepsilon}_t$). If the residuals are stationary based on the test conducted, then Y and X are co-integrated. The next step would be to proceed to a cointegration test which is briefly explained in the following section.

4.6.5 ARDL Cointegration Test

In order to empirically analyse the long-relationship between stock returns and economic variables, this study has employed the Auto-regressive Distributed Lag (ARDL) procedure developed by Pesaran et al. (2001). In comparison to other co-integration techniques, this method is simple to apply as it allows the co-integrating relationship to be estimated by OLS once the Lag order is chosen. This method relies on the bound test procedure which examines the relationship between the variables and does not require the variables to be integrated in the same order, contrary to the positions of Johansen and Juselius (1992) and Engle and Granger (1987). However, the ARDL approach cannot be applied if the series are integrated at the order I(2). The Error correction model defines short-term dynamics with long-term equilibrium without losing long-term information. The following equation is the unrestricted Error correction model of the ARDL approach which empirically tests the long-term and short-term relationships between the variables for the US and India, in the following form:

$$\Delta RETURNS = \delta_0 + \delta_1 T + \delta_2 LM3_{t-1} + \delta_3 INDPRO_{t-1} + \delta_4 CPI_{t-1} + \delta_5 TB_{t-1} + \sum_{i=1}^{q} \alpha_i \Delta RETURNS_{t-i} + \sum_{i=1}^{q} \beta_i \Delta LM3_{t-i} + \sum_{i=1}^{q} \mu_i \Delta INDPRO_{t-i} + \sum_{i=1}^{q} \sigma_i \Delta CPI_{t-i} + \sum_{i=1}^{q} \omega_i \Delta TB_{t-i} + \varepsilon_t \quad (4.7.5\ a)$$

$$\Delta RETURNS = \delta_0 + \delta_1 T + \delta_2 LM3_{t-1} + \delta_3 INDPRO_{t-1} + \delta_4 CPI_{t-1} + \delta_5 IR_{t-1} + \sum_{i=1}^{q} \alpha_i \Delta RETURNS_{t-i} + \sum_{i=1}^{q} \beta_i \Delta LM3_{t-i} + \sum_{i=1}^{q} \mu_i \Delta INDPRO_{t-i} + \sum_{i=1}^{q} \sigma_i \Delta CPI_{t-i} + \sum_{i=1}^{q} \omega_i \Delta IR_{t-i} + \varepsilon_t \quad (4.7.5\ b)$$

The above equation (4.7.5 a and b) are for the US and India respectively, where variables have been defined earlier. Here, T implies a time trend. The above equations can be divided into two parts, where the first part represents the long term relationship with coefficients δ_2, δ_3, δ_4 and δ_5. The second part describes the short-term relationship with coefficients $\alpha, \beta, \mu, \sigma$ and ω.

ARDL Bounds Test Procedure

The test begins by estimating the following equation (4.7.5 c and 4.7.5 d) for the US and India through the application of the OLS method to test for the existence of long-term relationships between the variables while conducting an F-test for a joint significance of the coefficients of lagged levels of variables. The null hypothesis suggests that there is no cointegration between the variables. By this, $H_o : \delta_2, = \delta_3 = \delta_4 = \delta_5 . = 0$ while an alternate hypothesis implies a co-integration among the series $H_a : \delta_2, \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq 0$.

$$\Delta RETURNS = \alpha_0 + \sum_{i=1}^{q} \delta_1 RETURNS_{t-i} + \sum_{i=1}^{q} \delta_2 LM3_{t-1} + \sum_{i=1}^{q} \delta_3 INDPRO_{t-1} + \sum_{i=1}^{q} \delta_4 CPI_{t-1} + \sum_{i=1}^{q} \delta_5 TB_{t-1} + \varepsilon_t \quad (4.7.5\ c)$$

$$\Delta RETURNS = \alpha_0 + \sum_{i=1}^{q} \delta_1 RETURNS_{t-i} + \sum_{i=1}^{q} \delta_2 LM3_{t-1} + \sum_{i=1}^{q} \delta_3 INDPRO_{t-1} + \sum_{i=1}^{q} \delta_4 CPI_{t-1} + \sum_{i=1}^{q} \delta_5 IR_{t-1} + \varepsilon_t \quad (4.7.5\ d)$$

When co-integration is established between the variables, the next step will entail selecting the orders of the ARDL model (q, q_1, q_2, q_3, q_4) using SIC criteria. Moving on, short-term dynamic parameters would be obtained by applying an error correction model with long-term estimates, as shown below in the equation (4.7.5 e and f) for the US and India.

$$\Delta RETURNS = \mu + \sum_{i=1}^{q} \alpha_i \Delta RETURNS_{t-i} + \sum_{i=1}^{q_1} \beta_i \Delta LM3_{t-i} + \sum_{i=1}^{q_2} \mu_i \Delta INDPRO_{t-i} + \sum_{i=1}^{q_3} \sigma_i \Delta CPI_{t-i} + \sum_{i=1}^{q_4} \omega_i \Delta TB_{t-i} + \emptyset ECM_{t-1} + \varepsilon_t \quad (4.7.5\ e)$$

$$\Delta RETURNS = \mu + \sum_{i=1}^{q} \alpha_i \Delta RETURNS_{t-i} + \sum_{i=1}^{q_1} \beta_i \Delta LM3_{t-i} + \sum_{i=1}^{q_2} \mu_i \Delta INDPRO_{t-i} + \sum_{i=1}^{q_3} \sigma_i \Delta CPI_{t-i} + \sum_{i=1}^{q_4} \omega_i \Delta IR_{t-i} + \emptyset ECM_{t-1} + \varepsilon_t \quad (4.7.5\ f)$$

As stated earlier, $\alpha, \beta, \mu, \sigma$ and ω are short-term dynamic coefficients to equilibrium and $\emptyset$ represents the speed of adjustment. To check the goodness of fit of the ARDL model, diagnostic tests and stability tests will be conducted in the following chapter. The diagnostic tests will

determine if the model is free from serial correlation and heteroscedasticity. The structural stability of the test will be examined using a graphical presentation by employing the cumulative residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ).

4.6.6 Variance Decomposition (VD)

VD is a useful tool which helps in making inferences on causal relationships between variables beyond the sample period. It differentiates the information piece that one variable contributes to others. In an analysis of the impact of macroeconomic variables on the stock market and vice versa, a variance decomposition or what is referred to as a Forecast error variance decomposition (FEVD) is very important. Like the IRF model, VD assists in analysing the VAR model, which has already been estimated, albeit in a different manner. It indicates the amount of information each of the selected variables under study contributes to the other variables in the auto-regression. Ultimately, this vital information obtained through VD which determines how exogenous shocks can explain the FEVD of each of the variables to the other variables. VD makes one of the variables a dependent variable and gives the proportion of the response of each intervening variable to variation in the selected dependent variable.

IRF and VD have similar setbacks which consist of identifying ε_1 andε_2 sequences. However, the Cholesky decomposition method has been suggested as the solution to this issue. Impulse response analysis and variance decomposition are commonly referred to as Innovation accounting which examines the relationships between economic variables. If the correlations between the various innovations are small, the identification problem is not an issue at that stage. However, the alternating orderings should yield a similar impulse response and variance decomposition. Indeed, the contemporaneous movements of many economic variables are highly correlated. The result of the test is later presented in a tabular form, highlighting the selected macroeconomic variables which have the most proportion in explaining the variations in the stock market.

4.7 Volatility Definition and Measurement

The spread of all possible outcomes of an uncertain variable is referred to as volatility. Within the context of this research and in financial markets generally, the possible spread of asset

returns is a significant concern. Statistically, volatility is measured as the sample standard deviation as represented below:

$$\hat{\sigma} = \sqrt{\frac{1}{T-1}\sum_{t=1}^{T}(r_t - \mu)^2} \qquad (4.8\ a)$$

Where r_t stands for return on day *t,* and μ is the average return over the T-day period.

In some instances, variance $(\sigma)^2$ is used as a volatility measure.

4.8 Stylized Facts about Volatility in Empirical Time Series

Recently, major events within the financial market have resulted in changes in the volatility of returns. Additionally, unexpected shocks have been one of the causes of volatility and as such is a major concern for policymakers and investors. This research is looking to examine the impact of changes in economic variables on the behaviour of the stock markets in the US and India as well as shifts in the respective financial markets, and the reverse causality. This section and the following sections will focus on some facts about volatility, different methods of modelling volatility and volatility behaviour. It must be noted that financial time series exhibit certain patterns which must be understood in order to obtain a correct model specification. Hence, the researcher has listed a few stylized facts about volatility before applying different conditional volatility models, as suggested by Enders (2004). Researchers must incorporate these facts when modelling the time-series financial data to obtain a reliable forecast of volatility.

- **Leptokurtic distribution:** This distribution has a kurtosis value which is unusually higher than the normal distribution that results in high peak distribution, thin midrange, and fat (heavy) tails. Therefore, such series have higher chances of extreme events than normally distributed data.
- **Volatility clustering:** This happens when large and small values occur in clusters in a log-return sample. According to Mandelbrot (1963), large changes tend to be followed by large changes - of either sign - or small changes by small change. This characteristic is also called volatility clustering.
- **Leverage effect:** There is a negative correlation between changes in stock prices and changes in volatility. According to Black (1976), leverage effects occur when

adverse shocks affect volatility more than the positive shocks with the same magnitude as adverse shocks.

- **Long memory:** Although sample autocorrelation of data is small, sample autocorrelations of absolute and squared values are significantly different from zero, even for large lags. This suggests that there is long-range dependence (long memory) in the data which implies that volatility is highly persistent, and there is evidence of near unit root behaviour of a conditional variance process.
- **Aggregational Gaussianity:** This occurs when the distribution of log-returns over long periods such as a month, six months or a year, is close to normal distribution than for hourly or daily log-returns
- **Co-movements in volatility:** This happens when significant movements in one series are complemented with big changes in another series from a different market.

4.9 Volatility Modelling Technique

Econometrics has provided various methods for volatility modelling, and they are mainly subdivided into two categories; symmetric and asymmetric models. According to Saha (2017), under symmetric models, conditional variance only depends on the magnitude, and not the sign, of the underlying assets. For asymmetric models, shocks of the same magnitude, whether positive or negative, have different effects on future volatility. This research has adopted only the asymmetric modelling approach. For further research, financial time series may be tested using the asymmetric volatility modelling approach. Two popular volatility testing models include the ARCH and GARCH test, which are briefly explained below. To start with, there is a need to understand conditional variance, which plays a fundamental role in the ARCH and GARCH techniques.

4.9.1 Conditional Variance

In probability theory and statistics, a conditional variance is the variance of a random variable, given the value of one or more other variables. The conditional variance equation is a fundamental contribution to the ARCH and GARCH models and can be illustrated as follows:

$\varepsilon_t = v_t\sqrt{h_t}$ where $\varepsilon_t \mid \Omega_{t-1} \sim N(0, h_t^2)$ and $v_t \sim N(0,1)$ (4.10.1 a)

$$h_t^2 = \alpha_0 + \sum_{i=1}^{q} \alpha_i \varepsilon_{t-1}^2 + \sum_{j=1}^{p} \beta_j h_{t-j}^2 \quad (4.10.1\ b)$$

$$\alpha_0 > 0,\ \alpha_i, \beta_j \geq 0 \rightarrow h_t^2 \geq 0,\ i=1\ldots q,\ \text{and}\ j=1,\ldots..p \quad (4.10.1\ c)$$

Where Ω_{t-1} is the set of all information available at time *t-1*.

The GARCH (*p,q)* process is stationary when $\sum_i \alpha_i + \sum_j \beta_j < 1$, while the conditional variance of the GARCH model illustrated in equation (4.10.1 a,b and c) above is a function of three equations. Here, mean forecast denoted by ω and it is the first term. On the other hand, the second term refers to the squared residuals obtained from the mean equation which is equally called ARCH terms and denoted by ε_{t-i}^2. ARCH terms relate to any new information about volatility from past periods which have a weighted impact on the current conditional volatility, that slowly declines but never reaches zero. Finally, the third term represents GARCH and is denoted h_{t-j}^2, which relates to the impact of the last period's forecast variance. The three above mentioned parameters which are ω, $\alpha_i{}'s$ and $\beta_j's$ cannot attain non-negative values in order to ensure positive values for the conditional variance or $h_t^2 \geq 0$.

On the other hand, the size of parameters denoted by α_i and β_j determines the short-term volatility of the data. The sum of α_i and β_j governs the persistence of volatility as a result of a particular shock. If the sum of two parameters is close to unity, then a shock at time *t* tends to persist over many future periods. If α_i has a significant positive value, this indicates that strong volatility clustering exists in the data. Conversely, if β_j has a significant value, this means the impact of the shocks to the conditional variance lasts for a long time ('long memory') before dying out, hence volatility is persistent (Alexander, 2009). According to Nelson (1990), the GARCH (*p, q)* model is covariance stationery only if $\alpha_i + \beta_j$.

4.9.2 Autoregressive conditional heteroskedasticity (ARCH)

This model describes the variance of the current error term or innovation as a function of the actual sizes of the previous periods' error terms (ε_t^2).The variation in the model explains the squares of pervious variation. The ARCH model is appropriate when the error variance in a time series follows an autoregressive (AR) model. In order to perform the ARCH test, we need to check the presence of heteroskedasticity in residuals of return series by employing the Lagrange Multiplier (LM) test as suggested by Engle (1982). He suggested that the conditional

variance equation needs to be modelled as a linear function of the past q squared innovations as follows:

$$h_t^2 = \omega + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 \varepsilon_{t-2}^2 + \ldots\ldots\ldots\ldots + + \alpha_q \varepsilon_{t-q}^2 = \omega + \sum_{i-1}^{q} \alpha_i \varepsilon_{t-i}^2 \qquad (4.10.2\ a)$$

Where ω and α_i are non-negative parameters to ensure that conditional variance is positive. ε_t^2 is the square error obtained from the mean equation and is referred to as the Autoregressive conditional heteroskedasticity (ARCH) model. Worthy of note is the fact that the ARCH model fits in the time series with a large number of Lags.

4.9.3 Lagrange Multiplier (LM) test

As earlier mentioned, the presence of heteroskedasticity in residuals return series may be detected by LM tests which are fundamental tests for ARCH and GARCH. The methodology starts by employing the OLS method to estimate $\{r_t\}$ sequence by the most appropriate regression equation or ARMA model. Here, the conditional mean equation will be the AR (1) process. When the residuals (ε_t) are obtained, the next step will entail regressing the squared residuals on a constant and *q* lags as shown below in the following equation.

$$\varepsilon_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \alpha_2 \varepsilon_{t-2}^2 \ldots\ldots\ldots\ldots + \alpha_q \varepsilon_{t-q}^2 + \upsilon_t \qquad (4.10.3\ a)$$

The next step entails checking the null hypothesis in order to ensure that there is no ARCH effect up to order *q* as shown below:

$$H_0: \alpha_1 = \alpha_2 = \ldots\ldots\ldots\ldots\ldots = \alpha_q = 0 \qquad (4.10.3\ b)$$

$$H_1: \alpha_1 \neq \alpha_2 = \ldots\ldots\ldots\ldots\ldots = \alpha_q \neq 0 \qquad (4.10.3\ c)$$

The LM test statistic can be conveniently obtained from the coefficient of determination (R^2) in the above regression equation. In other words, the LM statistic is $ARCH_{LM}\ (q) = TR^2$. According to Engle (1982), it has an asymptotic distribution if the null hypothesis of no conditional heteroskedasticity holds. Large values of test statistic indicate that H_0 is false and, hence, there may be ARCH in the residuals.

4.9.4 Generalized Autoregressive Conditional Heteroskedasticity (GARCH) Model

Bollerslev (1986) proposed a fundamental extension to the ARCH (q) model which is also known as the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model. In an attempt to fulfil the requirement of large numbers of Lags for the ARCH model, Bollerslev (1986) introduced the GARCH model *(p, q).* To do so, the author employed a unique technique which allows the conditional variance to be modelled as an ARMA process such that innovations and its lags determine the conditional variance. In practice, the GARCH (p, q) model jointly estimates two equations which are well elaborated in the following section.

In statistical terms, the conditional mean may be illustrated as follows:

$$R_t = \rho_o + \sum_{i=1}^{P} \rho_i \; R_{t-i} + \; \varepsilon_t + \; \sum_{j=1}^{q} \gamma_j \; \varepsilon_{t-j} \qquad (4.10.4\ a)$$

Where R_t indicates the daily return of a market index, it is calculated as R_t = ln (pt*)* – ln (p_{t-1}*)*. R_{t-i} and ε_{t-j} are the autoregressive and moving average components of the model, while *p* and *q* are the order of processes. The *p* and *q* values determine the four different forms of mean equations listed below.

- When *p* and *q* = zero, the model has a random walk which implies that stock prices cannot be forecasted based on past values.
- When *p* and *q* are greater than zero, the mean equation is an ARMA (*p, q)* process
- When *p>0* and *q = 0,* the mean equation is a purely autoregressive process reflecting AR(*p)*
- When *p = 0* and *q>0,* this means the mean equation is a purely moving average reflecting MA (*q)*

The mean equation above (4.10.4 a) is an essential step of the GARCH (*p, q)* model.

4.10 Summary

This chapter has discussed the research design adopted within the context of this research. The research paradigm, research approach and data collection are presented within the first section. As per the positivist approach, it can be concluded that this research fits perfectly within the positivist paradigm. The next section follows with a discussion on various countries and global macroeconomic factors that are chosen and justified, and possible linkages between these

variables and stock returns are highlighted from past empirical studies. As applied within this study, an econometric methodology entails identifying the omitted variables to understand possible variability in the data. Data validity tests will be conducted in the following chapter. The data is subjected to validity tests which certify that further statistical analyses can be carried out to ascertain the relationship between stock returns and economic variables. Econometric tests such as ARDL bound test and ARDL short-term and long-term tests, Variance decompositions, ARCH and GARCH tests would enable the researcher to address the research questions and objectives adequately. These tests have been conducted using EViews 9, which is a type of statistical software used for econometric analysis. The results of such empirical tests will be presented in chapter five.

CHAPTER FIVE
EMPIRICAL ESTIMATION OF ECONOMETRIC MODELS

5.1 Introduction

This chapter presents the findings obtained through the application of the econometric methodology explained in the previous chapter. The focus of this study is unveiling the linkages between stock markets and macroeconomic variables in India and the US while making a comparative analysis of the behaviour of both stock markets. To this end, this research has considered the same set of macroeconomic variables for both countries, and these have been presented in the preceding sections. Moreover, the rationale for the selection of these variables has been outlined in Chapter three of this study. The data required to carry out the econometric analysis has been collected from different sources. The following sections will present the empirical findings of this investigation using the proposed methodology. This chapter is mainly divided in two sections; the first section seeks to establish the short- and long-term relationship between macroeconomic variables between the U.S and India stock markets. Also, all the necessary tests will be undertaken to ensure that there are no discrepancies in the data and that the stability of the proposed model is checked. In addition, this section would solely focus on the US and India stock market volatility using the ARCH and GARCH techniques.

5.2 Time plots of our economic variables and stock returns

The observations collected from the analysis of economic variables for India and US are sourced from the Federal Reserve Bank of St. Louis. In contrast, stock prices are obtained from Yahoo finance. The analysis begins with a visual inspection of the time plots of our variables for the period under study. The graphs presented below show the evolution of these variables during the sample period.

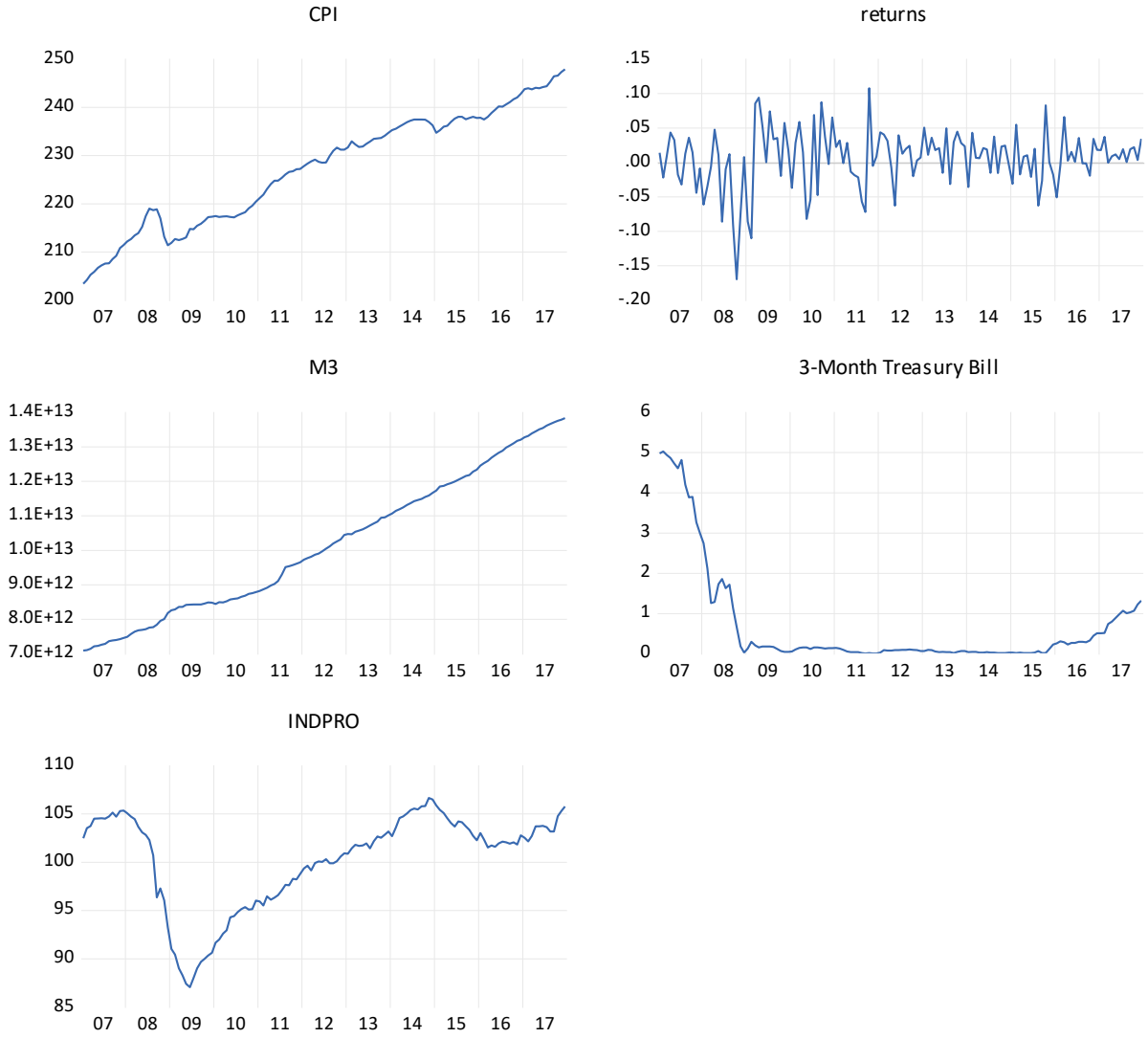


Figure 5*:* Combined time plots for US variables[15]

[15] Graphical presentation of variables under study in level form for US

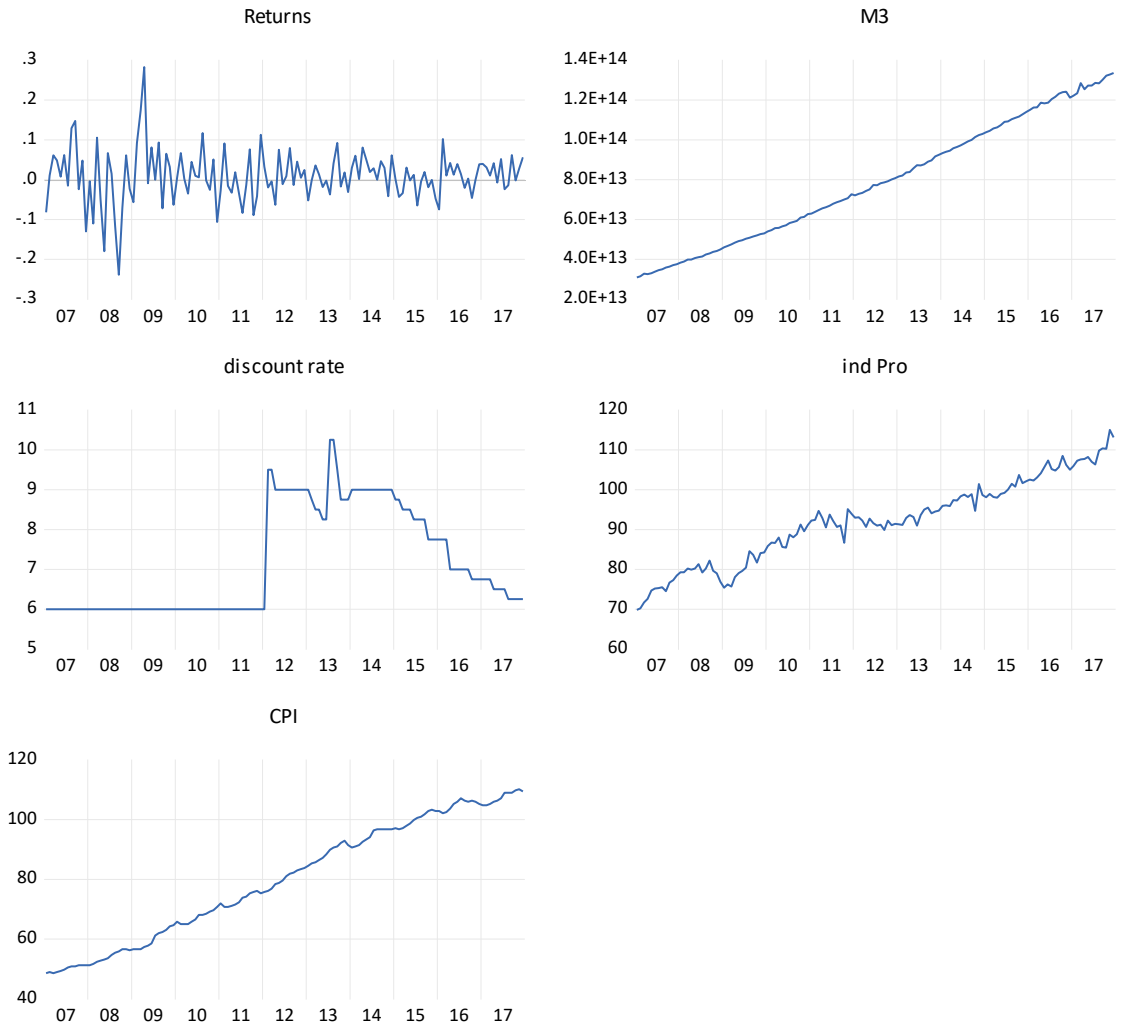


FIGURE 6: COMBINED TIME PLOT FOR INDIA VARIABLES[16]

The time frame illustrated above covers 2007-2017, which is the selected time period for this investigation. From the illustration above, none of the macroeconomic variables are evolving around the mean for India and the US at the M3 level. In other words, money supply for India and the US are following an increasing trend. Another similarity highlighted in the visual representation is the presence of an upward trend in the consumer price index for India and the US. In addition, returns are evolving around the mean for both countries, while the remaining variables are following a random walk with no trend. This could be explained by the stock returns and time differencing of series, which are calculated similarly. Hence, returns are stationary at level form. Stationarity is an important factor in time series analysis as the data

[16] Graphical presentation of variables under study in level form for India

must obey the time series properties. If the data is not stationary, implying that the mean and variance are not constant over time, then it may result in spurious results.

5.3 Transformation of data

It is within the nature of time-series data to often exhibit seasonality, particularly concerning monthly and quarterly data (Frances and Kunst, 2004). Therefore, it is vital to exclude seasonality from time-series data through relevant adjustments. Such adjustments exclude cyclical, seasonal movements from a series to focus on underlying trends highlighted within the series. For this research, EVIEWS 10 has been incorporated to enable the researcher to adjust seasonality on the data using simple commands. The economic indicators used in this study are quite popular for research purposes, as seasonally adjusted data is widely accessible and sourced from the Federal Reserve Bank of St. Louis. Consequently, there was no need to adjust the seasonality of the data used, except for stock returns which were extracted from stock prices using a simple formula: [(Stock price $_{t}$ / stock price $_{t-1}$)-1]. Since data for stock returns is not readily accessible, and this research is seeking to assist investors in their decision-making process, stock prices were needed to be transformed into stock returns. Additionally, Money supply was converted into Natural Logarithm as the figures observed for money supply were too high and had outliers, hence transforming the data will allow proportional (%) interpretation to our result.. Furthermore, the selected macroeconomic variables were first differenced to obtain stationarity as briefly explained below. According to Nasseh and Straus (2000), it is essential to consider logs and differences of data as it serves to exclude the permanent component of data which avoids the complications associated with unit root and spurious regressions.

5.4 Descriptive statistics

Tables 5 and 6 below summarize the basic statistical features of the data used for this research which are mean, minimum, and maximum values, standard deviation, kurtosis, skewness, and the Jarque-Bera test for the data. Such descriptive statistics help in assessing the behaviour of the variables. It should be noted that all the macroeconomic variables are at their level form and are seasonally adjusted. Also, the log values of Money supply are incorporated due to their large values. For instance, standard deviation represents the volatility of variables as well as a similar pattern between India and the USA as industrial production (INDPRO) and consumer price index (CPI) are more volatile than the rest of the variables such as Discount rate, Money supply (lm3), 3- month Treasury Bill (TB) and returns for both countries. The descriptive

statistics also show the normality of data set, which is indicated by P-values of the Jarque-Bera test, which reveal that the sample skewness and kurtosis are significantly different from zero and three, respectively.

	RETURNS	LM3	INDPRO	TB	CPI
Mean	0.005721	29.93099	100.2510	0.685000	227.4141
Median	0.010583	29.93463	102.0022	0.130000	228.9970
Maximum	0.107723	30.25833	106.6630	5.030000	247.9010
Minimum	-0.169425	29.59040	87.06940	0.010000	203.4370
Std. Dev.	0.042313	0.200393	4.955232	1.275682	11.82231
Skewness	-0.780292	-0.009009	-1.022503	2.383460	-0.216826
Kurtosis	4.879197	1.742075	3.052642	7.572994	1.848816
Jarque-Bera	32.81741	8.704845	23.01650	239.9969	8.323030
Probability	0.000000	0.012876	0.000010	0.000000	0.015584

TABLE 5*:* STATISTICAL FEATURES OF THE DATA AT LEVELS AFTER SEASONAL ADJUSTMENT FOR USA[17]

US data set suggests that M3, CPI and returns are close to the tail on the left-side of a probability density in a bell-shaped curve as mean values are less than the median, while INDPRO and TB fall to the right tail of a probability density curve due to mean values being greater than median values. The difference between the maximum and minimum values indicate the dispersion in the data set and M3 has a maximum value of 30.25833 and minimum value of 29.59040, representing less dispersion. This implies less variability in the data while TB and INDPRO are highly dispersed, and the rest of the variables are moderately dispersed, in the case of the US. Negative skewness is observed for all the variables in the US data set except TB which implies that returns, M3, INDPRO and CPI fall close to the tail on the left of the probability density in a bell-shaped curve while TB falls to the right side of the curve. The Jarque-Bera test suggests that all the variables are normally distributed as the probability of all the variables is less than 0.05. Hence, the reason for the rejection of the null hypothesis of the normal distribution of series for all variables. The kurtosis tests reveal that M3 and CPI are platykurtic, as their distributions are flat in proportion to normal because the value of the kurtosis is less than 3. Returns and TB are leptokurtic, which implies that their distribution is peaked when compared to the normal. These results are based on the value of kurtosis, which is greater than 3. The INDPRO value is close to normal as kurtosis is close to three.

[17] The table provides the descriptive statistics of all the variables under study for USA.

	RETURNS	LM3	IND_PRO	IR	CPI
Mean	0.009220	31.91674	91.92629	7.149621	80.06202
Median	0.006523	31.97805	92.34244	6.375000	80.33153
Maximum	0.282551	32.52546	115.0131	10.25000	110.1690
Minimum	-0.238901	31.06174	69.78814	6.000000	48.58145
Std. Dev.	0.064977	0.423921	10.58871	1.332169	19.82551
Skewness	0.048371	-0.336571	-0.089307	0.603876	-0.081363
Kurtosis	6.201018	1.921828	2.213616	1.735255	1.618478
Jarque-Bera	56.40730	8.885659	3.576667	16.82035	10.64295
Probability	0.000000	0.011763	0.167239	0.000223	0.004886

TABLE 6: STATISTICAL FEATURES OF THE DATA AT LEVELS AFTER SEASONAL ADJUSTMENT FOR INDIA[18]

Since the mean values of M3, CPI and INDPRO are less than the median values in the Indian data set; this implies that the variables are close to the tail on the left-side of a probability density in a bell-shaped which is quite similar to the US descriptive data results. In comparison, the IR and returns fall on the right tail of a probability density curve as a result of greater mean values than median values. The maximum and minimum values suggest that CPI and INDPRO are highly dispersed, while M3 and IR are moderately dispersed. Like US data, variables for India's data set observed negative skewness except for IR. This implies that returns, M3, INDPRO and CPI fall close to the tail on the left of the probability density in a bell-shaped curve while IR falls to the right side of the curve. Kurtosis tests reveal that all the macroeconomic variables are platykurtic, as their distributions are flat in proportion to normal as the value of the kurtosis is less than 3. On the other hand, returns are leptokurtic, and this implies that their distribution is peaked when compared to the normal. These results are based on the value of kurtosis, which is greater than 3. The Jarque-Bera test suggests that all the variables in India's data set are normally distributed, with the exception of INDPRO since probability of the variables is less than 0.05. Hence, this justifies the rejection of the null hypothesis of the normal distribution of series for all variables.

[18] The table provides the descriptive statistics of all the variables under study for India

5.5 Correlation Matrix

Correlation	RETURNS	LM3	IND_PRO	IR	CPI
RETURNS	1.000000				
LM3	0.926454	1.000000			
INDPRO	-0.209873	0.368581	1.000000		
IR	0.613455	0.534799	0.392009	1.000000	
CPI	0.718765	0.291609	0.463330	0.536666	1.000000

TABLE 7: CORRELATION MATRIX OF US STOCK RETURNS AND US MACROECONOMIC VARIABLES[19]

The matrix allows us to determine the strength of the relationships connecting the macroeconomic variables. The correlation matrix is used as a starting point to summarise the data, however more rigorous statistical analysis is required to gauge the relationship between macroeconomic variables and stock returns, which is presented in the following sections. The table shows strong and positive relationship between returns and money supply (LM3) with a correlation coefficient of 0.92 which indicates increased money supply is associated with higher stock returns for US and the same for other macroeconomic variables except Industrial production. The Industrial production and US stock returns are weakly correlated (-0.20) and have a negative relationship and Industrial Production have a positive relationship with other macroeconomic variables. It can be observed Inflation (CPI) has somewhat strong relationship with stock returns with coefficient of 0.71, whereas Interest rates and stock returns positively correlated but the strength of the relationship is somewhat strong with coefficient of 0.61. The correlation matrix gives us an insight into the association between various variables, however it does not tell us causation and neither it tells us anything about long-run and short-run relationship among the variable. The correlation among US macroeconomic variables is positive but weakly correlated as per the matrix presented above.

Correlation	RETURNS	LM3	INDPRO	CPI	IR
RETURNS	1.000000				
LM3	0.737217	1.000000			
INDPRO	-0.051963	0.423971	1.000000		

[19] The table presents the degree of correlation among the economic variables including stock returns of US.

CPI	0.809783	0.582827	0.465792	1.000000	
IR	-0.581039	-0.500433	0.329886	-0.525238	1.000000

TABLE 8: CORRELATION MATRIX OF INDIA STOCK RETURNS AND INDIA MACROECONOMIC VARIABLES[20]

On the other hand, the correlation matrix (table 8) depicts the relationship between India stock returns and economic variables. The relationship between India stock returns and money supply is also positive and shows somewhat strong relationship with the correlation coefficient of 0.73. The relationship between Inflation (CPI) and Stock returns is positive and with coefficient of 0.81 which highlights strong relationship whereas Interest rates and Industrial production exhibit negative relationship and weakly correlated as the coefficient is less than 0.60. The matrix helps us to determine the variation in stock returns which is associated with macroeconomic variables, and correlation is most appropriate when the two variables have a linear relationship. To capture the non- linear relationship among the variables, we have employed more sophisticated statistical techniques in our analysis.

5.6 Stationarity test

Non-stationarity is an essential issue in time series analysis as it may have an impact on the way data is handled. The existence of a non-stationary series in the Time-series modelling can affect the overall significance of the results. Therefore, it is vital to test the stationarity of data before proceeding to conduct any further tests. One of the simplest ways to inspect the stationarity of data is by visualizing the graph of the data set. From Figures 6 and 7, it can be evidenced that all the macroeconomic variables exhibit non-stationarity from the graph on both countries (India and the US). Figures 6 and 7 suggest that the variables, with the exception of returns, do not evolve over time. Additionally, they suggest that there is either an increasing or decreasing trend among the variables for the selected period for both the US and India. It should be noted that an increasing pattern in the series is not always an indication of non-stationarity. The process might be stationary around the trend line, and if so, it is described as a trend stationary process.

[20] The table presents the degree of correlation among the economic variables including stock returns of India.

In addition, the graphs above, further justifications are needed to support the conclusions made. Hence, it is essential to test the stationarity of the data set using the econometric methods explained in Chapter four. It is important to understand the order of integration before proceeding further. This mainly refers to the order of co-integration I(d), where (d) is the number of differences required to obtain stationarity within the time series. Within the context of first-differencing a time series, the **first difference** of a time series refers to the series of changes from one period to the next. If Y_t denotes the value of the time series Y at period t, then the first difference of Y at period t is equal to Y_t-$Y_{t-1.}$ Since the macroeconomic variables under study are integrated at order one as suggested by the tests below, there is no need to further explain a second or third differencing.

5.6.1 Augmented Dickey-Fuller and Phillips-Perron Result (ADF and PP)

It is worth noting that econometric methodology requires each of the time-series data to be stationary prior to investigating the short and long-term equilibrium relationships between the variables. According to Hill et al. (2008), most macroeconomic factors tend to be non-stationary at their level form which makes it necessary to test the stationarity of the data. Also, from the visual inspection above, it was concluded that most macroeconomic factors follow a random non-stationary trend. Hence, it is essential to confirm findings obtained by conducting actual tests in order to detect their non-stationarity. On the other hand, the results revealed that the stock returns were stationary at their level as the returns were calculated from the stock prices i.e. $P_1 – P_0 / P_0$ which is very similar to the calculation of first-differencing i.e. Y_t-$Y_{t-1.}$ Therefore, it is crucial to observe the stationarity of stock returns at level form.

The table below presents ADF and PP test results for all the variables, for India and the US. The null hypothesis (H_o) under ADF and PP is the series has the unit root, suggesting the series are non-stationary. Following the statistical rule, we can reject (H_o) if the P-value is less than 0.05 and fail to reject if P-value is higher than 0.05. In this case, the majority of variables exhibit non-stationarity at level form, however when first differenced the variables exhibits stationarity. Therefore, we reject the (H_o) that series has a unit root.

	ADF Test statistics		**PP Test statistics**		
	(H0: Unit root /Non-stationary)		**(H0: Unit root/Non-stationary)**		
Variables	**Level (P-value)**	**First Difference (P-value)**	**Level (P-value)**	**First Difference (P-value)**	**Order of Variable**
Returns	0.0000	0.0000	0.0000	0.0000	I(0)
CPI	0.0599	0.0000	0.1713	0.0000	I(1)
INDPRO	0.6894	0.0101	0.5801	0.0000	I(1)
LM3	0.7638	0.0000	0.7152	0.0000	I(1)
TB	0.0000	0.0000	0.0008	0.0000	I(0)

TABLE 9: ADF AND PP TEST RESULTS FOR US[21]

	ADF Test statistics		**PP Test statistics**		
	(H0: Unit root /Non-stationary)		**(H0: Unit root/Non-stationary)**		
Variables	**Level (P-value)**	**First Difference (P-value)**	**Level (P-value)**	**First Difference (P-value)**	**Order of Variable**
Returns	0.0000	0.0000	0.0000	0.0000	I(0)
CPI	0.9958	0.0000	0.8511	0.0000	I(1)
INDPRO	0.0713	0.0006	0.8299	0.0000	I(1)
LM3	1.0000	0.0000	0.3893	0.0001	I(1)
IR	0.4332	0.0000	0.5082	0.0000	I(1)

TABLE 10: ADF AND PP TEST RESULTS FOR INDIA[22]

The above tables illustrate the fact that most of the macroeconomic variables exhibit non-stationarity at their level form. As a confirmation of the test results, a graphical presentation of first-differenced data is illustrated below. The indication of stationary data refers to the mean, while the variance evolves over time as seen below.

[21] The table presents ADF and PP test results for US data which suggest the presence of unit root for some variables at level form. As, the data is first differenced- the unit root is not present in the US data for the chosen period.

[22] The table presents ADF and PP test results for India data which suggest the presence of unit root for some variables at level form. As, the data is first differenced- the unit root is not present in the India data for the chosen period.

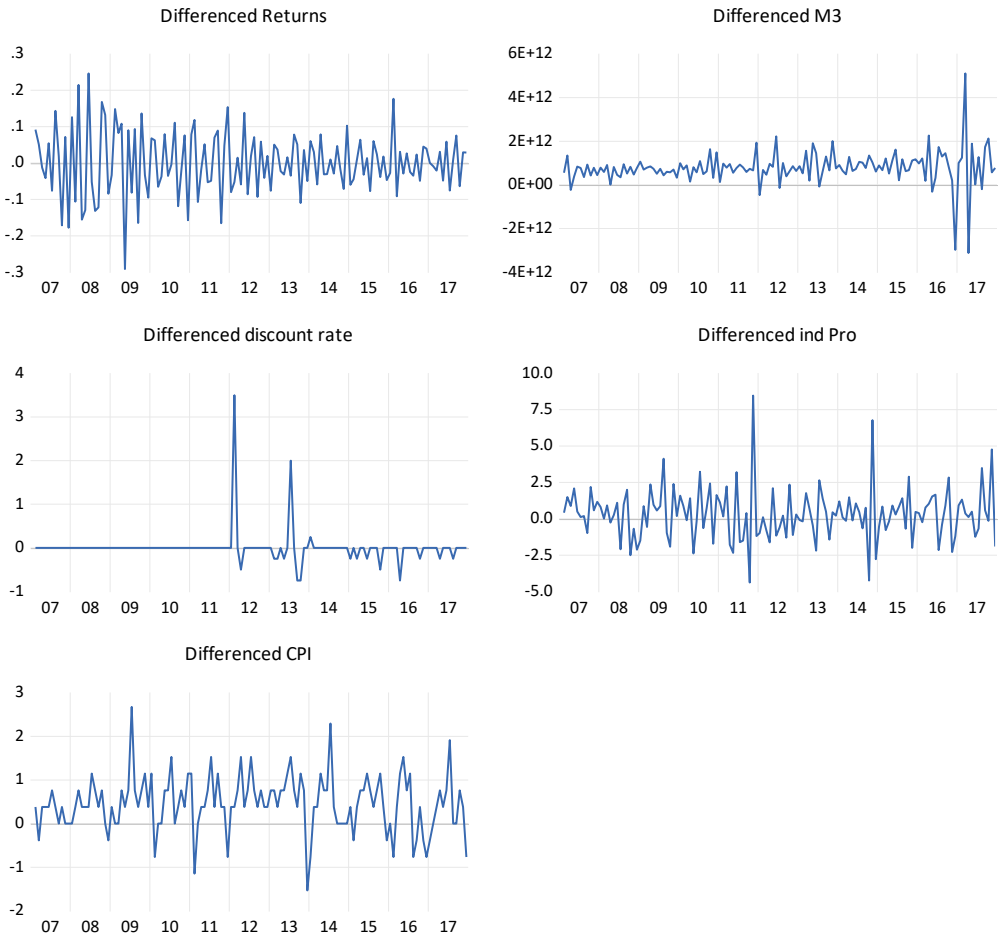


FIGURE 7: GRAPHICAL REPRESENTATION OF FIRST DIFFERENCED VARIABLES FOR INDIA. [23]

[23] The five graphs demonstrate the absence of unit root and stationary data at first difference for India variables.

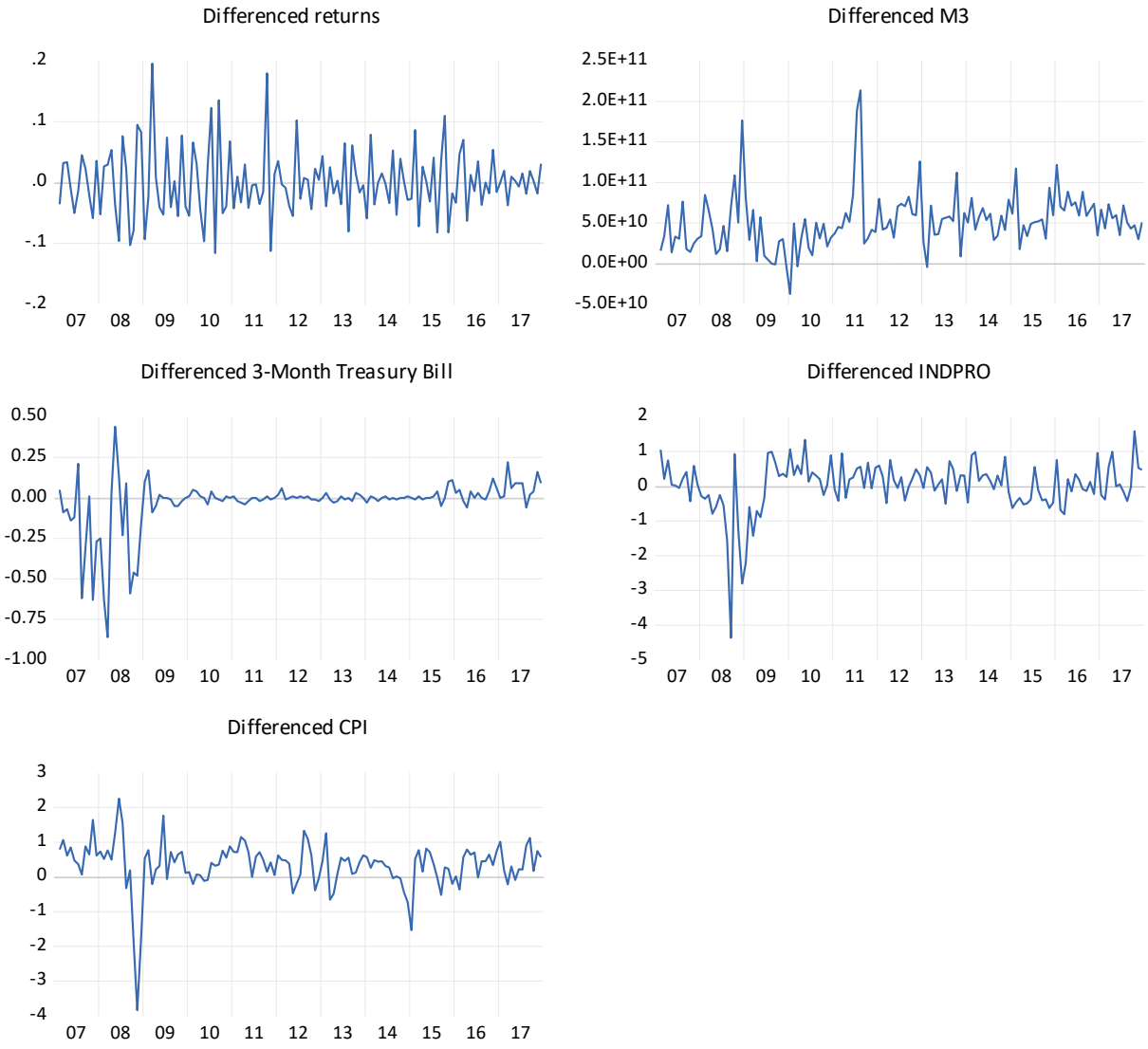


FIGURE 8: GRAPHICAL REPRESENTATION OF FIRST DIFFERENCED VARIABLES FOR USA. [24]

5.7 Cointegration: ARDL technique

The ARDL approach requires the researcher to start by conducting a bound test to determine the existence of a long-term relationship between the variables. Under the bound test approach, the F-test determines the joint significance of coefficients of the variables where there are two asymptotic critical values. This approach provides a test for cointegration when the independent variables are i(d) where ($0 \leq d \leq 1$) is a lower value, assuming that the regressors are I(0) and an upper value. Where I(1) regressors of the F- statistics is greater the the upper critical values, the null hypothesis of no long-term relationship can be rejected. Conversely,

[24] The five graphs demonstrate the absence of unit root and stationary data at first difference for US variables.

the null hypothesis cannot be rejected if the test statistics fall between the lower and the upper bound of critical values. Furthermore, if the calculated values lie between lower and upper bounds and the variables are cointegrated. The next step would entail establishing an ARDL long-term model for this research which is shown below for India and the US (5.8.1a and b) involves selecting the orders of ARDL (q, q1, q_2, q3, q4). Finally, short-term dynamic parameters may be obtained by calculating an error correction model using long-term estimates. The F-statistics bound test is presented below to determine whether variables are cointegrated or not, followed by a diagnostic test to confirm if the model is free from serial correlation and heteroscedasticity.

5.8 ARDL model Equation

5.8.1 ARDL Estimated Equation for US

$$\Delta Returns_t = \alpha_0 + \sum_{i=1}^{q} \delta_1 \ LM3*_{t-i} + \sum_{i=1}^{q} \delta_2 \ INDPRO_{t-i} + \sum_{i=1}^{q} \delta_3 \ TB_{t-i} + \sum_{i=1}^{q} \delta_4 \ CPI_{t-i} + \varepsilon_t$$

Bound test for cointegration using selected ARDL model (1, 1, 0, 0, 1) for US

F-statistic: 20.74753

Upper bound: 4.01**

Lower bound: 2.86**

Lags: 1***

5.8.2 ARDL Estimated Equation for India

$$\Delta Returns_t = \alpha_0 + \sum_{i=1}^{q} \delta_1 \ LM3*_{t-i} + \sum_{i=1}^{q} \delta_2 \ INDPRO_{t-i} + \sum_{i=1}^{q} \delta_3 \ IR_{t-i} + \sum_{i=1}^{q} \delta_4 \ CPI_{t-i} + \varepsilon_t$$

*Bound test for cointegration using selected ARDL model (*1, 0, 1, 0, 1*) for India*

F-statistic: 23.829

Upper bound: 4.01**

Lower bound: 2.86**

Lags: 1***

The above empirical output confirms the cointegrating relationship between the stock returns and macroeconomic variables for both India and the US. Since the bound test captures the cointegrating relationship of all the variables as a whole, it is important to test further the significance of each single macroeconomic variable on its own in relation to stock returns and their impact on stock returns for every 1 per cent change. The table 15-18 below presents the long-term and short-term relationships between the variables alongside the P values and T-statistics to confirm their significance for India and the US. The lag selection criterion was based on AIC (Akaike Information criterion) and optimal lag, which was an automatic selection by the EViews, suggesting one lag for both the models. Khim-Sen (2004) suggests that the AIC information criterion produces the least underestimation among all criteria, thereby avoiding the problem of overestimation. It should be noted that it is important to run diagnostic tests before proceeding further and continue with empirical analysis

5.9 Diagnostic test

5.9.1 Serial Correlation

We analyse the serial correlation in our ARDL model by regressing the residuals on lagged values up o lag q. The testing criteria is $\chi^2 > \chi^2_{critical}$ reject null of no q order serial correlation. Here q implies the periods. The Breusch-Godfrey output presented below implies we fail to reject the Null hypothesis at 0.05 level of significance and conclude that there is no serial correlation.

H_0: There is no serial correlation i.e. $\beta_1 = 0$

H_1: There is serial correlation i.e. $\beta_1 \neq 0$

F-statistic	1.411394	Prob. F	0.2483
Obs*R-squared	3.260312	Prob. Chi-Square	0.1959

TABLE 11: BREUSCH-GODFREY TEST RESULTS FOR US[25]

[25] The table presents Breusch- Godfrey test results for Serial correlation in data which suggests there is no serial correlation in US data.

F-statistic	0.614045	Prob. F	0.5429
Obs*R-squared	1.339983	Prob. Chi-Square	0.5117

TABLE 12: BREUSCH-GODFREY TEST RESULTS FOR INDIA[26]

5.9.2 Heteroscedasticity test

It is important to make sure the variance of variables is equal as the presence of heteroscedasticity can make the coefficient bias. A null hypothesis describes a situation wherein the error variances are all equal (homoscedasticity). In contrast, the alternative hypothesis states that the error variances are a multiplicative function of one or more variables (heteroscedasticity). The decision rule provided that if the test statistic has a P-value below 0.05 then the null hypothesis of homoskedasticity is rejected, and heteroskedasticity assumed, and vice-versa. The test output below confirms that we are unable to reject H_o at 0.05 % significance and concludes that the series is homoscedastic.

H_0: $\sigma_1^2 = \sigma_2^2 = \cdots = \sigma^2$ (Homoscedasticity)

H_1: $\sigma_1^2 \neq \sigma_2^2 \neq \cdots \neq \sigma^2$ (Heteroskedasticity)

F-statistic	1.322950	Prob. F	0.2097
Obs*R-squared	16.78227	Prob. Chi-Square	0.2094
Scaled explained SS	12.78559	Prob. Chi-Square	0.4645

TABLE 13: BREUSCH-PAGAN-GODFREY TEST RESULTS FOR US[27]

[26] The table presents Breusch- Godfrey test results for Serial correlation in data which suggests there is no serial correlation in India data.

[27] The table presents Breusch- Pagan Godfrey test results for Heteroscedasticity in data which suggests US data is Homoscedastic.

F-statistic	2.594315	Prob. F	0.1191
Obs*R-squared	21.15929	Prob. Chi-Square	0.1120
Scaled explained SS	35.16576	Prob. Chi-Square	0.1001

TABLE 14: BREUSCH- PAGAN--GODFREY TEST RESULTS FOR INDIA[28]

5.10 Estimated Long-term Coefficients using ARDL Approach (Dependent variable: Returns)

When diagnostic tests confirm that coefficients are valid and free from bias, the next step entails estimating the long-term relationship between stock returns and macroeconomic variables. It also involves checking the significance of individual variables in influencing the stock returns of the respective countries. We have presented below the long-run cointegrating coefficients along with their significance, assuming at 0.05 % level of significance for India and US.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LM3	0.206122	0.053794	3.831663	0.0002
INDPRO	0.000925	0.000849	1.089973	0.2781
CPI	-0.003994	0.001102	-3.623038	0.0004
TB	-0.007725	0.002602	-2.969162	0.0037
C	-5.331306	1.426405	-3.737583	0.0003

TABLE 15: ARDL LONG RUN COEFFICIENTS (1,1,0,0,1) FOR US[29]

The results for the US indicate that LM3, CPI and TB are statistically significant as their P values are less than 0.05 while their T-values are greater than 1.90. This suggests that these macroeconomic variables explain the variability in stock returns over a long-term period except INDPRO which was observed to be insignificant at 95% level of confidence for the selected period. The empirical test suggests that CPI and TB has a negative relationship with US stock returns, which is consistent with the findings of Saleem et al. (2012) ,Geske and Roll (1983), Asaolu and Ogunmuyiwa (2011), Laopodis (2006), Quayes (2010). However, Van Aarle et al.

[28] The table presents Breusch- Pagan Godfrey test results for Heteroscedasticity in data which suggests India data is Homoscedastic.

[29] The test output presents results from ARDL long run tests which suggests the relationship between US stock returns and US macroeconomic factors in the long run

(2003), Udegbunam and Oaikhinan (2012) propose contrasting views, stating that LM3 and INDPRO has a positive relationship with US stock returns over a long-term period. It can be inferred that for every 1 per cent change in LM3 will result in 0.206 % change in US stock returns implying that demand for money increases in anticipation of growth in economic activity, subsequently higher expected profitability. And, for every 1 unit increase in CPI will result in a 0.003994 drop in US stock returns. Conversely, every 1-unit change in TB will result in a 0.007725-unit fall in stock returns.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LM3	0.306993	0.137730	2.228946	0.0277
IR	-0.009886	0.006617	-1.494056	0.1378
INDPRO	0.010311	0.003271	3.151897	0.0021
CPI	-0.000832	0.002552	-0.325862	0.7451
C	-8.706129	4.078578	-2.134599	0.0348

TABLE 16: ARDL LONG RUN COEFFICIENTS (1, 0, 1, 0, 1) FOR INDIA[30]

On the other hand, most of the variables exhibit a negative relationship with the Indian stock market except LM3 and INDPRO which demonstrate a positive relationship over a long-term period, agreeing with Ibrahim and Yusof (2001). The positive relationship between LM3 and stock returns can be justified by the quantity theory of money which states that increase in money supply is expected to create an excess supply of money balances and, in turn, excess demand for shares. As a result, share prices are expected to rise (Friedman and Schwartz, 1963). According to the ARDL output for India, the results declare that LM3 and INDPRO are significant at 95% confidence as the level of significance for both variables is less than 0.05% and t-statistic is more than 1.90 in absolute terms. On the other hand, CPI and IR are insignificant and do not contribute to explaining the variation in India's stock returns for the selected period. The findings agree with several studies conducted over different periods in different countries (Mahmood and Dinniah, 2009; Williams, 2011). It was observed that every 1 percent increase in LM3 will cause a 0.306993 increase in stock returns in India, while every 1 unit increase in INDPRO will increase India's stock returns by 0.010311.

[30] The test output presents results from ARDL long run tests which suggests the relationship between India stock returns and India macroeconomic factors in the long run.

5.11 Estimated Short-run Coefficients using ARDL Approach (Dependent variable: Returns)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ΔLM3	-0.934221	0.564990	-1.653518	0.0911
ΔINDPRO	0.001992	0.002925	0.681089	0.4972
ΔCPI	0.015220	0.004255	3.576629	0.0005
ΔTB	0.024243	0.005125	4.730215	0.0000
ECM	-0.322994	0.101462	-13.039358	0.0000

TABLE 17*:* ARDL SHORT RUN COEFFICIENTS (1,1,0,0,1) FOR US[31]

Note: R^2 = 0.716, Adj. R^2 =0.694, F (6,114) = 36.12 Prob(F-stat) = 0.000 DW= 1.91 * Denotes significance of coefficient at 5% level.

Table 17 presents the short-run relationship among the variables for the US, and the long-run relationship between variables are maintained in the short run for the US. The coefficient of the variables with 'Δ' suggests short-term elasticities. The output indicates that TB and CPI are significant at 5% level of significance except INDPRO, while LM3 is significant at 10% level of significance. Hence, LM3 indicates a weak relationship with US stock returns over a short-term period. It was observed that every 1 percent change in CPI and TB will influence stock returns by 0.015220 and 0.024243 respectively over a short-term period. Moreover, every one-unit change in M3 will cause 0.934221 variation in US stock returns over a short-term period. The ECM represents the speed of adjustment. In other words, if variables were to move away from their equilibrium value, then ECM will reinforce the variables to their long-term equilibrium value. According to Ilyas and Siddiqi (2010), the significant ECM coefficient should lie between 0 to -1, which is -0.3229944 significant at 5% level of significance. The ECM term suggests that any deviation from a long-term equilibrium path will be corrected within the next period by 0.32%.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ΔLM3	0.300754	0.136313	2.206340	0.0293
ΔIR	-0.009685	0.006550	-1.478599	0.1419
ΔINDPRO	0.000687	0.003601	0.190886	0.8489

[31] The test output presents results from ARDL long run tests which suggests the relationship between US stock returns and US macroeconomic factors in the short run.

ΔCPI	-0.014372	0.009319	-1.542263	0.1257
ECM	-0.979675	0.089989	-10.886620	0.0000

TABLE 18: ARDL SHORT RUN COEFFICIENTS (1, 0, 1, 0, 1) FOR INDIA[32]

Note: R^2 = 0.623, Adj. R^2 =0.586, F(4,115)= 23.98 Prob(F-stat)= 0.000 DW= 1.79 * Denotes significance of coefficient at 5% level.

Short-term empirical findings conclude that the macroeconomic variables are insignificant at 5% level, apart from LM3 which shows a positive relationship with stock returns as presented on the table 18. Every 1 unit increase in LM3 will increase stock returns by 0.30075 while IR and CPI show a negative relationship with returns over a short-term. This implies that variation in stock returns is mainly influenced by its own past values and to an extent changes in money supply over a short-term period. This research has examined the short-term adjustment process of the ECM coefficient which is significant and lies between 0 and -1, (-0.979675). This implies that the equilibrium converges to its long-term equilibrium path and is responsive to any external shocks. On the other hand, if the ECM coefficient is positive, this implies that the equilibrium will diverge from reported values of the ECM test. In conclusion, the coefficient value 0.976975 indicates that any deviation from the equilibrium level of stock returns in the current period will be corrected by 97% within the next period so as to resort the equilibrium.

5.12 CUSUM Test

To test the stability of the selected model, the cumulative sum (CUSUM) and the cumulative sum of square (CUSUMSQ) tests have been employed to investigate the stability of long and short-term parameters. The test results are illustrated in the figure below and the indication of stability within model is reflected through the plots if the plots are between critical boundaries at 5% level of significance. The figures below indicate that long-term and short-term parameters are steady and specified appropriately for the US and India.

[32] The test output presents results from ARDL long run tests which suggests the relationship between India stock returns and India macroeconomic factors in the long run.

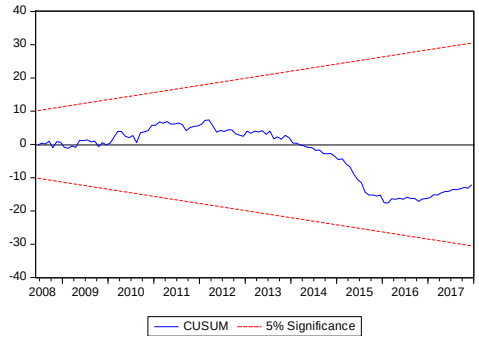


FIGURE 9: PLOT OF CUMULATIVE SUM OF RECURSIVE RESIDUALS FOR US[33]

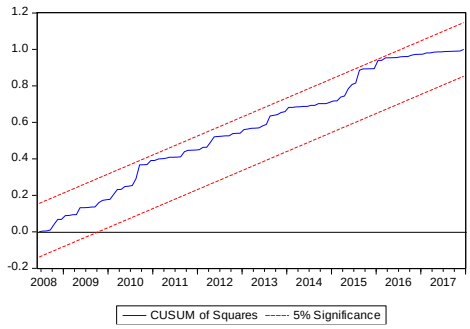
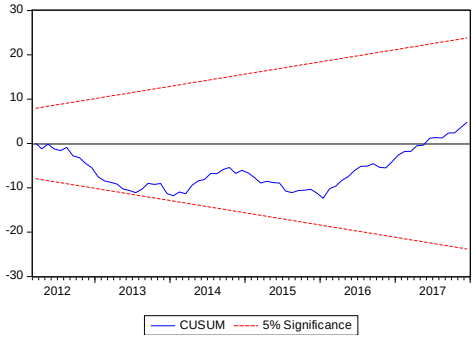


Figure 10*:* Plot of cumulative sum of squares of Recursive Residuals for US[34]



[33] The figure illustrates the stability of coefficients for US data as the coefficients falls inside the critical bands of 5 % level of significance.

[34] The figure confirms the stability of coefficients and suggests the absence of structural change in the chosen period of US data.

FIGURE 11: PLOT OF CUMULATIVE SUM OF RECURSIVE RESIDUALS FOR INDIA[35]

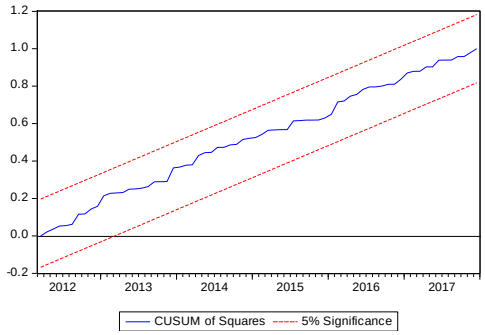


FIGURE 12: PLOT OF CUMULATIVE SUM OF SQUARES OF RECURSIVE RESIDUALS FOR INDIA[36]

5.13 Variance Decompositions (VDC) Analysis

According to Pesaran and Shin (2001), this method describes the contribution of one variable to another because of innovation or shocks. Basically, VDC highlights the information which each variable contributes to other variables in the autoregression. This method determines the forecast error variance of each variable which may be explained by exogenous shocks to the other variables. One of the major advantages of VDC analysis over other methods is that the method is unaffected by the ordering of variables. The VDC results are presented in Table 19 and below for the US and India. The empirical evidence for the US suggests that around 74% change in stock returns is influenced by its own innovative shocks. Furthermore, shocks in the US returns are influenced by LM3 at 9.8%, followed by TB at 6.7%, which is consistent with our ARDL short and long-run analysis. In conclusion, the movements of US stock returns from LM3 and TB can be predicted to an extent while the share of other variables is very minimal. On the other hand, the VDC analysis for India suggests that Indian stock returns are affected mainly by their own shocks at 91.15% while shocks in INDPRO contributes to 7.4%. According to VDC Table 20, the share of other variables is very minimal in the VDC approach. This may be as a result of speculative trading which dominates the Indian stock market as

[35] The figure illustrates the stability of coefficients for India data as the coefficients falls inside the critical bands of 5 % level of significance

[36] The figure confirms the stability of coefficients and suggests the absence of structural change in the chosen period of India data.

suggested by Saha (2017). Graphical illustrations of the VDC output have been presented below on Figure 14 and 15). The blue line on the horizontal axis represents the % variation in dependent variables due to shocks in explanatory variables.

Period	S.E.	RETURNS	LM3	INDPRO	CPI	TB
1	0.037000	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.038497	92.44939	2.610318	2.949877	0.011740	1.978677
3	0.040453	85.97345	8.296693	3.710145	0.112197	1.907518
4	0.041048	83.49985	8.299750	4.911142	0.109067	3.180196
5	0.041583	81.96295	8.523296	4.838230	1.553069	3.122458
6	0.042945	76.85474	9.137999	4.593983	3.153480	6.259802
7	0.043725	75.87951	8.879701	4.444342	4.181177	6.615268
8	0.044150	75.03814	9.135824	4.359887	4.670296	6.795855
9	0.044319	74.47633	9.509130	4.407137	4.844380	6.763021
10	0.044492	73.97379	9.776551	4.486516	5.042760	6.720384

TABLE 19*:* VARIANCE DECOMPOSITION ANALYSIS (VDC) OF US STOCK RETURNS[37]

Period	S.E.	RETURNS	LM3	INDPRO	CPI	IR
1	0.064357	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.064463	99.88540	0.073562	0.013307	0.003051	0.024675
3	0.066535	94.32392	0.105151	5.046890	0.023190	0.500849
4	0.067075	92.87498	0.163076	6.050157	0.032433	0.879358
5	0.067330	92.25072	0.183302	6.586261	0.050901	0.928816
6	0.067512	91.80058	0.188240	7.011766	0.071845	0.927566
7	0.067595	91.58541	0.189814	7.194349	0.099184	0.931242
8	0.067659	91.42467	0.189687	7.296479	0.128021	0.961142
9	0.067714	91.28265	0.189381	7.356882	0.157980	1.013109
10	0.067764	91.15178	0.189217	7.389681	0.189098	1.080222

TABLE 20*:* VARIANCE DECOMPOSITION ANALYSIS (VDC) OF INDIA STOCK RETURNS[38]

[37] The VDC table indicates the contribution of economic variables and its own lagged values in explaining the variability of US stock returns

[38] The VDC table indicates the contribution of economic variables and its own lagged values in explaining the variability of India stock returns

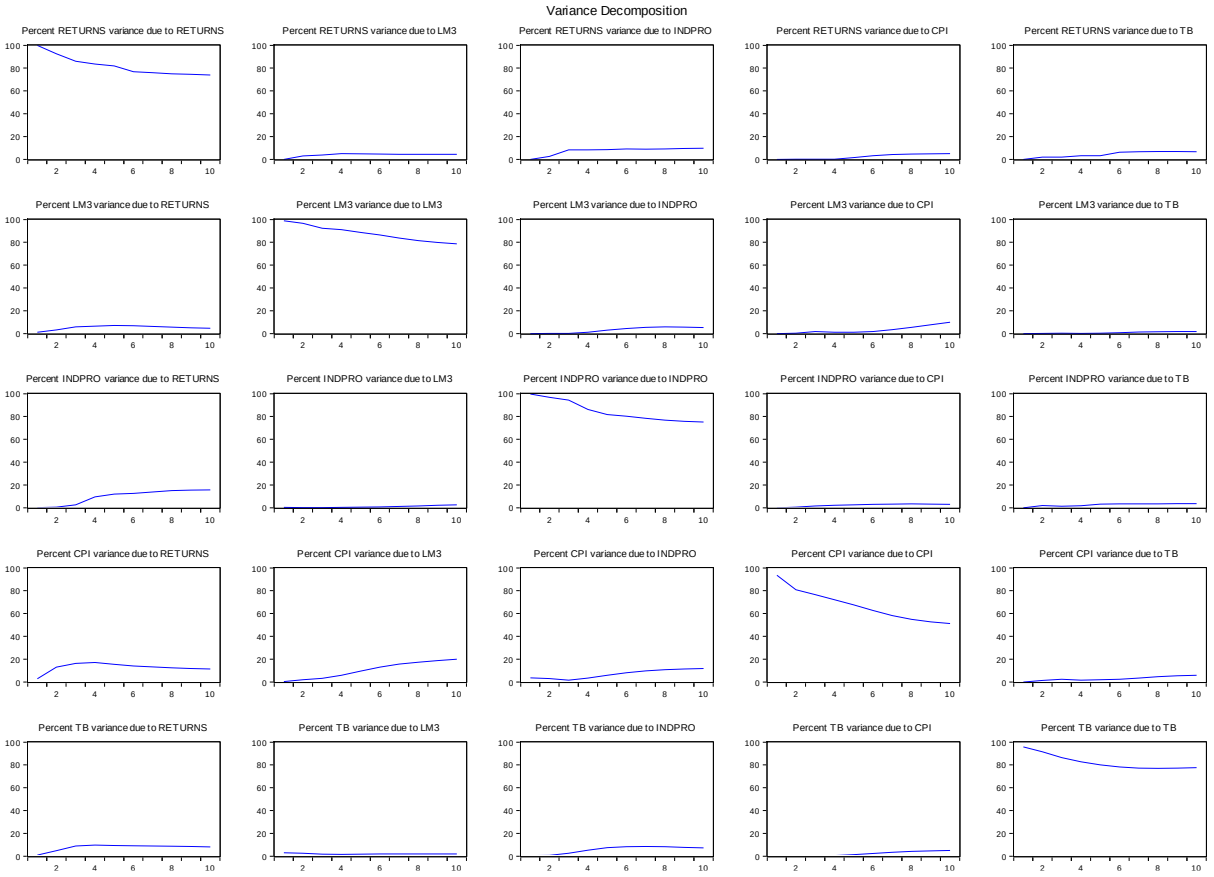


FIGURE 13: GRAPHICAL ILLUSTRATION OF COMBINED VDC ANALYSIS OF US VARIABLES[39].

[39] The multiple visual graphs present the impact of shocks introduced to US economic variables and how it impacts the other variables. For instance- the top second figure illustrates shock to US Money supply will result in a positive impact to US stock returns as the blue line is above zero and y axis indicates the percentage impact, and the x axis indicates the impact of shock in various periods.

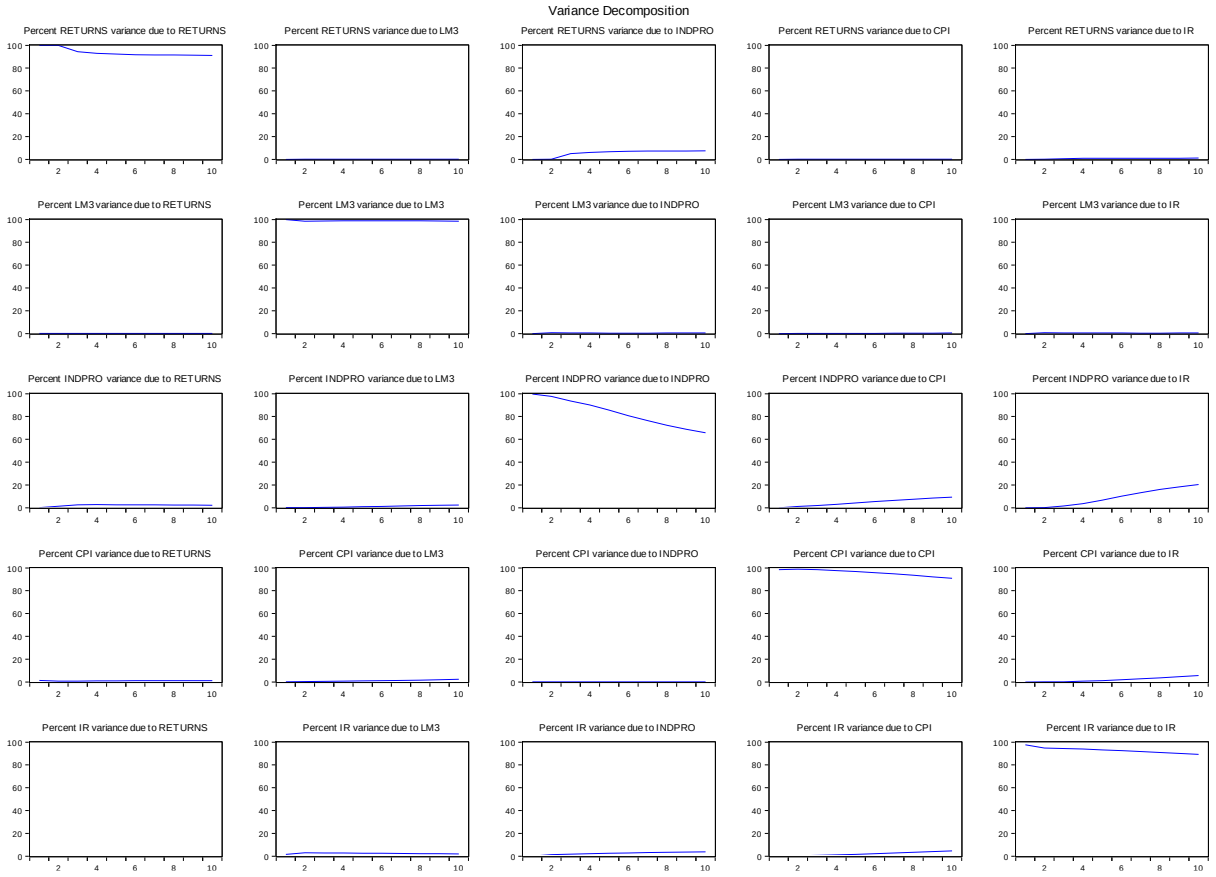


FIGURE 14*:* GRAPHICAL ILLUSTRATION OF COMBINED VDC ANALYSIS OF INDIA VARIABLES[40].

5.14 Empirical analysis of Macroeconomic factors on stock return Volatility

When asset returns disperse from its mean value, this phenomenon is referred to as Volatility. Modelling stock market volatility has always been an ongoing research subject empirically and theoretically for investors and practitioners. Volatility is a crucial factor when it comes to decision-making for investors, and since this research is targeted at investors, academics and policymakers. Therefore, it is important to analyse the impact of the relationship between macroeconomic factors on stock return volatility for the US and India. Stock return volatility may also be described as conditional variance or standard deviation of stock returns that are not directly observable (Baillie and Degennaro, 1990). This research is devoted to modelling

[40] The multiple visual graphs present the impact of shocks introduced to India economic variables and how it impacts the other variables. The blue line above zero indicates positive impact and below is negative impact. The Y axis suggests the impact of a shock in percentage and x axis suggests the impact in different periods. As shown, the blue line is close to zero for most variables which implies that shock introduced to economic variables will have minimal impact on India stock returns.

the impact of macroeconomic factors on stock market volatility, where macroeconomic factors will be modelled jointly as conditional variance parameters and later as isolated on stock return volatility. As explained in Chapter Four, the researcher will carry out this preliminary step before applying the GARCH model, which entails analysing the ARCH effect in the returns series.

5.14.1 ARCH - LM Test

The mean model will be assessed to observe the ARCH effect by performing the ARCH-LM test. The test proposed by Engle (1982) evidences the presence of heteroscedasticity in the residuals and AR (1) has been considered as a conditional mean equation. As explained in the equation below, we obtained the OLS residuals where we have regressed the square residuals on a constant and *q* lags.

$$\varepsilon_t^2 = a_0 + a_1\varepsilon_{t-1}^2 + a_2\varepsilon_{t-2}^2 \ldots\ldots\ldots\ldots + a_q\varepsilon_{t-q}^2 + \nu_t \qquad (5.14.1\text{ a})$$

The null hypothesis implies that there is NO ARCH effect. In other words, the level of homoscedasticity is up to order *q* and can be formulated as below:

$$H_o: a_1 = a_2 = \ldots\ldots\ldots\ldots a_q = 0 \qquad (5.14.1\text{ b})$$

$$H_a: a_1 \neq a_2 \neq \ldots\ldots\ldots\ldots a_q \neq 0 \qquad (5.14.1\text{ c})$$

Heteroskedasticity Test: ARCH			
F-statistic	72.03583	Prob. F (1,128)	0.0007
Obs*R-squared	71.17327	Prob. Chi-Square (1)	0.0008
Serial Correlation Test			
F-statistic	0.954443	Prob. F (1,128)	0.3304
Obs*R-squared	0.969583	Prob. Chi-Square (1)	0.3248

TABLE 21: HETEROSKEDASTICITY AND SERIAL CORRELATION TEST FOR ESTIMATED RESIDUALS AR (1) FOR US[41]

[41] The table presents Breusch- Godfrey test results for Serial correlation in data which suggests there is no serial correlation in US data and the heteroskedasticity test suggests presence of ARCH effect in US lagged data.

Serial Correlation Test			
F-statistic	0.954443	Prob. F (1,128)	0.3304
Obs*R-squared	0.969583	Prob. Chi-Square (1)	0.3248
Heteroskedasticity Test: ARCH			
F-statistic	46.460493	Prob. F (1,128)	0.0122
Obs*R-squared	46.246178	Prob. Chi-Square (1)	0.0124

TABLE 22: HETEROSKEDASTICITY AND SERIAL CORRELATION TEST FOR ESTIMATED RESIDUALS AR (1) FOR INDIA[42]

In Tables 21 and 22 above, the findings of the empirical tests reject the null hypothesis. This implies that residuals are homoscedastic for both India and the US at a 5% significance. The heteroscedasticity test for ARCH effect for AR (1) model indicates the presence of ARCH effect for US and India stock returns. Hence, the next step entails proceeding with the ARCH and GARCH analyses. Also, the diagnostic test (serial correlation) confirms the absence of a serial correlation among residuals for both countries and this provides strong evidence that our estimate output of AR (1) is not biased for both countries.

5.14.2 Volatility clustering

Another useful tool is the volatility clustering. The application of ARCH family model is necessary by plotting the graph to identify volatility clustering. According to Kirchler and Huber (2007), volatility clustering results from dissemination of larger changes, access to new information or at the beginning of each period, resulting in higher volatility, subsequently higher returns. In the following periods, these returns tend to fall as traders learn about higher

[42] The table presents Breusch- Godfrey test results for Serial correlation in data which suggests there is no serial correlation in India data and the heteroskedasticity test suggests presence of ARCH effect in India lagged data.

returns and later market moves towards a partial equilibrium until new information is announced and causes a new start for the next period for the same patterns. Volatility is an important aspect of the GARCH model. Therefore, the presence of volatility clustering acts as a pre-assessing tool to determine whether or not to proceed with the GARCH model.

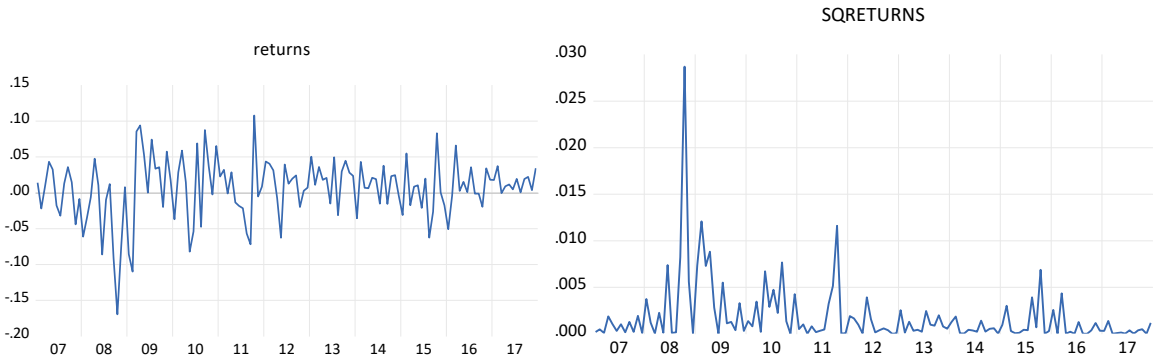


FIGURE 15: GRAPHICAL ILLUSTRATION OF ABSOLUTE (LEFT) AND SQUARED STOCK RETURNS (RIGHT) FOR US[43]

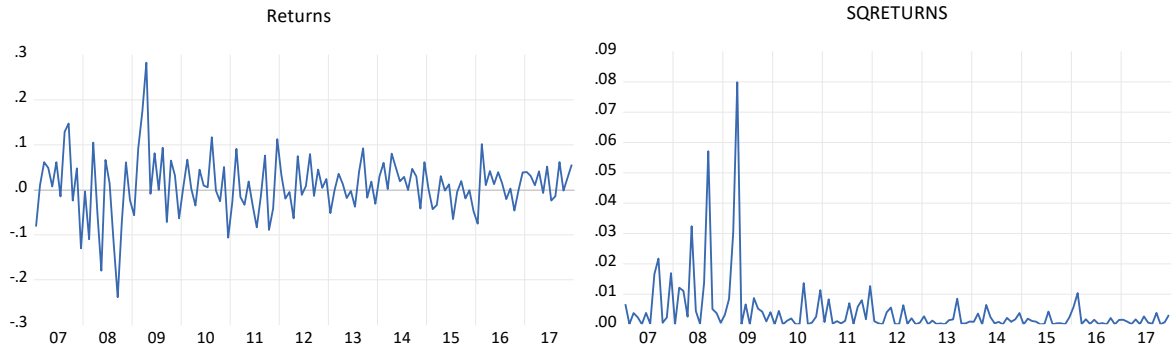


FIGURE 16: GRAPHICAL ILLUSTRATION OF ABSOLUTE (LEFT) AND SQUARED STOCK RETURNS (RIGHT) FOR THE US[44]

Figures **15** and **16** above are graphical illustrations of absolute and squared returns of US and Indian stock markets which demonstrate the period of high/low volatility in the respective market returns followed by high/low volatility.

[43] The graph illustrates the Volatility clustering for US stock returns which suggests the US equity returns are not independent across time, meaning the data exhibit clustering properties.

[44] The graph illustrates the Volatility clustering for India stock returns which suggests the India equity returns are not independent across time, meaning the data exhibit clustering properties.

5.15 Estimation of AR (1) model – ARCH and GARCH (1, 1)

The volatility analysis conducted above confirms the impact of the lagged stock returns (*t-1)* on the stock returns at *t*. This is the standard process in determining conditional volatility in several high-frequency time series data, as suggested by Bollerslev (1987) and Engle (1993). A joint estimation of the mean and variance equation of AR (1) – ARCH and GARCH (1, 1) model for the US and India stock returns is presented below.

Dependent Variable: RETURNS				
Method: ML ARCH - Normal distribution (Newton-Raphson / Marquardt				
Panel (a): Mean Equation				
Variable	**Coefficient**	**Std. Error**	**z-Statistic**	**Prob.**
C	0.010672	0.003095	3.447999	0.0006
RETURNS (-1)	0.075096	0.001188	4.675396	0.0044
Panel (b): variance equation				
C	6.28E-05	7.31E-05	0.858253	0.3908
RESID (-1) ^2: α_1	0.311684	0.120617	2.584077	0.0098
GARCH (-1): β_1	0.670170	0.112851	6.115749	0.0000

TABLE 23*:* ESTIMATES OF AR (1) – GARCH (1, 1) MODE FOR US STOCK RETURNS[45]

Table 23 presented above is the joint estimation of the mean and variance equation of GARCH (1, 1) AR (1) results for the US. These results present several conclusions. The Returns (-1) coefficient 0.075096 under mean equation in Panel (a) is significant at 5 % level of significance. This suggests that past stock returns influence future stock returns volatility for the US. On the other hand, the constant is also significant at 5 % level of significance. The coefficient α_1 and β_1 signify the ARCH and GARCH coefficients under variance equation in Panel (b) are highly significant at 5% level of significance. Several conclusions may be drawn from Panel (b). For instance, the sum of α_1 and $\beta_1 = 0.98$, and it is less than one which indicates that the unconditional variance of error term ε_t is stationary. Also, the sum of α_1 and β_1 is close to one, which suggests that the time-varying volatility of the US stock market is persistent. In other words, a shock to US stock market volatility will last for a long time. The value of coefficients α_1 is less than β_1, which implies that the volatility of India's stock market is affected by past volatility more than by past related news.

[45] The table presents ARCH and GARCH (1,1) test results of US data to determine the US stock returns Volatility based on US stock returns lagged value.

Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)				
Panel (a): Mean Equation				
Variable	**Coefficient**	**Std. Error**	**z-Statistic**	**Prob.**
C	0.011670	0.004614	2.529114	0.0114
RETURNS (-1)	0.212812	0.003073	2.064689	0.0064
Panel (b): variance equation				
C	0.000120	0.000129	0.925908	0.3545
RESID (-1) ^2: α_2	0.169425	0.068291	2.480911	0.0131
GARCH (-1): β_2	0.803723	0.070568	11.38928	0.0000

TABLE 24*:* ESTIMATES OF AR (1) – GARCH (1, 1) MODEL FOR INDIA STOCK RETURNS[46]

The estimation output of the GARCH (1, 1) AR (1) model presented in Table 24 for India suggests similar conclusions to the US. As seen in the Mean equation or Panel (a), the model confirms the impact of the past period on future stock returns in India as Returns (-1) coefficient 0.22 is significant at 5 % level of significance. The constant is close to 0, which is consistent with an unconditional mean as it has a significance level of 5%.

On the other hand, Panel (b) or variance equation equally suggests several conclusions. The coefficient α_0 and β_0 signify the ARCH and GARCH, respectively, in our model. Both α_2 and β_2 in variance equation are highly significant at 5 % level and have positive coefficients. Therefore, we can conclude that the model seems to capture volatility clustering. The sum of ARCH and GARCH coefficients is less than 1 ($\alpha_2 + \beta_2 = 0.96$), which indicates that the unconditional variance of error term ε_t is stationary. Another highlight of the model output is that the sum of $\alpha_0 + \beta_0$ is close to 1, which suggests that the time-varying volatility of the stock market returns is highly persistent like the US. Lastly, it can be observed that α_0 is lower than β_0, which implies that the volatility of India's stock market is more affected by past volatility than past related news.

5.16 Estimation of AR (1) model –GARCH-X (1, 1)

According to the ARDL cointegration test results, it may be concluded that macroeconomic variables have a relationship with stock returns for the US and India. While some variables exhibited a long-term relationship, some others indicated a short-term relationship. The

[46] The table presents ARCH and GARCH (1,1) test results of India data to determine the India stock returns Volatility based on India stock returns lagged value.

researcher proceeded to estimate the AR (1) model GARCH-X (1, 1) as suggested by Lee (1994). This model links the variation within stock returns to the degree of deviation from its equilibrium which presents the magnitude of the error correction in terms of the cointegrating relationship. This has been achieved by adding the lagged square of the error correction term in the variance equation, classifying it as an independent variable. Below is the mathematical equation adopted for the estimation of the AR (1) model GARCH-X (1, 1).

$$R_t = \mu + \rho_1 R_{t-1} + \varepsilon_{t,} \quad (5.16\text{ a})$$

$$\varepsilon_t \,|\, \Omega_{t-1} \sim N(0, h_t^2), \quad (5.16\text{ b})$$

$$h_t^2 = \omega + \alpha_0 \varepsilon_{t-1}^2 + \beta_0 \varepsilon_{t-1}^2 + \lambda_{ECT} Z_{t-1}^2 \quad (5.16\text{ c})$$

$$\omega > 0, \alpha_0, \beta_0\ \lambda_{ECT} \geq 0 \ \rightarrow\ h_t^2 \geq 0 \quad (5.16\text{ d})$$

The estimated parameters α_0, β_0 stand for ARCH and GARCH values in the above equations and will represent the coefficient in variance equation of AR (1) GARCH–X (1, 1). Conversely, λ_{ECT} is the parameter is the new addition by Lee (1994) in the standard GARCH model. This is aimed at accounting for the deviation from the cointegrating relationship on the conditional volatility of stock market returns as well as the long-term relationship of the cointegrated variables on the conditional variance of the Indian stock returns. If the value of λ_{ECT} is large and positive, it implies that variation within stock returns corresponding to group of macroeconomic variables will tend to get larger over time. This means that the stock market is likely to be more volatile and unpredictable. To account for this, the researcher has incorporated Z_{t-1}^2 which is the lagged square of the ECT obtained from the long-term equilibrium relationship. The table 25 below presents the AR (1) model GARCH-X (1, 1) results for the US and India, accounting for the impact of macroeconomic variables on stock returns volatility of both countries.

Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)				
Panel (a): Mean equation				
Variable	**Coefficient**	**Std. Error**	**z-Statistic**	**Prob.**
RETURNS (-1)	0.162646	0.043215	3.763628	0.0002
C	0.004629	0.001548	2.989593	0.0028
C	5.71E-05	4.37E-05	1.306190	0.1915
RESID (-1) ^2: α_1	0.140592	0.038955	3.609078	0.0003
GARCH (-1): β_1	0.485991	0.000647	751.6141	0.0000
ECT (-1)^2 : λ_{ECT1}	0.382464	0.085188	4.489632	0.0000

TABLE 25: ESTIMATES OF AR (1) – GARCH-X (1,1) MODEL FOR US STOCK RETURNS[47]

The explanation of the above model output for the US is similar to the explanation provided on the GARCH models, with the exception of the new parameter added to the AR (1) model GARCH-X (1,1). The results are consistent with an unconditional mean since the constant in mean equation/Panel (a) is close to zero and significant at 5 % level of significance. On the other hand, the estimated coefficients under variance equation in Panel (b) are significant at 5% level of significance, except for a constant which is similar to the findings of Saha (2017). Again, the sum of the ARCH (α_1) and GARCH (β_1) coefficients are less than 1, implying that the GARCH model is stable. Since $\alpha_1 < \beta_1$, the volatility of US stock market returns is more affected by past volatility than related news from the previous period. The Error correction coefficient which consists of λ_{ECT1} represents the collective impact of the macroeconomic variables on the US stock returns volatility. It is highly significant at 5 % level of significance, indicating the relationship between the volatility of US stock market returns and short-term deviations of the macroeconomic variables.

Method: ML ARCH - Normal distribution (BFGS / Marquardt steps)				
Panel (a): Mean Equation				
Variable	**Coefficient**	**Std. Error**	**z-Statistic**	**Prob.**
RETURNS (-1)	0.058769	0.034986	1.679795	0.0430
C	0.007370	0.002371	3.108066	0.0019
	Panel (b): Variance Equation			
C	0.000111	0.000102	1.083782	0.2785
RESID (-1) ^2: α_2	0.115094	0.042753	2.692066	0.0071
GARCH (-1): β_2	0.450085	0.188893	2.382747	0.0172
ECT (-1)^2 : λ_{ECT2}	0.328417	0.063711	5.154790	0.0000

TABLE 26: ESTIMATES OF AR (1) – GARCH-X (1, 1) MODEL FOR INDIA STOCK RETURNS[48]

[47] The table presents GARCH-X (1,1) test results which indicates the volatility of US stock returns can be explained by US macroeconomic variables

[48] The table presents GARCH-X (1,1) test results which indicates the volatility of India stock returns can be explained by India macroeconomic variables.

Table **26** above presents the model estimates for AR (1) – GARCH-X (1, 1) Model for India. It suggests that most of the coefficients are highly significant, and the findings are like the US. The results satisfy the condition for an unconditional mean since the constant in Panel (a) or mean equation is close to zero and significant at 5 % level of significance. Under the variance equation, the values of the ARCH (α_2) and GARCH (β_2) imply that the model is stable. Additionally, they indicate that the volatility of India's stock market returns is more affected by past volatility than related news from the previous period. The error correction term (λ_{ECT2}) signifies the impact of macroeconomic factors on India's stock returns volatility and the P-value (0.000) suggests that the volatility of India's stock market returns and short-term deviations of macroeconomic variables such as the P-value is less than 0.05. This implies that the coefficient is highly significant.

5.17 Summary

In summary, this study has justified the linkages between macroeconomic variables and stock returns, as well as their volatility within the US and India stock markets. As a reminder, the foremost objective of this research is to investigate the impact of macroeconomic factors on both markets. This analysis started with the transformation of selected variables. Since the data collected was seasonally adjusted, the transformation of data was not necessary, except for stock prices and M3. The transformation of M3 was required due to large values, and it was transformed into Log M3. Therefore, it becomes convenient for readers to make meaningful interpretations from the coefficient figures. On the other hand, the transformation of stock prices was mainly done to acquire stock returns since the research objective is to study the relationship between macroeconomic variables and stock returns. This chapter equally presented the statistical features of data along with their correlation matrix.

The ADF test and PP test were incorporated to test the stationarity of data which is a crucial step in econometrics. The results reveal that if unit root tests are not performed, the findings may be biased. The test concluded that most variables were non-stationary at level form except stock returns for both US and India and treasury bills. Therefore, it essential to examine the non-stationary variables for further analysis. In order to determine the relationship between variables, the Cointegration technique has been adopted. However, there are multiple cointegration techniques and application methods based on the type of data. This research has some stationary variables at level form, while others were stationary at first differenced. Hence,

this research has adopted an Auto-regressive Distributed Lag (ARDL) bound test technique which is unlike the more popular methods such as the Johansen-Juselius and Engle-Granger methods which require all the variables to be stationary at first differenced form. The ARDL bound test suggested a relationship between the macroeconomic variables and stock returns for India and the US.

In addition, this study seeks to understand the nature of the relationship between the selected variables, whether positive or negative, long-term or short-term. The first step entailed choosing the appropriate lag while relying on the AIC criteria to select the lag, which is four lags for the US model and 2 for the Indian model. This part of the chapter picked up the differences between two different stock markets. For instance, all the macroeconomic variables explain the variability in US stock returns in over a long-term period, with the exception of INDPRO. On the other hand, changes in Indian stock returns can only be explained by LM3 and INDPRO over a long-term period. Both stock markets exhibit a contrary relationship with their domestic economic variables to some extent. The US stock returns have indicated a positive relationship with INDPRO, although not as significant as India stock returns indicate a significant positive relationship with INDPRO. In contrast, the variables behave differently over a short-term period, and so their relationship with stock returns varies. TB and CPI are the two variables that explain the variation in US stock returns within a short period of time. On the other hand, only LM3 influences the India stock returns while the rest of the variables demonstrate a weak relationship with stock returns over a short-term period. The ECM represents the speed of adjustment. This implies that if a variable was to move away from its equilibrium value, then ECM will reinforce the variables to its long-term equilibrium value. The US coefficient of ECM suggests that any deviation from a long-term equilibrium path will be corrected in the next period by 32%. On the other hand, any deviation from the equilibrium level of India's stock returns within the current period will be corrected by 97% in the next period to restore the equilibrium. The CUSUM and CUSUM square model has been employed to determine the stability of the model and the graphical representation confirmed stability for both countries. Furthermore, VDC concluded that around 74% changes in US stock returns are influenced by its own innovative shocks, LM3 by 9.8%, followed by TB by 6.7%. These conclusions are consistent with the ARDL short-term and long-term analyses. The VDC analysis for India suggests that India's stock returns are majorly affected by its own shocks which make up 91.15% while shocks in INDPRO contributes to 7.4%.

The next section will examine the relationship between macroeconomic variables and stock returns volatility using ARCH and GARCH analyses. The LM test confirmed the presence of the ARCH effect by testing whether residuals are heteroscedastic or homoscedastic for both countries. Additionally, we employed a serial correlation test to check if the AR (1) model is biased or not. The estimated output of AR (1) GARCH (1, 1) suggested that past stock returns influence the volatility of future period stock returns for the US and India. Surprisingly, the estimated output had similar results for both countries. This suggests that regardless of the development of a country, its stock returns volatility is highly influenced by its past returns. The method proposed by Lee (1994) was adopted to analyse the joint impact of macroeconomic variables on stock returns volatility by employing AR (1) model GARCH-X (1, 1). The Error correction Term (λ_{ECT}) presented the collective impact of macroeconomic variables on stock returns volatility, and the results concluded that there is a relationship between the volatility of stock market returns and short-term deviations of macroeconomic variables for both countries.

CHAPTER SIX

DISCUSSION OF FINDINGS

This chapter aims to conduct a comparative analysis of the results derived from the use of econometric tests in the previous chapter. Previous empirical findings had varying conclusions regarding the impact of domestic macroeconomic factors on stock returns and their volatilities. As such, this research has set out to identify the differences and/or similarities in the responses of both developing and developed stock markets towards the same domestic variables. A discussion on the results obtained from the previous chapter will be of relevance to investment managers and portfolio managers for decision-making. It will equally determine how these two distinct markets respond to changes within the economic environment.

Additionally, this will allow policymakers to link such changes in policies to stock markets, thereby implementing the changes accordingly. This section has also analysed the role of macroeconomic variables on stock markets during the recession. This chapter is aimed at checking whether all the hypothesis and objectives this research have been adequately addressed. Subsequently, the researcher will discuss the findings of the empirical analyses performed in the previous chapter.

6.1 Interaction between stock returns and macroeconomic variables

The ARDL bound test presented in Tables 15-18 indicates the long-term relationship between the US and India stock markets and their domestic macroeconomic variables. Previous studies have produced contradictory results due to different time periods and variables, while some

agree with the findings of this research such as Castillo-Ponce et al. (2015) and Akbar et al. (2012). However, Kutty (2010) disagrees with the findings of this research. It was observed that authors who employed recent data in their findings identified a relationship between macroeconomic variables and the stock market. A possible explanation could be that the stock market is becoming more prone to the overall health of the economy other than just company profits. Consequently, the ARDL bound test suggests a relationship between macroeconomic variables and stock returns for the US and India. While some researchers have argued that there is a weak or no long-term relationship between stock returns and economic variables, several empirical studies have been reviewed in literature which indicate contradictory results. Such variances within the findings and conclusions may be attributed to the differences in methodology, choice of variables and the period of study. Nevertheless, a greater number of studies confirm linkage between macroeconomic variables and stock returns in the long-term as well as short but this statement needs to be made with caution, as some studies conclude that only minimal variation in stock returns can be explained by these macroeconomic variables. In this research, the analyses of the US and Indian stock markets proffer the same conclusion, confirming that there is a relationship between stock returns and macroeconomic variables. This indicates that there is some degree of interdependency between the two countries. However, the relationship between the variables and stock returns varies for both countries. The table below provides a brief synopsis of test results from our econometric models presented in chapter five and this will be used as a basis for further discussion below.

Variables	US Stock Returns	India stock returns
Money supply	The US stock returns exhibit positive relationship and 1 percent change in domestic money supply will explain 20.6% change in stock returns in the long run and negative relationship in the short-run with the coefficient of -0.934221 which is significant at 10 % level, meaning 1 percent increase in money supply will result in 93% drop in US stock returns in short-run	The India stock returns demonstrate positive relationship and 1 % change in the money supply will result 30.69 % change in the stock returns in long run and demonstrate positive relationship in the short run too and the coefficient is significant at 5 % level of significance.
Inflation	As inflation increases in the long run, it impacts the US stock returns negatively. The statistical test suggests 1 % increase in Inflation will result in 0.3 % drop in the stock returns which suggest most listed companies are able to pass on the increased input cost in final prices in the long run. However, the results show positive relationship between Inflation and stock returns in the short run with a coefficient of 0.015220.	Although Inflation affect India stock returns negatively in the long run and in the short run i.e., increase in Inflation will result in a drop in stock returns, however results are insignificant at 5 % level of significance for the chosen period.
Interest Rates	The results suggest the impact of Interest rates on US stock returns are quite minimal which is 1 % increase in Interest rates will result in a 0.07 % and significant at 5 % level in the long run. On the other hand, Increase in Interest rate will result in increase in stock returns by 2.42 % and quite significant at 5 % level of significance.	The ARDL Long-run and short-run output suggests Interest rate are insignificant in explaining the variation in stock returns for the chosen period.
Industrial Production	The long-run output suggests Industrial Production fails to explain variation in stock returns in the long-run and short-run as it is insignificant at 5 % level of significance.	On the other hand, Industrial production is significant for India stock returns and 1 % increase in the level of production will result in increase in 1.03% in India stock returns and fails to describe variation in stock returns in short run.

Error Correction Model Coefficient	The ECM coefficient suggests speed of adjustment meaning if variables were to move away from their equilibrium value, then ECM will reinforce the variables to their long-term equilibrium value, and it should be between 0 to -1 which is -0.322994.	On the other hand, the ECM coefficient for India is -0. 979675 which implies that any deviation from a long-term equilibrium path will be corrected within the next period by 0.97 %
GARCH-X (1,1) Test Results	The volatility of US stock market returns is more affected by past volatility than related news from the previous period. The Error correction coefficient which consists of λ_{ECT1} represents the collective impact of the macroeconomic variables on the US stock returns volatility which suggest the short- term deviations of macroeconomic variables explain the volatility of the US stock returns	The volatility of India's stock market returns is more affected by past volatility than related news from the previous period. The error correction term (λ_{ECT2}) signifies the impact of macroeconomic factors on India's stock returns volatility and the P-value (0.000) suggests that the volatility of India's stock market returns and short-term deviations of macroeconomic variables such as the P-value is less than 0.05. This implies that the coefficient is highly significant.

TABLE 27: COMPARATIVE ANALYSIS OF ARDL AND GARCH-X (1,1) TEST RESULTS BETWEEN US & INDIA

6.1.1 Money Supply and stock returns

The US stock returns respond to every 1 per cent change in LM3, CPI and TB, while India stock returns respond to every 1 percent change in LM3 and INDPRO. The common variable which seems to affect both markets over a long-term period is the money supply. By this, LM3 suggests that money supply is an influential factor within developed and developing stock markets. Gupta (1974) supports this position by purporting that the money supply may be utilised for predicting the development of stock markets and concluded that 59% of the value of stock indices could be predicted based on the money supply. Similarly, Sirucek (2012) claimed that money supply is an important determinant of the development of the Dow Jones Industrial Average (DJIA) stock index, particularly over the past 25 years. He implied in his research; the monetary aggregate seemed to be statistically significant in explaining the development of the DJIA index during the Dot.com bubble formation. Despite the importance of money supply in the US stock market, the research findings connote a strong relationship in

the long run and a weak relationship over a short-term period based. On the other hand, India stock returns is influenced by money supply over both long term and short periods. Bisson et al. (2016) suggested that developing countries are better off using the money supply to predict stock returns. The study equally inferred that when the total amount of money increases in developing countries, in particular, stock indices will eventually increase. Consequently, firms may expect stock prices to grow.

6.1.2 Industrial Production and stock returns

The role of industrial production as a variable in explaining the movements in stock returns can be debated as some empirical studies did not conclude with significant and reliable statistical relationship between stock market and real output (Gultekin, 1983; Fama, 1981; Homa and Jaffee, 1971). A recent study by Burcu (2016) claimed that industrial production indicates the health of the economy and an increase in industrial production tends to raise the expected future cash flows and profitability of firms. Nevertheless, the importance of the industrial output is questionable in this research as INDPRO has indicated no relationship with US stock returns for the chosen timeframe over long-term and short-term periods. Young (2006) studied the relationship between industrial production and US stock returns for the period 1989 to 2004. He concluded that the relationship was eventually lost due to a transformation from manufacturing based to service based. Industrial production figures are significantly reliant on manufacturing industries. This has also been evidenced over the last decade as the US economy has offshored substantially their production to low-cost countries. For instance, giant InfoTech Company, Apple, has moved its manufacturing from the US to other developing nations to benefit from cheap labour. This further suggests that there is a significant relationship between INDPRO and India stock returns in the long. An increase in industrial production tends to affect stock prices positively since an increase in industrial production tends to increase corporate earnings. This enhances the present value of the firm, leading to an increase in investment within the stock market. Ultimately, this enhances stock prices.

6.1.3 Consumer price Index and stock returns

According to Fama (1981), the connection between inflation rate/CPI and stock prices is negative due to the Money Demand theory which means stock returns will be negatively influenced by inflation. The negative relationship can be justified using Dividend Discount

model (DDM) as a reference. Based on the DDM pricing technique, stock prices are perceived as the discounted value of an expected dividend and increase in inflation results in increase in nominal risk-free rate which results in higher discount rate to discount the future dividends and consequently, declining stock price. Also, higher inflation rates tend to raise production costs which is then translated into lower profits, subsequently affecting the real economic activity. Because real activity has a direct relationship with stock returns, therefore rise in inflation will ultimately have a negative effect on market returns. This analogy of Fama (1981) is evidenced in our empirical results for the US and India, as the stock returns for both countries exhibit a negative relationship with CPI over a long-term period. However, the relationship between US stock returns and CPI is significant over a short period of time, while insignificant for India stock returns based on the empirical analyses conducted. The findings on the US stock returns agree with Albulescu et al. (2016). They studied the long-term relationship between stock prices, inflation and its uncertainty for different U.S. sector stock indices, over the period 2002M7 to 2015M10. The study discovered that over a long period, inflation and its changes negatively impact on stock prices.

On the contrary, ARDL short-term coefficients indicated a positive relationship between US stock returns and CPI which is probably because equity acts as a hedge against inflation within a short period of time (Ratanapakorn and Sharma, 2007). Another possible explanation is the fact that household demands tend to increase over a short-term period, and families resort to stocking up goods to avoid price hikes which ultimately increases cash-flow within corporations over short-term periods. Consequently, this leads to an increase in stock prices. This study indicates a negative relationship between variables for developing countries, as supported by Pal and Mittal (2011) in their analysis of India. Similarly, Akbar et al. (2012) also highlighted a negative relationship for Pakistan. However, findings from the empirical analyses conducted within this research indicate that CPI does not contribute as a significant variable in explaining the India stock returns movement. The is based on the premise that past findings used stock prices instead of stock returns, and within this study, the researcher has extracted the stock returns via stock prices. As such, this explains why a possible connection between the variables was not evident in the econometric analysis.

6.1.4 Interest Rate and Stock returns

The strong interdependence between interest rates (IR) and stock markets have been extensively reviewed by researchers, particularly for developed economies. The empirical tests conducted within this investigation have produced results which are similar to the findings of Chen and Hu (2015), where US stock returns are deemed to be significantly influenced by Treasury Bills (TB) while India stock returns have demonstrated a weaker relationship with IR. The varying relationships between countries may be attributed to the contrasting market efficiency in developed and developed economies. Most of the studies conducted on the US stock market have suggested a relationship between stock returns and interest rates, albeit negative. For instance, Rigobon and Sack (2004) established that surge in short -term interest rates because of fed actions followed with drop in US stock returns significantly as investors tend to prefer debt securities over equity securities. More specifically, they concluded that stock indices declined by 1.9% as result of increase in interest rates by 0.25%. On the other hand, Ehrmann and Fratscher (2004) examined the prominent effects of monetary policy announcement on stock prices as well and concluded that an unannounced increase in federal fund rate (tightening monetary policy) by 0.50% lead to 3% decline in stock prices .On the other hand, decline in interest rates tends to shift investors demand from debt to equity securities as corporations can finance their projects or expand their operations at lower cost of borrowing ,which further encourages more investment , subsequently increase in future earnings and higher stock prices. The empirical tests conducted within this research confirm previous findings. They show that an increase in 100 basis points in TB rate will result in a fall in US stock returns by 0.7725 % in the long run as well as a positive relationship within a short period. Investors in the US stock market were not significantly affected by the movements of interest rates over a short period of time. The VDC analysis again confirms that shocks in US stock returns are contributed by TB by 7.4% from 2007 to 2017. On the other hand, India stock returns indicate no relationship with interest rates, which is probably due to a weak-form efficiency in the Indian stock market. According to Li and Fan (2000), the weak impact of interest rates on stock markets is due to an inefficiency in the stock market and monetary market at the time.

6.2 Interaction between macroeconomic variables and stock return volatility

According to John Bollinger, “Volatility is a function of uncertainty." There is an negative relationship between stock market behaviour and its volatility, as the market prices increases, the Volatility within the stocks drops and vice-versa. Volatility is nothing but a ‘Risk’ which is statistically expressed as dispersion around mean returns. Investors/traders tends to measure the volatility by observing the dispersion around the mean and large dispersion is perceived as greater chance of decline in compound returns. Crestmont Research observed the volatility of S&P500 by calculating the average range for each day and concluded high volatility is associated greater chance of market decline and low volatility associated with rising market (Ang & Liu, 2007). This guided the researcher in determining how macroeconomic factors influence the volatility of the stock market. Each macroeconomic factor plays a role in creating random fluctuations in the stock market. The idea here is that there is a strong link between the macroeconomy and the stock market. Consequently, any shock in macroeconomic variables will present a source of systematic risk which will affect any market portfolio, irrespective of how well diversified the portfolio is (Chowdhury and Rahman, 2004). Such economic factors may influence market volatility either directly or indirectly. For instance, inflation is considered as an important variable in determining investors’ expectation for future return and indirectly affects market volatility. Since future return constitutes inflation-risk premium and any changes in the inflation rate could affect the investor's expectation for future returns, this ultimately leads to switching of shares or any other class of securities that pays for the inflation risk (Bhowmik, 2013). On the contrary, industrial production is perceived as variable that affects stock return volatility directly and often causes random fluctuations of stock volatility around its level which arises from the business cycle propagation mechanism (Corredi et al. 2010).

Monetary authorities such as the Central Bank or Federal Reserve play a crucial role in inducing stock market volatility in most countries by governing certain macroeconomic factors such as interest rates and money supply. According to Christiano et al. (2008), implementing an accommodative monetary policy which entails increasing the money supply to boost the economy may be an indication that a rebound of the stock market is about to take place. Thus, the imperfect rationality of investors may lead to more frequent fluctuations within the stock market than usual. Researchers have also suggested that the aftermath (post-crisis), the real

recovery of the economy[49] slows down if the stock prices exhibit volatility. It remains controversial if monetary policies contribute to stock market volatility, therefore most researchers have proposed that central banks should take the possibility of increased market volatility into account when establishing monetary policies.

In addition, changes in interest rates have equally been noted to cause volatility in the market through different channels. For instance, the price of stocks is the discounted value of expected dividends and discount rate i.e. Interest rate. Mature firms with the history of distributing of high dividends will be more sensitive to the changes in interest rates. According to Bernanke and Kutter (2005), volatility in equity prices may be directly attributed to announcements of changes in interest rates. The results of this research tend to agree with previous conclusions. Hence, the model estimates for AR (1) – GARCH-X (1, 1) for both India and the US indicate that the influence of macroeconomic variables on the US and India on stock returns volatility holds. Also, it suggests that past volatility has a greater impact on stock market returns than related news from past periods. The model estimates within this research analyses are confirmed by several other relevant studies such as Liljeblom and Stenius (1997) who examined Finnish data and concluded that changes in conditional stock market volatility were related to macroeconomic factors (namely inflation, industrial production, and money supply).

Morelli (2002) examined the relationship between conditional volatility in the UK stock market and a few macroeconomic variables. He concluded that there is a significant relationship between stock markets and macroeconomic factors with respect to the ability of macroeconomic volatility in predicting stock market volatility. Studies on emerging economies have equally provided similar conclusions on stock market volatility. Engle and Rangel (2005) studied emerging markets, as well as developed markets, by accounting for volatility clustering using the Spline-GARCH model. They reported that macroeconomic variables such as GDP growth, inflation and short-term interest rates are important explanatory variables that tend to increase unconditional stock market volatility. Chowdhury and Rahman (2004) investigated the relationship between macroeconomic variables and the volatility of stock returns in Bangladesh. By using VAR models, they concluded that macroeconomic volatility significantly causes stock market volatility. Hence, it can be safely concluded that changes in macroeconomic factors may impact volatility in developed and developing markets.

[49] As a result of implementing stimulative monetary policy

6.3 Interaction of macroeconomic variables with the stock market during the recession and the aftermath

This analysis covered a period which is commonly referred to as the subprime bubble had resulted in the global fall of stock markets world-wide. The bubble initiated from real estate market in mid-2007 and disseminated into the financial system until late 2009, which was the longest recession since World War two. The real GDP dropped drastically, and the unemployment rate was peaking high to 10% by mid- 2009. There general perception on the emergence of these financial crises is that the surge in housing prices exposed the lenders and investors to unprecedented levels of securitization of mortgages through collateral debt obligation which eventually created considerable uncertainty in financial markets (Szablowska,2010). However, some have argued that several notable signs should have been regarded as warnings, blaming the government for allowing banks and other financial institutions to increase excessive leverage. According to Taylor (2009) fed adopted excessively loose US monetary policy i.e. lowered the interest rates (pre-crisis) which fuelled the credit boom, whereas Elmendorf (2007) argued that interest rates were not too low. Additionally, this raised doubts on the credibility of US financial regulation and monetary policies as well as global imbalances (the glut of savings flowing from surplus countries to deficit economies). Below is a graphical representation of the variations in variables during the recession and its aftermath within the US.

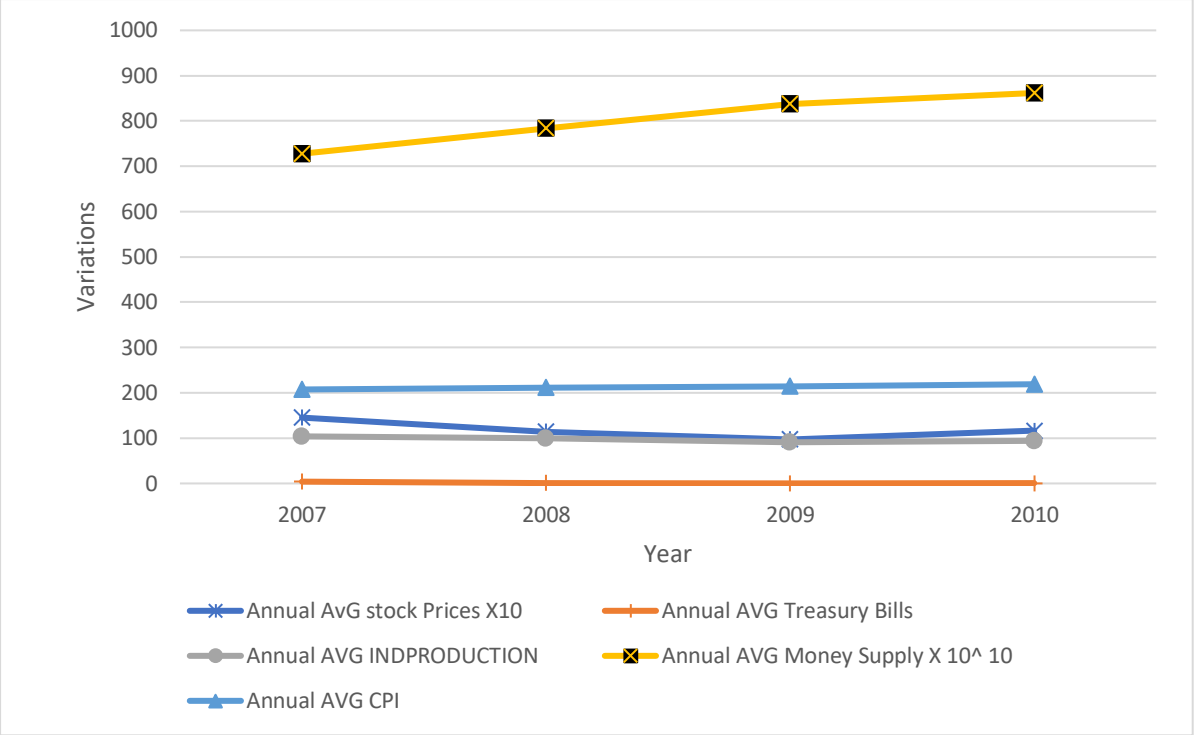


FIGURE 17: VARIATIONS OF STOCK PRICES WITH OTHER MACROECONOMIC FACTORS WITHIN THE UNITED STATES

To clearly depict the actual relationship between these variables and the stock market, the researcher has incorporated stock prices for the purpose of this analysis. Based on the above graph, between the year of 2007 and 2010, Consumer Price Index (CPI) had a small variation with the stock prices which confirms the position of Geetha et al. (2011), who found a weak connection between inflation and the US stock market for the period 2000 -2009. As illustrated on the graph above, changes in CPI would not have greatly affected stock prices for the United States during the chosen period. Treasury Bills during the period 2007 to 2010 had minimal movement and the rates were kept low as the economy receded in order to initiate quantitative easing following the 2008 financial crisis. As the financial crisis progressed and intensified by 2008, the Federal open market committee took further actions to cut down the interest rates, taking the rate to its effective floor i.e. a target range of 0 to 25 basis points. Despite the interest rate cuts, the economic condition persistently weakened and barely had any impact on the US financial sector (Steelman and Weinberg, 2015). On the contrary, it can be observed from the graph that there is a strong variation between money supply and stock prices. The money supply was essential in helping the economy overcome the recession through price regulations (Singh, Mishra and Das, 2017). In an analysis of the recession period, Picha (2017) concluded that if the money supply increases for $1 billion, S&P 500 rises for 0.14 points. It indicates that

S&P 500 reacts intensively to changes in money supply during observed order of lag (6 months). As a result of changes in monetary policy, the stimulus in the monetary policy affected individual's portfolio, affecting risk and return of different asset classes within the portfolios. This prompted portfolio managers and investors to reallocate their portfolios which increased the demand for equity securities which acted positively in stock market recovery.

It is irrefutable that the 2007 recession had a global impact, leading several advanced economies to join ranks, particularly those exposed through financial and later trade channels with the US. Nevertheless, Asian countries such as China and India and also Australia, avoided a significant contraction, despite their integration within the global economy (Verick and Islam, 2010). The impact of this crisis was significantly different for the Indian economy as opposed to the western developed nations as the Indian banking sector was not affected. This was due to the fact it hardly had any direct exposure to subprime assets. Moreover, banks were well capitalised and inherently sound (Mohanty, 2009) and the Indian financial markets remained unaffected in the early phases of global crisis. It is after the Lehman brother collapse, it started proliferating to the global economy through the trade and finance and confidence channels.

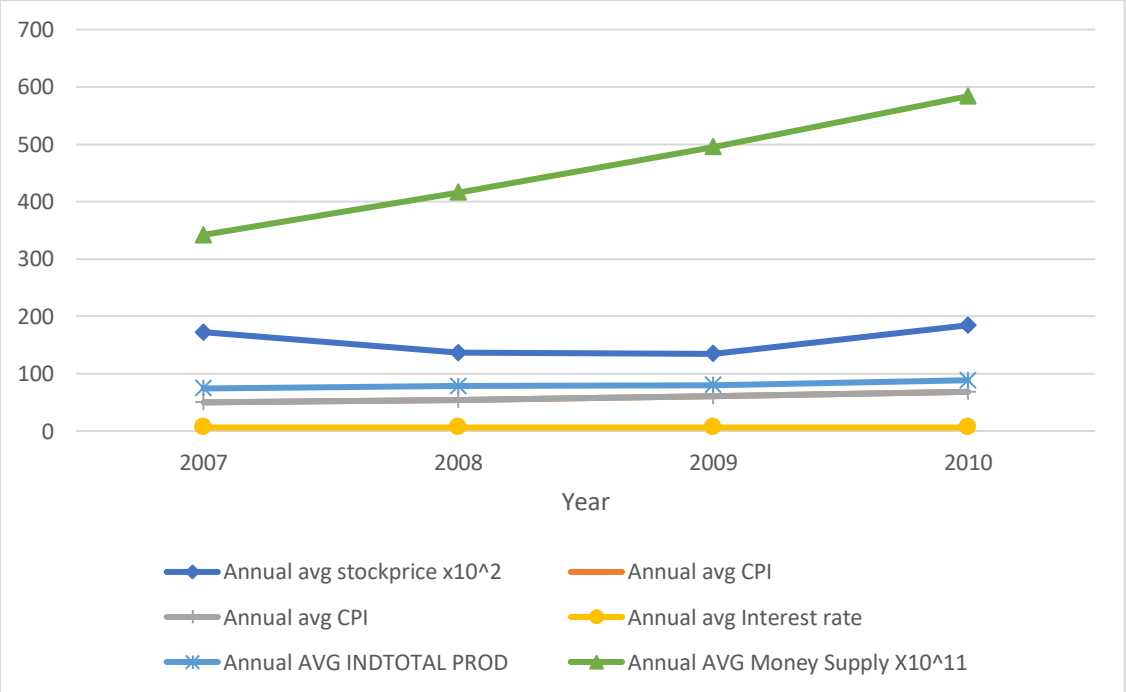


FIGURE 18: VARIATIONS OF STOCK PRICES WITH OTHER MACROECONOMIC FACTORS WITHIN INDIA

The above graph depicts the economic environment of India from 2007 to 2010, when the economy was characterized by low financial developments (Joseph et al., 2009). According to Srinivasan and Vani (2009), the macroeconomic factors which influenced stock prices to an extent in India during its recession were interest rate, Consumer Price Index (CPI), and money supply. The interest rate can be seen as a constant rate (Figure 19), having a small variation with the stock prices; therefore, it never had a significant effect on recovering India from the recession period of 2007 to 2010 (Dani, 2014). The Consumer Price Index (CPI) according to the graph, was steadily increasing throughout the years of recession. According to Bhatt (2011), the rise in food prices and fuel during this period had a knock-on effect on the financial instability causing uncertainty in the industrialized nations. To a lesser extent, it affected stock prices in India during the recession period and had no influence in recession recovery within a short-term period. Due to this, domestic demand and the international demand for goods and services depressed and the India's industrial sector export markets had suffered. As per the index of industrial production (IIP) data released by CSO revealed that the overall growth in 2008-2009 was 3.2 percent compared to a growth of 8.7 percent in 2007-08. Over a period of time, the IIP figures progressed to 10.5% by 2009-10 which increased the ability of the country to export to other countries (Srinivasan and Vani, 2009). Besides strengthening the economy, this also helped in stabilising the financial market.

The analysis indicated a substantial variation between money supply and stock prices as money supply was an important tool in helping the Indian economy to overcome the recession. In order to facilitate recovery from the recession, the Reserve Bank of India announced a series of measures to facilitate the orderly operation of financial markets and to ensure financial stability, which was predominantly inducting liquidity into the economy via monetary channels and fiscal channels (Bhatt, 2011). This was achieved through the application of the Cash Reserve Ratio (CRR), which was reduced to 5% from 9% in August 2009 and Statutory Liquidity Ratio (SLR) stipulation and Open Market Operations (OMO), as well as a reduction in the repo rate to 4.75% which improved the flow of credit to productive sectors at viable costs in order to sustain the growth. Ultimately, this improved the profits of corporations and led to steady improvements in the stock market.

6.4 Review of aim and objectives

This research aims to establish *whether macroeconomic factors have any relationship with stock returns in the US and India and consequently examine volatility in both markets* using a multi-statistical analysis. As clearly depicted in the preceding sections, this analysis has so far revolved around exploring the relationship between the relevant variables. Furthermore, the objectives stated in Chapter one are reviewed below which will help the researcher to ascertain if the aim of this research has been met. Nevertheless, this section will look at each of the objectives to observe whether they have been adequately addressed within this research.

Conduct an extensive review of the literature and critically review past research findings of developed and emerging economies, especially papers relating to India and the US.

Existing literature has been empirically reviewed in Chapter two, where the researcher systematically reviewed previous studies on the subject for both the US and India. Also, the researcher briefly covered other countries. Chapter two includes a discussion on some important contributions made by other researchers, which has been structured into two sections including the impact of macroeconomic factors on stock returns as presented in Section **2.4** and the impact of macroeconomic factors on stock returns volatilities presented in Section **2.5**. Nonetheless, the chapter has equally sub-sectioned the discussion on literature review for the US, India and other countries. It is quite evident that such findings either contradict or agree with the existence of a relationship between economic factors and the stock market. Contrary positions may be attributed to different time periods, variables or even the research methods involved.

On the other hand, a significant proportion of existing literature also indicates the existence of a relationship between the stock market and country macroeconomic variables. Nevertheless, this research seeks to fill the gap within the context of comparative study between the US and India by focusing on the selected time period. In addition, this research examines the impact of the macroeconomy on stock returns and stock returns volatility.

Evaluate various theoretical frameworks such as the Arbitrage pricing theory (APT), Efficient Market hypothesis (EMH), Portfolio theory and the Dividend discount model to formulate a conceptual framework for this research.

This research has been guided by selected economic theories, enabling the researcher to test their relevance within the context of this subject. It is quite evident that theories on market behaviour have received considerable attention by academicians over the years. It began with portfolio theory and DDM (1950s), moving on to CAPT (1960s) and eventually APT and EMH (1970s). Although this research has shed light on the Portfolio theory, EMH and DDM in section 2.2, this research has mainly focussed on validating the APT theory as most researchers in the past too (Adesanmi, 2017). Similarly, several other researches have concentrated on the APT and EMH models (Bhayu and Rider, 2012; Hsing et al., 2013; Izedonmi and Abdullahi, 2011; Kadir et al., 2009; Olukayode and Atanda, 2010; Osamwonyi and Osagie, 2012). According to the EMH model, stock prices are supposed to fully reflect the very information that is used in the prediction of the stock price. This implies that the price is not influenced by the revelation of information to market participants, asserting that financial markets are efficient.

According to the EMH hypothesis, traders cannot rely on changes in macroeconomic factors to earn abnormal profits consistently. The stock prices reflect all the past and current information on the growth of macroeconomic variables. Therefore, traders cannot apply this as their profitable trading strategy, using the available information in the market as per EMH. Since this research is not aimed at testing market efficiency, the researcher has paid less attention to the Market hypothesis theory. This research mainly focuses on the factors which influence stock returns. Therefore, the APT served as a foundation to formulate the conceptual framework for this research since it is a general theory which proposes that market factors drive the expected return of an asset. The conceptual framework of this research has allowed the researcher to test the research hypothesis whilst illustrating the research topic in Figure 5 which connects dependent variables with macroeconomic variables, using arrows.

Determine the relationship between each selected macroeconomic variables and stock market returns of India and the US using an appropriate cointegration technique.

This objective has been addressed within the research analysis section of this thesis. In order to determine long-term or short-term objectives, the researcher first performed the ARDL Bound test by conducting an F-test for joint significance of the coefficients of lagged levels of variables, as shown in section 5.8.1. The bound test captured the cointegrating relationship between the variables for the US and India, which signalled that the variables could be further tested for Long-term and short-term relationship. The results and the explanation for the Long-

term and short-term coefficient tests using the ARDL approach is presented in section 5.10 and 5.11, respectively. The results suggest that money supply, Consumer Price Index and Treasury Bills for the US influence stock returns except for industrial production over long-term and short-term periods. On the other hand, money supply and industrial production have a long-term relationship with India stock returns. In contrast, in the short-run, only money supply may be used to explain changes in the Indian stock returns.

Analyse the stability of the chosen model and examine stock markets in response to shocks in selected macroeconomic variables to learn the inter-dependence between the variables.

The CUSUM test determines the stability of the parameters in the model. Based on Figure 10-13, it was concluded in section 5.12 that the tested model for this research is stable and appropriately specified. The Variance decomposition analysis test has quantified the response of stock markets as a result of shocks in macroeconomic factors as well as shocks within the stock market. From the resulting output, it indicates that the US and India stock returns are mainly affected by shocks within the stock market. US stock returns primarily respond to any shocks on money supply and Treasury Bills which are consistent with the ARDL test, while industrial production has been concluded as a key variable as per VDC analysis which suggests that any shocks of industrial output will cause a shock in India's stock returns as explained in section 5.13.

Assess the ARCH effect in the series and evaluate the volatility in the stock markets using ARCH and GARCH analyses.

The Lagrange Multiplier test was performed to observe the ARCH effect in the series, which gives an indication of the existence of heteroscedasticity in the residuals. The Heteroscedasticity and serial correlation test for estimated residuals are illustrated in 5.14.1 which suggested the presence of ARCH effect in the US and India stock returns. Therefore, it suggests the need to perform further tests. In the following section, ARCH and GARCH (1, 1) tests confirmed that the US and India stock returns were volatile for the period 2007-2017 in section 5.15. The results in figure 25 and 26 are the estimates of AR (1) – GARCH (1,1) for the US and India respectively, which suggests that the time-varying nature of volatility of stock markets is persistent. This also implies that previous stock returns influence the volatility in the US and India stock returns. Section 5.16 also estimates the volatility of stock returns by

estimating the AR (1) model –GARCH-X (1, 1) and adding another parameter into the model λ_{ECT} which signifies the role of macroeconomic factors in explaining volatility in the stock markets. The results in figure 27 and 28 imply that short-term deviations in macroeconomic variables lead to stock return volatility in US and India stock returns, as illustrated in section 5.16.

6.5 Review of Research Hypothesis

This section examines the research hypothesis within this research. In view of the research objectives and research questions, the hypotheses below were formulated. The hypotheses set below seek to confirm whether the proposed analysis indicates a connection between the variables.

H_{01}: Macroeconomic variables do not contribute to Stock returns Volatility.

H_{A1}: Macroeconomic variables contribute to stock return Volatility.

H_{02}: Macroeconomic variables do not influence the Stock return movements.

H_{A2}: Macroeconomic variables influence the stock return movements.

Consequently, the analyses reject the Null hypothesis (H_o) and the results achieved are statistically significant. This implies that the domestic macroeconomic variables demonstrate relationship with stock returns in US and India respectively. Additionally, the hypothesis test results agree that macroeconomic factors significantly explain the volatility of US and India stock returns.

6.6 Summary

This chapter has presented a comprehensive explanation of the econometric test results from the previous chapter and justified the findings with explicit references. It has provided an extensive discussion on the relationship between each macroeconomic variable and stock returns of US and India while comparing these research findings with conclusions from other studies. Another aspect of this research entailed examining the relationship between stock

return volatility and macroeconomic factors by discussing the key findings from the ARCH and GARCH tests performed in Chapter five. These findings were equally compared with other related studies since the target period for this research is 2007-2017, thereby covering one of the most recent economic downturns with a global impact. Hence, it is worthwhile to shed light upon the movement of macroeconomic variables and stock returns during the recession and its aftermath. This chapter has briefly covered the interaction between the variables during the recession and how economic variables helped in the recovery from the recession within respective countries from the researcher's viewpoint.

In addition, this chapter has reviewed the research aim and objectives to ascertain if they have been adequately addressed, as mentioned in Chapter one. In conclusion, the research hypothesis developed in Chapter three has been evaluated, and the researcher has failed to reject all the H_o of this research, confirming the relationship between macroeconomic variables and stock returns and their volatilities within the respective countries.

CHAPTER SEVEN

CONCLUSION AND POLICY RECOMMENDATIONS

7.1 Introduction

This chapter summarizes the entire research and briefly highlights the contents of the above chapter. This investigation has been guided by the research objectives and questions which were designed to help the researcher in determining whether the selected macroeconomic variables contribute to the long-term and short-term behaviour of the US and Indian stock markets. More precisely, the research explored the long-term and short-term relationship between the US and Indian stock markets for the period of January 2007-December 2017. The chosen variables include the Industrial production index (INDPRO) as a proxy of the economic environment/GDP, broad money supply (M3) to represent monetary policies and Treasury bill (TB) rates used as a proxy for US interest rates and interest rates (IR) for India. The theoretical background in Chapter two summarised the different theories proposed concerning the subject under study, which suggested that economic factors and economical events influence security prices. However, these theories have been silent about which factors influence asset prices. Hence, the researcher adopted a few macroeconomic variables based on previous empirical studies and developed a conceptual framework, as discussed in Chapter three. Another justification for the use of specified variables is the availability of data at monthly frequency, which made it easier for the researcher to model the time series data.

This chapter will focus on summing up all the results of the empirical analyses from chapter five and will consequently suggest policies for policy-makers. The following section (7.2) gives a synopsis on key findings explored from the relationship between macroeconomic factors and stock market behaviour. Section 7.3 will attempt to prescribe new policies which may improve the performance of the US and Indian stock markets. Section 7.4 will follow up with concluding remarks based on the overall study from researcher's point of view. This research will not be completed without identifying possible limitations. Hence, the limitations of this research are addressed in section 7.5 and 7.6 will identify areas for further study.

7.2 Comparison of Key Takeaways: U.S and India

A wide range of statistical tests was employed to study the behaviour of the U.S and Indian stock markets as a result of changes in domestic economic factors. Key findings from the analysis of the specified model are summarized below for the U.S and India.

- The empirical tests revealed a significant positive relationship between stock returns and money supply (M3) for the U.S and India over a long-term period. This position agrees with real activity theorists. Every one per cent change in money supply will influence stock returns in the U.S and India. This relationship is justified as an increase in the money supply will increase the purchasing power to spend more on goods and services. Hence, the demand for goods and services will increase and ultimately increase pressure on stock prices of such good and services. The tests indicated a positive relationship between money supply and Indian stock returns over a short-term period. However, a negative relationship between money supply and U.S stock returns over a short-term period was established. It must be noted that the negative relationship between U.S money supply and U.S stock returns was not very significant and was therefore observed as a weak relationship over a short-term period, based on the level of significance. The possibility of a negative relationship between money supply and US stock returns in the short-run may be attributed to peaking inflation in certain periods between 2007-2017. According to Wongbangpo and Sharma (2002), the relationship between money supply and stock prices will become negative in the event of high inflation.

- The Treasury bill rate (TB) which indicates interest rate (IR) is another key variable in influencing US stock returns over long-term and short-term periods. However, the results obtained from this research suggest that IR in India was not significant in influencing Indian stock returns over long-term and short-term periods. It may be concluded that interest rates tend to influence the U.S stock market as opposed to the India stock market, due to inefficiency within the monetary system of India. According to the Reserve Bank of India, the credit market in India is occupied mainly by non-bank credit providing institutions such as money lenders, cooperatives, relatives and friends. At the same time, a large segment is not affected by changes in interest rates. Therefore, stock prices in India move irrespective of interest rate movements, unlike the U.S where wherein changes in interest rates have a massive influence on the stock

market. A decrease in interest rates will allow individuals, businesses and corporations to borrow at cheaper costs which improve profits and consequently result in an increase in stock prices and vice-versa.

- The Consumer Price Index (CPI) used as a proxy to represent inflation has indicated a different relationship within short and long-term periods. U.S stock returns have highlighted a negative relationship with inflation in the long-run and a positive relation over a short period of time. As inflation increases, the cost of inputs increases for organisations and this increase is then reflected in the final prices of goods and services. This reduces the demand for such goods and services, thereby imposing a downward pressure on the profits of the corporations and ultimately their stock prices. Inflation also reduces the purchasing power of investors, leading them to invest more in their necessities than investing in securities which tend to impose a downward pressure on security prices. This phenomenon is evident in our empirical analysis for the U.S over a long-term period. However, it does not exist within short-term periods for the U.S stock market. The empirical tests conducted suggest a direct relationship between US stock returns and inflation within a short-term period, possibly due to hedging properties of equity in comparison to debt securities. According to Kramer (2017), real equity returns are higher than the bonds during inflationary periods as returns on Bonds are on nominal basis i.e. real plus inflation, therefore stocks offers a degree of protection from inflation in comparison to Bonds and the risk premium paid to equity investors to compensate for high inflation tends to be higher and increase with growth in inflation rates. Here, the real returns of both equities and bonds are negative. The absence of a relationship between stock returns and inflation in India may be attributed to the ability of companies to sustain their profits due to increase in inputs prices. On the other hand, Johnson (2018) highlighted inflation should not affect stock prices because companies can simply raise their prices to make up for the increased cost to produce goods and services. Another justification for the absence of a relationship between the variables is possibly due to the application of stock returns instead of stock prices within the analysis as the relationship is more significant between stock prices and inflation, based on previous studies. Hence, there is a possibility of a relationship being inexistent in the econometric analysis due to the application of stock returns as opposed to stock prices.

- The impact of domestic industrial production on the respective stock markets equally shows differing results. The relationship between industrial production and stock returns in the US has indicated an insignificant relationship in both long-term and short-term periods. As previously discussed in Chapter Six, the relationship has probably been extinct due to transformation from manufacturing-based to service-based. Industrial production figures are significantly reliant on manufacturing industries, and the U.S economy has offshored considerably their production to low-cost countries. This has resulted to an increase in the Industrial Production Index for low cost countries, including India. This is quite significant in influencing the stock market in India over long-term periods as this gives investors confidence that the stock prices will increase as a result of increased company cash flow from manufacturing goods. The relationship is insignificant in the short-term for India's stock market, based on the econometric results obtained which may be attributed to sudden movements in the Industrial production Index over a short-term period as well as the reliance of investors on other factors to determine their investment strategy.

- The Error Correction Mechanism (ECM) represents the speed of adjustment. This implies that if variables were to move away from their equilibrium value, then ECM will reinforce the variables to their long-term equilibrium value. The US coefficient of ECM suggests that any deviation from the long-term equilibrium path will be corrected in the next period by 32%. On the other hand, any deviation from the equilibrium level of India's stock returns in the current period will be corrected by 97% in the next period to resolve the equilibrium. This demonstrates the fact that shocks in US stock markets may take several periods to resolve the disequilibrium, while the Indian stock market will come back to its equilibrium value by the next period.

- The Variance decomposition (VDC) analysis determines how much of the forecast error variance of stock returns can be explained by exogenous shocks to the stock returns and macroeconomic variables. The VDC results suggested that around 74% changes in US stock returns are influenced by its own innovative shocks, LM3 by 9.8%, and TB 6.7%, which are consistent with our ARDL short-term and long-term analyses. The VDC analysis for India suggests that India's stock returns are primarily affected by its own shocks, consisting of 91.15% while shocks in INDPRO contributes

to 7.4%. The results indicated that US stock returns are more prone to shocks in macroeconomic variables than India stock returns.

- Both stock markets equally respond to past information despite their distinct efficiency within the market. This may be because financial markets are becoming more competitive and integrated within international markets. Thus, understanding factors that influence the volatility are necessary. Market efficiency is irrefutably higher in the US as opposed to India. However, US and India's stock returns demonstrate that past information contributes to stock returns volatility of both countries based on AR (1) GARCH (1,1) test output. The results suggested that both stock market returns behaved randomly, and the previous returns positively affected the current stock market returns in the economy. Also, the coefficients concluded that the volatility of both market returns was more affected by past volatility than related news from previous periods.

- Since the volatility of many economic time series is not constant through time, conditional heteroskedasticity models cannot adequately estimate macroeconomic behaviour on stock returns volatility. For that reason, Lee and Hansen (1994) GARCH (*p,q)* model and GARCH–X model have been used to investigate the impact of a set of nine macroeconomic variables on the volatility of the US and India stock returns. The model employed λ_{ECT} to represent the collective impact of macroeconomic factors on stock return volatility and put forth the same conclusion, that volatility of U.S and India stock market returns and short-term deviations of macroeconomic variables such as the P-value is less than 0.05. This infers that the coefficient is highly significant.

- The impact of the global crises in 2007 had more impact on the U.S than India. While most advanced economies had been significantly affected, some countries including India were able to avoid a major contraction (Verick and Islam, 2010). On the other hand, the impact of the crises was significantly different in both countries. Despite the fact that the U.S financial sector was mainly affected by direct exposure to subprime mortgages, this was not the case for India, where the strength of the banking sector was relatively preserved. The aftermath recovery of the U.S economy was attributed mainly to the intervention of monetary policies such as money supply and interest rates. In the case of India, the industrial production index has been perceived as a key determinant in stabilising the economy from the global recession.

7.3 Policy Recommendations

From the above discussion, the health of the stock market is irrefutably a reflection of the health of the economy and vice versa. Therefore, governments need to take relevant measures from time to time to improve on stock market efficiency. Hence, this section of the research mainly targets policymakers of the respective countries. Based on empirical estimates on the inter-linkage between stock markets and macroeconomic policies of the U.S and India, the researcher has developed some suggestions in relation to policies that would enhance the stock market of both countries, particularly India, which has a lot of potentials to match developed economies.

7.3.1 Policy measures in the U.S

The U.S stock market is very prone to changes in economic variables, except for industrial production. Also, the relationship between variables significantly varies over short-term and long-term periods. Looking at the relationship between Inflation (CPI) and stock returns, the empirical findings suggest a negative relationship which is rationally correct over a long-term period. The increase in CPI will increase the price of goods, services and raw materials, thereby reducing the purchasing power of individuals and businesses who may tend to drop their production due to an increase in the input costs over a long period of time. On the other hand, the relationship between inflation and U.S stock returns has indicated a direct relationship. This may be attributed to the individual behaviour of buying and stocking goods due to a perceived increase in future prices of goods which may impose an upward pressure on stock prices in the short run. However, the U.S government is very spontaneous in its response to inflation hikes and has put controls in place to curb the increasing Inflation. The Federal Reserve of the U.S has put inflation-targeting policies in place. This practice is highly recommended as it will allow corporations to set their prices accordingly in the long-run as well as provide insight for investors in the process of predicting cash-flow for companies.

Additionally, policymakers should promote the setting of transparent inflation targets in the U.S. which will help improve inflation expectations in the economy. This can help investors in making real and financial investment decisions accordingly as well as support businesses and individuals to develop expectations about future inflation rates.

The impact of the Treasury bill rate (Interest Rate) is very significant on stock market movements, particularly in the U.S. The recent House price bubble is a historical example of

when low interest rate spiked the Investor's behaviour back in 2004, before the start of the recession. Interest rates in 2003 (1%) were the lowest in 45 years and investors were lured into borrowing money during that time, particularly by those who were not credible to pay it back. In spite of the fact that the Federal Reserve had started raising the rates in June 2006, the damage had already been done as financial institutions had lent money to subprime borrowers at lowered rate and, U.S. homeownership had peaked at 70% [50]by 2004

The empirical results obtained have highlighted the negative relationship between stock returns and interest rates. Based on this, the researcher recommends that policymakers in the US be very mindful in announcing interest rate changes, as the impact of unsuccessful movement transcends the U.S market and has a global Impact. Moreover, the researcher proposes that the U.S government should not bring their interest rates any lower than 2%, except weak economic conditions. Mindful of the fact that the U.S equity market is one of the largest markets in the world with a large Investor base, it may be concluded that extremely low interest rates may potentially promote borrowing on a larger scale. Large-scale borrowing accompanied with low interest rates should be allowed if the borrowers or the collateral is credible. This measure can curb the occurrence of crises in equity markets as well as other sectors of the U.S economy.

The impact of money supply on securities could be direct as well as indirect. Direct impact is evidenced through the level and direction of interest rates, while indirect impact may be observed through expectations regarding the direction of inflation. The decrease or increase in money supply helps to indicate whether the U.S has adopted restrictive (tight), accommodative (loose) or neutral (somewhere in between) policies. When the economy is growing too fast and inflation rates are moving at a significantly higher pace, the central bank may take steps to cool the economy by raising short-term interest rates, which reduces the money supply in the economy (tight monetary policy). Conversely, when the economy is sluggish, the central bank will adopt loose and accommodative policies by lowering short-term interest rates in order to stimulate growth and get the economy back on track. Policymakers in the U.S have so far managed the economy well during strong economic conditions and to an extent in crises periods. And, during global crisis, the Federal Reserve endeavoured to stimulate the economy by taking multiple actions such as keeping short-term interest rates nearly to zero as well

[50] As per the historical data, accessed at : https://www.statista.com/statistics/184902/homeownership-rate-in-the-us-since-2003/

successive rounds of Quantitative easing[51]. The actions by fed places downward pressure on long-term interest rates and led to billions of dollars injected into the U.S economy, which eventually stabilised the economy to a great extent. The researcher also proposes that policymakers at the Federal Reserve should adopt timely and appropriate policies when economic conditions are predicted to worsen or even in times of economic boom as was the case under the governance of Alan Greenspan in 2006.

7.3.2 Policy measures in India

The above discussion evidences the fact that real economic activities including INDPRO (a proxy of GDP) have a considerable impact on the Indian stock market. As a matter of policy to strengthen the stock market, industrial production or GDP is deemed to play a vital role based on empirical tests. Therefore, steps should be conducted by the government to stimulate industrial production, which will have a positive impact on the stock market. India is a vast country with vast and unused human resources (Biswas and Hartley, 2015). Where such resources are fully utilised, this could potentially inflate GDP figures. Thus, human resources could be converted into human capital through the improvement of skills, creative abilities, training and education of those human resources. Besides human resources, India is also endowed with natural resources which include land, mines, forestry, agriculture, minerals and many more natural resources. The efficient use of these natural resources, combined with human resources, could lead to excellent industrial production figures. Hence, policy-makers should endeavour to encourage domestic production by providing government-funded programmes, particularly for the unskilled population.

The ARDL test suggests that money supply exerts a positive impact on the BSE Sensex, which is logically correct, and both variables are expected to be directly connected. This is because an increase in money supply leads to the lowering of interest rates and an increase in effective demand for money which consequently results in the growth of businesses. Therefore, the Reserve Bank of India (Central Bank) should apply monetary policy instruments in instances where the Indian stock market is not performing at its full potential. Even though money supply seems to show a significant relationship with stock returns, the relationship with interest rates has demonstrated a weak link with India's stock returns. Monetary authorities regulate the

[51] buying longer-term mortgage-backed securities directly from financial institutions

money supply, mainly through interest rates. Hence, the relationship may be distorted due to the application of stock returns instead of stock prices. Another possibility of a weak relationship between interest rates and money supply may be attributed to the fact that the credit market in India is largely occupied by non-bank credit providing institutions. Hence, changes in interest rates in financial institutions may not necessarily affect the participants' behaviour in the stock market. To make monetary policies work more effectively, the government should encourage lending and borrowing via banking institutions or put controls that would discourage these arrangements of borrowing from non-bank credit providing institutions or individuals. The proposed measures will strengthen the financial market of India and these measures can be applied in other developing countries, subsequently promoting economic growth. The supply leading hypothesis proposed by McKinnon (1973) and Shaw (1973) suggested financial development is a pre-condition of economic growth and as the financial sector deepens i.e. improvement in transparency, less asymmetric information, it will result in growth in the real sector, which stresses the importance of well-established and functioning financial markets institutions to promote the growth of the nation, and this stands more important for developing and frontier capital market.

7.4 Conclusion

The incorporation of the Multi-factor model in this research has revealed significant differences in the magnitude and association of stock returns with each selected domestic macroeconomic factor, as briefly discussed in section 7.2. The responses of the respective equity markets to macroeconomic factors do not only show essential differences in the countries but also demonstrates different responses to exogenous and Endogenous shocks such as GDP, Inflation, Money Supply, and Interest Rates from global factors such as cyclical behaviour.

A significant part of the empirical literature has incorporated stock prices as a variable to represent stock markets. However, this study has included stock returns and stock return volatility to represent the stock market of the respective countries. Consequently, one of the main contributions of this research is its attempts to determine the relationship between macroeconomic indices and stock returns and their volatility using the ARDL approach and GARCH-X technique.

Additionally, this research has made another significant contribution by exploring a selected time period (2007-2017) in this study. Moreover, this investigation provides an opportunity for its readers to compare the responses of two distinct stock markets as a result of movements within their domestic economic factors. The study has also provided a synopsis of the contributions of these macroeconomic factors in recession as well as the aftermath of the recovery of these two stock markets.

So far, research findings from this study provide a strong indication of linkages between economic factors and stock returns in the U.S and India, as briefly discussed in Chapter six. In this research, the author made a conscious attempt to identify gaps in the literature that were yet to be filled. Research findings indicate that U.S and Indian stock returns are significantly affected by macroeconomic factors. However, both countries have highlighted a unique relationship with these economic variables within short-term and long-term periods, as discussed previously. The relationship between these variables differed for both countries. This was anticipated as the economies and practices of the U.S and India vary significantly. Hence, the varying conclusions indicate essential implications for both researchers and practitioners. From a research point of view, there is a need to develop a model which addresses a gradual integration of developing economies like India towards global economies, particularly within the financial sector.

From a practical perspective, the relationship between the stock market and macroeconomic variables for the U.S and India can enable investors to diversify their wealth strategically while considering the risk-return trade-offs due to the impact of economic shocks on stock markets. It is recommended that policymakers and regulators of the U.S and India should closely observe the behaviour of participants in the stock market as a result of disseminating any new information. Particular attention should be paid in the U.S economy when monetary announcements are made, and investors' behaviour should be monitored in order to avoid the likelihood of any global crisis.

The study of volatility in this research will assist policymakers, government institutions and corporations in financial and economic decision-making processes. Firstly, it enlightens policymakers on the interdependence of macroeconomic factors and stock market volatility. Excessive volatility in the stock market may cause capital outflow which can result in economic instability, for instance depreciation of country's exchange rate and economic measures to correct it . The economic instability can further prompt stock market volatility especially within

capital markets. It is difficult to avoid the macroeconomic variation, however appropriate strategies can be adopted to reduce the unfavourable effect on stock markets.

Due to the heterogeneity of beliefs among investors, they tend to disagree on what constitutes stock market volatility. A significant number of studies propound those perceived sentiments have often been regarded as a substantial constituent of stock market volatility (Rehman,2013). This research proposes past returns (R_{t-1}) and macroeconomic factors as additional key factors which contribute to stock return volatility. This information can potentially assist investors in making prudent investment decisions to earn higher returns while controlling the risk.

7.5 Contribution to the knowledge

The index values and market capitalization of stock markets tend to change daily. This changing value of stock markets has created the need to study the capital markets on regular basis. Although tremendous work has been done on this subject, there is a need for continuous exploration on this subject as the economic environment is dynamic and constantly changing. This research has unveiled the relationship between stock returns and macroeconomic factors within the time frame of 2007-2017, hence covering all the significant events within these ten years while making a comparative study between India and US stock markets. The time frame has been selected because there is a limited amount of information pertaining to more recent years, especially in the field of comparative studies.

The main contribution can be summarized in different points; firstly, to the best of researcher's knowledge the study makes the first attempt to incorporate the macroeconomic factors in the GARCH modelling technique to capture the contribution of macroeconomic factors in explaining the stock returns volatility of India and US. Additionally, majority of studies focussed on stock prices to study the behaviour of stock market; however, this research has incorporated stock returns which is more relevant for investors as they are concerned with stock returns and not stock prices. As a result, the study has employed ARDL modelling technique to determine the relationship which was not evident in reviewing the past literature as most studies in this subject has employed either Vector Auto regressive technique (VAR) or Vector error correction model (VECM) to study the relationship between the economy and stock market. The study bridges the gap in literature covering a recent decade within depth comparative analysis between developing and developed market and at the same time highlighting the relevance of chosen theoretical framework i.e., Arbitrage pricing theory. The

study concludes the APT exist in modern times and Stock returns and the volatility is the function of economic variables and its past lagged values.

Most of the empirical findings have either focused on stock prices, or stock volatility. This research has consolidated both subjects using statistical techniques for time series data. The model specification outcome determines the type of estimator employed. Diagnostic tests are carried out to ensure the reliability of the model estimated. The reason behind using multiple testing techniques is first to measure the reliability of results and secondly to identify the most significant macroeconomic variable that has the most impact on the India and US stock markets, hence making this research unique. This will assist the diverse audience such as foreign investors, portfolio managers and policymakers in decision making.

The findings will help the investors, academics to understand which macroeconomic factors are most relevant in the long-run, short-run and during market stress to value equity securities as suggested in the findings (6.1). According to CFA (2017), an investor will have competitive advantage if an analyst understands which economic variables are the most in given relevant markets. The study unveils the relevant variables and considering technical anomalies exists in markets, the relationship between macroeconomic variables and stock returns will give advantage to those investors who seeks to make profits.

7.5 Limitations and further research

It is essential to highlight the limitations of this research as acknowledging the shortcomings of this study will enable the researcher to look out for areas for further study. One of the constraints encountered by the researcher is the selection of macroeconomic variables used in the study, which were arbitrarily selected in line with the Arbitrage Pricing theory. However, more variables could have been added to the ARDL model, including global macroeconomic factors such as world oil prices and global Inflation. The use of such variables would have enabled the researcher to compare the impact of common economic factors on two distinct markets and how these common set of factors would have affected U.S and India stock returns differently. This constraint has provided an avenue for the researcher to further tests the relationship between macroeconomic factors and stock returns by extending the model through the application of common global variables in the future study.

Additionally, the use of monthly data for this analysis could be another limitation of this research as the stock market varies daily. Some tests such as the IRF have indicated that stock returns are irresponsive to shocks from a particular macroeconomic factor, especially for India. However, this may not be true in real life. Therefore, collecting data daily could potentially have generated a more accurate result as the statistical tests would have captured the daily variations or changes in stock returns. However, since macroeconomic variables do not move on a regular basis as compared to the stock price index, it is almost impossible to retrieve economic data in daily frequencies from most archives.

This research could be extended by analysing the lag effect of macroeconomic variables on stock return volatility which potentially can be worth exploring. In simple terms, a lag effect describes the period of time when new policies or changes in the economy are adopted and its time-delayed response within the stock market. It is now possible to study the lag effect by employing statistical techniques. Such a paper will not only test the Efficient Market hypothesis (EMH) theory but will equally assist and improve the trading strategy of investors as stock market movements will be easier to predict.

REFERENCES

Adesanmi, A.A. (2016) The impact of national and global macroeconomic factors on the emerging stock market: A multi-statistical analysis

Aduda, J., Masila, J. & Onsongo, E., (2012). The determinants of stock market development: The case for Nairobi Stock Exchange. *International Journal of Humanities and Social Science,* 2(9), pp. 214 - 230.

Adhikary,M. and Saha,S. (2013 Modelling Conditional Volatility: A Study of Indian Stock Market , *Arth Anvesan,* 2013, 8(2), 3-18, ISSN: 0973-8193

Agrawalla, R., (2005). Stock market and the real economy : a policy perspective for India from time series economietric analysis, *Amritsar: Annual Conference of the Indian Econometric Society*.

Ahn, E.S. and Lee, J. M. (2006) Volatility Relationship between Stock Performance and Real Output, *Applied Financial Economics*, 16(11), Pp. 777-784.

Ahmed, B. & Hasan, A., 2010. The causal relationship between stock prices and macroeconomic variables: a case study of Turkey. *International Journal of Economic Perspectives,* 4(4), pp. 601 - 610.

Akbar, M., Ali, S., & Khan, M.F. (2012). The Relationship of Stock Prices and Macroeconomic Variables revisited: Evidence from Karachi Stock Exchange. *African Journal of Business and Management,* 6(4), 1315-1322.

Alam, M. & Uddin, S., 2009. Relatiosnhip between interest rate and stock price:empirical evidence from developed and developing countries. *International Journal of Business and Management,* 4(3), pp. 43 - 51.

Albulescu, C. T., Aubin, C. and Goyeau, D. (2016) Stock Prices, Inflation and Inflation Uncertainty in the U.S.: Testing the long-run relationship considering Dow Jones sector indexes, *Applied Economics*, 49(18), Pp. 1794-1807.

Alexander M. L. (2009), Continuous Time Approximations to GARCH and Stochastic Volatility Models, *Handbook of Financial Time Series*, 10.1007/978-3-540-71297-8, (481-496),

Al-Khazali, O. M. (2004) The Generalized Fisher Hypothesis in the Asian markets, *Journal of Economic Studies,* 31(2), Pp. 144-157.

Al-Qaisi, K., (2011) The Economic Determinants of Systematic Risk in the Jordanian Capital Market, International, *Journal of Business and Social Science*,Vol. 2 No. 20; November 2011.

Al-Qenae, R., Li, C. and Wearing, B. (2002). The Information Content of Earnings on Stock Prices: The Kuwait Stock Exchange. *Multinational Finance Journal, 6*

Allen, Franklin & Gale, Douglas, 1994. "Limited Market Participation and Volatility of Asset Prices," American Economic Review, *American Economic Association*, vol. 84(4), pages 933-955, September.

Allen, F., Carletti, E., (2009) An Overview of the Crisis: Causes, Consequences and Solutions, Presented at the conference on Global Market Integration and Financial Crises at HKUST, July 12-13, 2009

Aliyu,S.U.R.,(2010). "Does inflation have an Impact on Stock Returns and Volatility? Evidence from Nigeria and Ghana," MPRA Paper 30091, University Library of Munich, Germany, revised 19 Mar 2011.

Antwi, S., Mills, E. F. E., and Zhao, X. (2013) The Impact of Macroeconomic Factors on Economic Growth in Ghana: A Cointegration Analysis, *International Journal of Academic Research in Accounting, Finance and Management Sciences,* 3(1), 35-45.

Ang, A., and Liu, J.(2007). Risk, return and dividends. Journal of Financial Economics *85: 1–38.*

Arcot, S., Black, J. & Owen, G., 2007. From local to global the rise of AIM as a stock market for growing companies, London: The London School of Economics and Political Science

Arestis, P., Demetriades P.O. and Luintel K.B., Financial Development and Economic Growth: The Role of Stock Markets *Journal of Money, Credit and Banking,* Vol. 33, No. 1 (Feb., 2001), pp. 16-4

Arthur, Jennifer & Williams, Robert & Delfabbro, Paul. (2016). The conceptual and empirical relationship between gambling, investing, and speculation. *Journal of Behavioural Addictions*. 5. 1-12. 10.1556/2006.5.2016.084.

Asaolu, T. O., & Ogunmuyiwa, M. S. (2011). An Econometric Analysis of the Impact of Macroeconomic Variables on Stock Market Movement in Nigeria. *Asian Journal of Business Management,* 3(1), 72 – 78.

Atipaga, U.F. (2014) Examining the extent to which macroeconomic environment affects stockprices in advance and emerging economies. Submitted at University of Greenwich, Business School

Barnor, C. (2014) 'The Effect of Macroeconomic Variables on Stock Market Returns in Ghana (2000-2013)', Doctoral Dissertation. Walden University: Minneapolis

Baillie, R., & DeGennaro, R. (1990). Stock Returns and Volatility. *Journal of Financial and Quantitative Analysis,* 25(2), 203-214. doi:10.2307/2330824

Batra, A. (2004), "Stock Return Volatility Patterns in India", http://www.icrier.org/pdf/wp124.pdf

Bernanke, B. S. (2003), "Monetary Policy and the Stock Market: Some Empirical Results," Fall 2003 Banking and Finance Lecture (October 2), Widener University, Chester, PA.

Bernanke, B. S. and Kuttner, K. N. (2004) What Explains the Stock Market's Reaction to Federal Reserve Policy?, *The National Bureau of Economic Research*, Working Paper No. 10402.

Bernanke, B. S. and Kuttner, K.N. (2005) What explains the stock market's reaction to Federal Reserve Policy? *Journal of Finance,* 60, 1221-1257.

Beltratti, A., & Morana, C. (2006). Breaks and persistency: macroeconomic causes of stock market volatility. *Journal of Econometrics, 131*, 151-177.

Bhatt, R. K. (2011) Recent Global Recession and Indian Economy: An Analysis, *International Journal of Trade, Economics and Finance,* 2(3), Pp. 212-217.

Bhattacharya, B. and Mukherjee, J. (2002). The nature of the Causal Relationship between Stock Market and Macroeconomic Aggregates in India: An Empirical Analysis. Paper Presented in the 4th Annual Conference on Money and Finance, Mumbai

Bhattacharyya, B. and Mukherjee, J. (2006). Indian Stock Price Movement and the Macroeconomic context – A Time Series Analysis, *Journal of International Business and Economics*, 5(1): 167-181

Bhattacharya, S. (2013), Intrinsic Value of share: A conceptual Discussion. Department of Commerce. University of Calcutta.

Bhayu, P. & Rider, M., 2012. Domestic and foreign shocks and the Indonesian stock market:time series evidence. Goergia, Sixth Southeastern International Development Economics Workshop Agenda .

Bhowmik, D. (2013) Stock Market Volatility : An evaluation International Journal of Scientific and Research Publications, Volume 3, Issue 10, October 2013 1 ISSN 2250-3153

Bhuiyan. and Chowdhury M., (2020). Macroeconomic Variables and Stock Market Indices: Asymmetric dynamics in the US and Canada. *The quarterly review of Economics and Finance* , 77 (2020) 62-74

Bilson M.C., Brailsford J.T., Hooper J.V. Selecting macroeconomic variables as explanatory factors of emerging stock market returns. Pacific-Basin Finance Journal 2001; 9; 401-426

Binswanger, Mathias, 2004. "How important are fundamentals?--Evidence from a structural VAR model for the stock markets in the US, Japan and Europe," Journal of International Financial Markets, Institutions and Money, Elsevier, vol. 14(2), pages 185-201, April.

Bissoon, R., Seetanah, B., Bhattu-Babajee, R., Gopy-Ramdhany, N. and Seetah, K. (2016) Monetary Policy Impact on Stock Return: Evidence from Growing Stock Markets, Theoretical Economics Letters, 6(5), Pp. 1186-1195

Biswas,A.K. and Hartley, K. (2015) News article at the The Diplomat : India's Lagging Human Capital. Available at https://thediplomat.com/2015/06/indias-lagging-human-capital/

Bjornland, H. C. and Leitemo, K. (2009) Identifying the Interdependence between US Monetary Policy and the Stock Market, Journal of Monetary Economics, 56(2), Pp. 275-282.

Black, F. (1976). Studies in Stock Price Volatility Changes. Proceedings of the 1976 Business Meeting of the Business and Economic Statistics Section, *American Statistical Association*, 177-181

Bodie, Z., Merton R.C., and Cleeton, D. (2009). *Financial Economics*, 2nd. Edition, Pearson.

Bollerslev, T. (1986). Generalized Autoregressive Conditional Heteroskedasticity. *Journal of Econometrics*, 31, 307-327.

Bollerslev, T. (1987). A Conditionally Heteroskedasticity Time Series Model for Speculative Prices and Rates of Return. *Review of Economics and Statistics,* 69, 542-547.

Brandt, M.W. and Kang, Q. (2004) On the Relationship between the Conditional Mean and Volatility of Stock Returns: A latent VAR approach, *Journal of Financial Economics,* 72, Pp. 217–257.

Bryman, A., (2012). *Social research methods.* 5th ed. Oxford: Oxford University Press.

Malkeil B. G., (2003). The Efficient Market Hypothesis and Its Critics. Princeton University. CEPS Working Paper Number 91

Caporale, G., Spagnolo, F. & Spagnolo, N., (2016). Macro news and stock returns in the Euro area: A VAR-GARCH-in-mean analysis. *International Review of Financial Ananlysis,* Volume 45, pp. 180 - 188.

Castillo-Ponce, R., Rodriguez- Espinosa, M. & Gaytan-Alfaro, E., (2015). Stock market development and economic performance: the case of mexico. *Revista de analisis Economico,* 30(1), pp. 41 - 56

Carlstrom, C. & Fuerst, T. & Ioannidou, V. (2002). Stock prices and output growth: an examination of the credit channel. Economic Commentary.

Chen, N. F., Roll, R. & Ross, S., (1986). Economic forces and the stock market. *Journal of Business,* Volume 59, pp. 383 - 403.

Chen, S. S. (2009). Predicting the bear stock market: macroeconomic variables as leading indicators, *Journal of Banking & Finance* 33(2): 211–223. doi:10.1016/j.jbankfin.2008.07.013

Chen, H. and Hu, D. (2015) The Interaction between Interest Rates and Stock Returns: A Comparison between China and US, Working Paper, Lund University: School of Economics and Management, Pp. 1-42.

Chowdhury, S. S. H. and Rahman, M. A. (2004) On the Empirical Relation between Macroeconomic Volatility and Stock Market Volatility in Bangladesh. *The Global Journal of Finance and Economics,* 1(2), Pp. 209-225.

Chaudhuri, Kausik & Smiles, S. (2004). Stock Market and Aggregate Economic Activity: Evidence from Australia. Applied Financial Economics. 14. 121-129.

Chinzara, Z. (2011), Macroeconomic Uncertainty and condistional stock volatility in South Africa. *South African Journal of Economics*, 79: 27-49.

Choo,W.S., Lee,S.N and Ung,S.N. (2011) Macroeconomics Uncertainty and Performance of GARCH Models in Forecasting Japan Stock Market Volatility *International Journal of Business and Social Science* Vol. 2 No. 1; January 2011

Christiano, L., C. Ilut, R. Motto, and M. Rostagno, 2008. Monetary policy and stock market boom-bust cycles. European Central BankWorking Paper Series with number 955.

Connolly, R. A. and Wang, F. A. (2002) International Equity Market Co-movements: Economic fundamentals or contagion? ,*Pacific-Basin Finance Journal,* 11 (1), Pp. 23-43.

Conover, C Mitchell (2011) Investment Issues in Emerging Markets: A Review C. Mitchell Conover, CFA, CIPM Associate Professor, Robins School of Business University of Richmond, Richmond, Virgini.

Corradi V., Distas W., Mele A., (2010) Macroeconomic determinants of stock volatility and volatility premiums, *Journal of Monetary Economics,Volume 60, Issue 2,2013, Pages 203-220,*

Crowther, D. & Lancaster, G., (2008). Research methods: a concise introduction to research in management and business consultancy. 2nd ed. Oxford: Routledge.

Dani, S. (2014). US Economic Recession and Lessons for India.

Dagar, A. (2014) Role of Stock Market in Economy Development , *IRJMST Volume 5, Issue 8 , ISSN 2250-1959*

Darnay, A. J. (1998). Economic Indicators Handbook: Time Series, Conversions, Documentation. Detroit: Gale

Dasgupta, R., 2012. Long-run and short -run relationships between bse sensex and macroeconomic variables. *International Research Journal of Finance and Economics*, 95: 135-150

Dickey, D.A. and Fuller, W.A. (1979) Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association*, vol. 74, pp. 427-431

Dickey, D. and Fuller W (1981) Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root" *Econometrica,* 49: 1057-1072.

Diebold, F. X. and Yilmaz, K. (2008) Macroeconomic Volatility and Stock Market Volatility, worldwide, Working Paper No 14269. Cambridge: National Bureau of Economic Research.

Dimson, E., Marsh, P. and Staunton, M. (2000) Triumph of the Optimists: 101 Years of Global Investment Returns, Princeton: Princeton University Press.

Dimitrios, D., and Simos, T. (2011) The Relationship between Stock Returns and Volatility in the Seventeen Largest International Stock Markets: A Semi-Parametric Approach, *Modern Economy*, 2011, 2, 1-8

Dovern, J. and Welsser, J. (2011) Accuracy, Unbiasedness and Efficiency of Professional Macroeconomic Forecasters: An empirical comparison of the G7, *International Journal of Forecasting,* 27(2), Pp. 452-465.

Dua, P.(2004). Business Cycles and Economic Growth: an Analysis Using Leading Indicators. Oxford University Press

Ehrmann, M. and Fratzscher, M. (2004) Taking stock: Monetary Policy Transmission to Equity Markets, *Journal of Money, Credit and Banking,* 36(4), Pp. 719-737.

Elmendorf, D.W. (2007) Was the Fed Too Easy for Too Long? Unpublished paper, The Brookings Institution.

Engle, R. F. (1982). Autoregressive Conditional Heteroskedasticity with Estimates of the Variance of UK Inflation. *Econometrica*, 50, 987-1007.

Engle, R.F. and Ng, V.K. (1993). Measuring and Testing the Impact of News on Volatility. *The Journal of Finance,* 48 (5), 1749-1778.

Enders, W. (2004). Applied Econometric Time Series (Second ed.). *Wiley*

Engle, R.F. and Granger, C.W.J. (1987) Co-Integration and Error Correction: Representation, Estimation, and Testing. *Econometrica: Journal of the Econometric Society*, 55, 251-276.

Engle, R. F. and Rangel, J. G. (2008) The Spline-GARCH Model for Low-Frequency Volatility and Its Global Macroeconomic Causes, *The Review of Financial Studies,* 21(3), Pp. 1187–1222.

Engle, R. F., and Rangel, J. G. (2005) The Spline GARCH Model for Unconditional Volatility and its Global Macroeconomic Causes, Working Papers 2005/13, Czech National Bank, Research Department.

Engle, F., Focardi, S.M. and Fabozzi F.J. (2012) ARCH/GARCH Models in Applied Financial Econometrics, *Wiley Online Library*

Engle, R.F., Ghysels, E. and Sohn, B., 2013. Stock Market Volatility and Macroeconomic Fundamentals. *Review of Economics and Statistics*, [online] 95(3), pp.776–797

Essaddam, N. & Karagianis, J., 2014. Terrorism, country attributes, and the volatility of stock returns. *Research in International Business and Finance,* Volume 31, pp. 87 - 100.

Fama, E. (1981) Stock Returns, Real activity, Inflation and Money, *American Economic Review*, 71(4), Pp.545–565.

Fama, R. (1990) Stock Returns, Expected Returns and Real Activity, *The Journal of Finance*, 45(4), Pp. 1089-1108.

Falkberg, A. (2012). Do macroeconomic variables affect stock market volatility? Business and Economics

Fifield, S. & Power, D. & Sinclair, C.D. (2002). Macroeconomic factors and share returns: An analysis using emerging market data. *International Journal of Finance & Economics*. 7. 51 - 62. 10.1002/ijfe.173.

Fisher, I. (1930) The Theory of Interest, New York: Macmillan.

Fernandez, Pablo. (2015). CAPM: An Absurd Model. *Business Valuation Review*. 34. 4-23. 10.5791/0882-2875-34.1.4.

Flannery, M. J. & Protopapadakis, A. A. (2002). Macroeconomic factors do influence aggregate stock returns. *The Review of Financial Studies*, 15(3), 751–782.

Friedman, M., and Schwartz A.J. (1963). A Monetary History of the United States, 1867-1960. Princeton, NJ: Princeton University Press.

Franses P.H. ,Kunst R.M. (2004) Analyzing a panel of seasonal time series: Does seasonality converge across Europe?

Fuller, W.A. (1976) Introduction to Statistical Time Series. New York, Wiley. Garcia, R. and Perron, P. (1996) An analysis of the real interest rate under regime shifts. Review of Economics and Statistics, vol. 78, pp. 111-125.

Gan, C. Lee, M. Yong, H. H. A. and Zhang, J. (2006). Macroeconomic Variables and Stock Market Interactions: New Zealand Evidence. Investment Management and Financial Innovation, 3(4), 89-101.

Geske, R., & Roll, R. (1983). The Fiscal and Monetary Linkage Between Stock Returns and Inflation. *The Journal of Finance, 38*(1), 1-33. doi:10.2307/2327635

Geetha C. Mohidin R. Chandran VV and Chong V. The Relationship between Inflation and Stock Market: Evidence from Malaysia, United States and China (2011) Int J Economics and Management Sciences 1: 1-16.

Ghulam A., Bashir U., and Wang S. (2019) The return and Volatility nexus among stock market and macroeconomic fundamentals for China. Sukkur IBA University, Sindh Pakistan, *Physica A526* (2019) 121025.

Glen J. Devaluations and emerging stock market returns. Emerging Markets Review 2002; 3; 409–428

Green, S. B., 1991. How many subjectsdoes it take to do a regression analysis. *Multivariate Behavioral Research,* 26(3), pp. 499 - 510.

Gultekin, B. (1983) Stock Market Returns and Inflation: Evidence from other countries, *Journal of Finance,* 38(1), Pp. 49–67.

Gupta, M. C. (1974) Money Supply and Stock Market: A Probabilistic Approach, *Journal of Finance and Quantitative Analysis,* 9(1), Pp. 57-68.

Gunay, S., 2016. Is political risk an issue for Turkish stock market?. *Borsa Istanbul Review,* 16(1), pp. 21 - 31.

Godfrey, N., 2013. Financial sector development and economic growth: evidence from Zimbabwe. *International Journal of Economics and Financial Issues,* 3(2), pp. 435 - 446.

Hamilton, J. D. and Lin, G. (1996) Stock Market Volatility and the Business Cycle, Journal of Applied *Econometrics,* 11, Pp. 573–593.

Hatemi-J, A., & Morgan, B. (2009). An empirical analysis of the informational efficiency of Australian equity markets. Journal of Economic Studies, 36(5), 437-445.

Heston, S. L. (1993) A Closed-Form Solution for Options with Stochastic Volatility with Applications to Bond and Currency Options. *Review of Financial Studies*, 6, Pp. 327–343.

Hill, C., Griffiths, W. & Lim , G., 2008. *Principles of Econometrics.* 3rd ed. Hoboken: John Wiley & Sons, Inc.

Homa, K. and Jaffee, D. (1971) The Supply of Money and Common Stock Prices, *The Journal of Finance,* Vol. 26(5), Pp. 1045-1066.

Hondroyiannis, G. and Papapetrou, E. (2001). Macroeconomic Influences on the Stock Market. *Journal of Economics and Finance,* 25 (1), 33-49.

Hughes, P., (2001). Paradigms, methods and knowledge in doing early childhood research: International perspectives on theory and practice. 2nd ed. Crows Nest, N. S. W.: Allen and Unwin.

Humpe, A. and Macmillan, P. (2009). Can Macroeconomic Variables Explain LongTerm Stock Market Movements? A Comparison of the U.S. and Japan. *Applied Financial Economics,* 19 (2), 111-119.

Hussain, M., Zaman, B.U. and Ahmad,N. (2015) Reletionship between Stock Market Volatility and Macroeconomic Variables: Evidence from Pakistan Department of Economics University of Sargodha *Pakistan Business Review January 2015*

Hussain, S.M. and Omrane,W.B. (2021), The effect of US macroeconomic news announcements on the Canadian stock Market : Evidence using high-frequency data. Department of Economic and Finance, College of Economics and Political Science.

Ibrahim, M. H. and Wan Yusuf, W.S. (2001). "Macroeconomic Variables, Exchange Rate and Stock Price: A Malaysian Perspective" *IIUM Journal of Economics and Management* 9, no. 2: 141-63 *Finance Research Letters 38 (2021)* 101450.

Ibrahim, Muazu & Musah, Alhassan. (2014). An Econometric Analysis of the Impact of Macroeconomic Fundamentals on Stock Market Returns in Ghana. *Research in Applied Economics.* 6. 47 - 72. 10.5296/rae.v6i2.5146.

Ilyas,M. and Siddiqi M.W. (2010) The Impact of Revenue Gap on Economic Growth: A Case Study of Pakistan World Academy of Science, Engineering and Technology International *Journal of Economics and Management Engineering* Vol:4, No:7, 2010

Izedonmi, F. P. & Abdullahi, I. B., 2011. The effect of macroeconomic factors on the Nigerian stock returns: a sectoral approach. *Global Journal of Management and Business Research,* 11(7), pp. 24 - 30.

IOSCO Emerging Markets Committee (2007) , Factors Influencing Liquidity in Emerging Markets.

Jaffe, J. and Mandelker, G. (1976) The "Fisher Effect" for Risky Assets: An Empirical Investigation, *Journal of Finance,* 31(2), Pp. 447-458.

Jamil, Maheen, and Naeem Ullah (2013). Impact of Foreign Exchange rate on stock prices. IOSR *Journal of Business and Management* 7 (3): 45-51

Jarque, C. M. and A. K. Bera (1987). "A Test for Normality of Observations and Regression Residuals." *International Statistical Review* 55: 163-172.

Jareño, Francisco & Negrut, Loredana. (2016). US Stock Market and Macroeconomic Factors. *Journal of Applied Business Research*. 32. 325-340. 10.19030/jabr.v32i1.9541.

Jensen G. R., Mercer J. M. and Johnson R. R. (1995) Business Conditions, Monetary Policy, and Expected Security Returns, *Journal of Financial Economics,* 40(2), Pp. 213-237.

Jensen, G.R. and Mercer, J.M. (2002), Monetary Policy and the Cross-Section of Expected Stock Returns. *Journal of Financial Research*, 25: 125-139.

Johansen, S., and K. Juselius. (1992) "Testing Structural Hypotheses in a Multivariate Cointegration Analysis of the PPP and UIP for U.K." *Journal of Econometrics* 53: 211-244.

Johnson,R. (2018) Research Report : The effect of Inflation on stock prices, Reviewed by: Cockerham,R. CISI Capital Markets and Corporate Finance

Kadir, S. Y., (2008). Macroeconomic variables, firm characteristics and stock returns:evidence from Turkey. *International Research Journal of Finance and Economics,* Issue 16, pp. 35 - 45.

Kadir, H. B. A., Selamat, Z., Masuga, T., & Taudi, R. (2011). Predictability Power of Interest Rate and Exchange Rate Volatility on Stock Market Return and Volatility: Evidence from Bursa Malaysia.*International Conference on Economics and Finance Research IPEDR* (Vol. 4)

Karolyi, G. A. (2001) Why Stock Return Volatility Really Matters?, *Institutional Investor Journals Series*, (614), Pp. 1-16.

Kawai, M. and Prasad, E.S. (2011), Financial Market Regulation and reforms in Emerging Markets. *Asian Development Bank Institute and the Brookings Institution.*

Keswani, S., & Wadhwa, B. (2021) Association among the selected Macroeconomic factors and Indian stock returns, *Symbiosis Centre for Management Studies (SCMS), Symbiosis International (Deemed) University, Nagpur, India*

Khan, M. R., & Mahmood, Z. (2013). Interest Rate Sensitivity and Stock Returns. Research *Journal of the Institute of Business Administration* , Karachi-Pakistan, 8(1), 20.

Khim-Sen, L. V., 2004. Which lag length selection criteria should we employ?. *Economics Bulletin*, 17 September, 3(33), pp. 1-9.

Kothari, C. R., 2004. Research methodology. 2nd ed. New Delhi: New Age International

Kirchler, M. & Huber, J. (2007). Fat tails and volatility clustering in experimental asset markets. *Journal of Economic Dynamics and Control*. 31. 1844-1874. 10.1016/j.jedc.2007.01.009.

Kramer, W. (2017) , Research Report: Equity Investments as a Hedge against Inflation (Part 1), Lazard Asset managment

Kumar, A., 2011. "An Empirical Analysis of Causal Relationship Between Stock Market and Macroeconomic Variables in India*", International Journal of Computer Science & Management Studies* 11:01, pp. 8-14.

Kumar,R. and Tamimi, M. (2011) Economic Growth, Expected Stock Returns and Volatility: A Case of Indian Stock Market. *The International Journal of Applied Economics and Finance*, 5: 257-268.

Kumari, J., Mahakud, J. (2015) Relationship Between Conditional Volatility of Domestic Macroeconomic Factors and Conditional Stock Market Volatility: Some Further Evidence from India. *Asia-Pac Financ Markets* **22,** 87–111

Kumpikaite, V.; Ciarniene, R. 2008. New training technologies and their use in training and development activities: Survey evidence from Lithuania, *Journal of Business Economics and Management* 9(2): 155-159. doi:10.3846/1611-1699.2008.9.155-159

Kutty, G., 2010. The relationship between exchange rates and stock prices: the case of Mexico. *North American Journal of Finance and Banking Research*, 4(4), pp. 1 - 12.

Lairellakpam, G. and Dash, M. (2012) A Study of Granger Causality of Macroeconomic Factors on Indian Stock Markets

Laopodis, N.T. (2006), Dynamic Interactions among the stock market, Fedreal Funds Rate, Inflation and Economic Activity. *The Financial Review*, Vol.41, No.4:pp.513-545.

Lee, S.-W. and Hansen,B. (1994) Asymptotic theory for the GARCH(1,1) quasi-maximum likelihood estimator. Econometric Theory 10, 29–53.

Lee W.Y., Jiang, C.X., & Indro, D.C. (2002). Stock market volatility, excess returns, and the role of investor sentiment. *Journal of Banking and Finance*, 26, 2277-2299

Leon, C. and Filis, G. (2008) Cyclical Fluctuations and Transmission Mechanisms of the GDP, Investment and Stock Exchange in Greece Evidence From Spectral and VAR Analysis, *Journal of Money, Investment and Banking*, (6), Pp. 54-65.

Li, D. and Fan, Z. (2005) The Empirical Study of Monetary Policy Shock and Stock Price Volatility, *Commercial Times*, 20, Pp. 12-14.

Liu, C.A. and Kuo, B.S. (2016): "Model averaging in predictive regressions," *Econometrics Journal*, forthcoming

Liljeblom, E. and Stenius, M. (1997) Macroeconomic Volatility and Stock Market Volatility: Empirical Evidence on Finnish Data, *Applied Financial Economics*, 7(4), Pp. 419-426.

Lincoln, Y. S. & Guba, E. G., (1989) *Fourth generation evaluation.* California: Sage.

Liua, X. and Sinclair, P. (2008) Does the Linkage between Stock Market Performance and Economic Growth Vary Across Greater China? *Applied Economics Letters*, 15(7), Pp. 505-508.

Lomnicki, Z. (1961), Tests for Departure From Normality in the Case of Linear Stochastic Processes. Metrika, 4, 37–6

MachMuddah, Z., Utomo,S.D., Suhartono,E.,Ali,S., Ghulam,W.A. (2020). Stock Market Reaction to COVID-19: Evidence in Customer Goods Sector with the Implication for Open Innovation. *Journal of Open Innovation: Tech*nology, Market, and Complexity, 6, 99; doi:10.3390/joitmc6040099

Madura, J. (2012), Financial Markets and Institutions, 11th Edition.

Maghayereh, A. (2003). Causal Relations among Stock prices and macroeconomic Variables in the Small Open Economy of Jordan.

Mandelbrot, B. (1963). The Variation of Certain Speculative Prices. The Journal of Business, University of Chicago, 36, 394-419.

Mahmood, W. M. & Dinniah, N. M., 2009. Stock returns and macroeconomic variables: evidence from six Asian-Pacific countries. *International Research Journal of Finance and Economics*, Volume 30, pp. 154 - 164.

Maitra, W. K. and Mukhopadhyay, K.C. (2011). Causal Relation Between Money Supply and Exchange Rate in India under the Basket Peg and Market Determination Regimes: A time Series Analysis, *The IUP Journal of Applied Economics*, 10(2), 40-56.

Majumder, S. and Nag, R. (2013). Foreign institutional investment, stock market, and volatility: Recent evidence from India. *Indian Journal of Finance*. 7. 23-31.

Maku, O. E. & Atanda, A. A., 2009. Does macroeconomic indicators exert shock on the Nigerian capital market?. [Online] Available at: http//mpra.ub.uni-muenchen.de/17917/

Maysami, R. C. & Koh, T. S. 2000. A vector error correction model of the Singapore stock market. *International Review of Economics and Finance* 9: 79-96.

Maysami, R. C., Howe, L. C., and Hamzah M. A. (2004) Relationship between Macroeconomic Variables and Stock Market Indices: Co-integration Evidence from Stock Exchange of Singapore's All-S Sector Indices. *Pengurusan Journal*, 24, Pp. 47-77.

Merton, M. (1991), Financial Innovation and Market Volatility, Cambridge Blackwell, pp. 20-25.

McKinnon, R.I., (1973). Money and Capital in Economic Development. Brookings Institution, Washington, DC

Mohanty, D. (2009) Global Financial Crisis and Monetary Policy Response in India, Working Paper, BIS Review.

Mohanty, S., Akhigbe, A., Al-Khyal, T. and Turki Bugshan, T. (2013) Oil and Stock Market Activity When Prices Go Up and Down: The Case of the Oil and Gas Industry. *Review of Quantitative Financial Accounting*, 41, Pp. 253-272.

Mohr, P. 1998. Economic Indicators. Pretoria: Unisa Press.

Mishkin, F. S. & Eakins, S. G., 2009. Financial Markets and Institutions. 6th ed. New York: Pearson Prentice Hall.

Moore, G. & Shishkin, J. Indicator of business expansion and contraction. *NBER Occasional Paper* 103 (1967).

Morelli, D. (2002) The Relationship between Conditional Stock Market Volatility and Conditional Macroeconomic Volatility Empirical Evidence Based on UK Data, *International Review of Financial Analysis,* 11(1), Pp. 101-110.

Mukhopadhyay, D. and Sarkar, N. (2003). Stock return and macroeconomic fundamentals in model-specification framework: Evidence from Indian stock market. Indian Statistical Institute, Economic Research Unit, ERU 2003-05 Discussion Paper , 1- 28

Muradoglu, Gulnur & Taskin, Fatma & Bigan, Ilke. (2000). Causality between Stock Returns and Macroeconomic Variables in Emerging Markets. Russian and East European Finance and Trade. 36. 33-53. 10.2307/27749553.

Mullins, G. (2000), "Stock Market Volatility: Measures and Results", Available at : www.uwsp.edu/.../Stock%20Market%20VolatilityMeasures%20and%20 Results.pdf.

Murzi, M., 2010. Encyclopedia of Political Theory. Mark Bevir (ed.), SAGE

Naka, A., Mukherjee, T.K. and Tufte, D. (2001). Microeconomic Variables and the Performance of the Indian Stock Market. Working Paper 1998-06, University of New Orleans, New Orleans, USA

Nasseh, A. and Strauss, J. (2000). Stock Prices and Domestic and International Macroeconomic Activity: A Co-integration Approach. *Quarterly Review of Economics and Finance,* 40, 229-245

Naik, P.K. (2013). Does Stock Market Respond to Economic Fundamentals? Time Series Analysis from Indian Data. *Journal of Applied Economic and Business Research*, 3(1), 34-50

Newman, I., 1998. Qualitative-quantitative research methodology: exploring the interactive continuum. Carbondale: South Illinois University Press.

Nelson,C.R. and Plosser C.I. (1982) Trends and Random walks in Macroeconomic Time series , *Journal of Monetary Economics* 10 (I 982) 139-162

Nelson, D.B. (1990). Stationarity and Persistence in the GARCH (1,1) Model. *Econometric Theory*, 6, 318-334.

Nguyen,T.,Chaiechi, T., Eagle L. and Low, D.(2020) Dynamic impacts of SME stock market development and innovation on macroeconomic indicators: A Post-Keynesian approach. *Journal of Economic Analysis and Policy* .ISSN 68 (2020), 327-347.

Okpara, G. & Odionye, J., (2012). Analysis of the relationship between exchange rate and stock prices:evidence from Nigeria. *International Journal of Current Research,* 4(3), pp. 175 - 183.

Olweny, T. O. and Kimani, D. (2011) Stock Market Performance and Economic Growth: Empirical Evidence from Kenya using Causality Test Approach, *Advances in Management & Applied Economic,* 1(3) Pp.153-196.

Omondi, K. & Tobias, O., (2011). The effect of macro-economic factors on stock return volatility in the Nairobi stock exchange, Kenya. *Economics and Finance Review,* 1(10), pp. 34 - 48.

Omorokunwa, O. & Ikponmwosa, N. (2014). Macroeconomic Variables and stock price volatility in Nigeria.. Annals of the University of Petrosani,Economics. 14. 259-268.

Oskooe, S. A. P. (2010) Emerging Stock Market Performance and Economic Growth, *American Journal of Applied Sciences,* 7(2), Pp. 265-269.

Okwuchkwu, O., (2015) Exchange Rate Volatility, Stock Market Performance and Foreign Direct Investment in Nigeria, International *Journal of Academic Research in Accounting, Finance and Management Sciences* Vol. 5, No.2, April 2015, pp. 172–184

Pal, K. and Mittal, R. (2011). Impact of Macroeconomic Indicators on Indian Capital Market. *Journal of Risk Finance*, 12(2), 84-97.

Park, J. and Paul Choi, B. (2011), "Interest rate sensitivity of US property/liability insurer stock returns", *Managerial Finance*, Vol. 37 No. 2, pp. 134-150

Patra, T., and Poshakwale, S. (2006) Economic Variables and Stock Market Returns: Evidence from the Athens Stock Exchange, *Journal of Applied Financial Economics*, 16(13), Pp. 993 1005.

Paulsen, J. (1984) Order determination of multivariate autoregressive time series with unit roots. *Journal of Time Series Analysis* 5, 115 27

Pesaran, M.H., Shin, Y. and Smith, R.J. (2001), Bounds testing approaches to the analysis of level relationships. J. *Appl. Econ.*, 16: 289-326.

Pethe, A. and Karnik, A. (2000). Do Indian Stock Markets Matter? - Stock Market Indices and Macroeconomic Variables. *Economic and Political Weekly*, 35(5), 349-356

Phan, D. H. B., Sharma, S. S. & Narayan, P. K., 2015a. Stock return forecasting:some new evidence. *International Review of Financial Analyses,* Volume 40, pp. 3 - 51.

Pham D.C. and Phuoc L.T. (2020). An augmented capital asset pricing model using new macroeconomic determinants. University of Economics and Law. Vietnam National University.

Picha, V. (2017) Effect of Money Supply on the Stock Market, 65(2), *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, Pp. 465-472.

Pierdzioch, C., Rulke, J.C. and Stadtman, C. (2011) Is there a Core of Macroeconomics that Euro Area Forecasters Believe In?, *German Economic Review*, 13(1), Pp. 103-115

Pinto,J.E., Henry,E.,Robinson,T.R. and Stowe, J.D. ((2015). Equity Asset Valuation, 4th Edition, CFA Institute, ISBN 978-1-119-62810-1

Poon, W.C. and Tong, G.K.(2009) Output Growth, Inflation and Interest Rate on Stock Return and Volatility: The Predictive Power

Pradhan, R.P., Arvin M. B. and Bahmani, S. (2015)Causal nexus between economic growth, inflation, and stock market development: The case of OECD countries,*Global Finance Journal*, Volume 27,2015, Pages 98-111, ISSN 1044-0283

Quayes, S. (2010). Does budget deficit lower equity prices in USA?. Economics Letters. 107. 155-157. 10.1016/j.econlet.2010.01.011.

Rahman, M. & Mustafa, M. (2008). Influences of Money Supply and Oil Price on U.S. Stock Market.

Rahman, A. A., Noor, Z. and Fauziah H. T. (2009). Macroeconomic Determinants of Malaysian Stock Market, *African Journal of Business Management*, 3 (3): 95-106.

Rapach, D., Wohar, M., and Rangvid, J. (2005) Macro Variables and International Stock Return Predictability, *International Journal of Forecasting*, 21(1), Pp. 137-166.

Ratanapakorn, O. and Sharma, S. (2007). Dynamic Analysis between the U.S. Stock Returns and the Macroeconomic Variables. *Applied Financial Economics*, 17(5), 369- 377.

Reilly, F. and Brown, K. (2003) Investment Analysis and Portfolio Management. 7th edn. Mason Ohio: South-Western Cengage Learning.

Rehman,M.U. (2013) Investor's Sentiments and Stock Market Volatility: an empirical evidence from emerging stock market , *Pakistan Journal of Commerce and Social Sciences 2013, Vol. 7 (1), 80-90*

Reddy, Subha (1996), "Volatility of Securities Traded on the National Stock Exchange and the Bombay Stock Exchange: A Comparison", *Decision*, Vol. 23, No. 1-4, pp. 1-22.

Rigobon, R. and Sack, B. (2004) The Impact of Monetary Policy on Asset Prices, *Journal of Monetary Economics*, 51(8), Pp. 1553–1575.

Ritter, J. R. (2005) Economic Growth and Equity Returns, *Pacific-Basin Finance Journal*, 13(5), Pp. 489 – 503.

Ross,S.A.(1976),The arbitrage theory of capital asset pricing,*Journal of Economic Theory*, Volume 13, Issue 3,Pages 341-360, ISSN 0022-0531

Rousseau, P. L. and Vuthipadadorn, D. (2005) Finance, Investment, and Growth: Time Series Evidence from 10 Asian Economies, *Journal of Macroeconomics*, 27(1), Pp. 87–106.

Robert, D.G. (2008), Effect of Macroeconomic Variables on Stock Market Returns for four Emerging Economies: Brazil, Russia, India and China, *International Business & Economics Research Journal*, Vol.7 (3), pp. 1-8.

R M Rogers Handbook of Key Economic Indicators Posted: 1998

Sadorsky, P. (1999). Oil Price Shocks and Stock Market Activity. *Energy Economics*, 21(5), 449-469

Saha,S. (2017) Inter Linkage between Indian Stock Market Volatility and Selected Macroeconomics Variables in the Post Reforms Era, The University of Burdwan, Department of Economics

Saleem, F., Yasir, M, Ahmed K, and Sebrish, S. (2012). Budget deficits and stock prices: evidence from Pakistan and India. *Interdisciplinary Journal of contemporary Research in business,* vol. 4, No. 5.

Schwert, G.W. (1989) Business cycles, Financial crises and Stock Volatility, *Carnegie-Rochester Conference Series on Public Policy*, 31, Pp. 83–125.

Schwert, G.W. (1989a) Why does Stock Market Volatility Change over time?, *Journal of Finance,* 44, Pp. 1115–1153.

Schwert, W. G. (1989) Why does Stock Market Volatility Change over time?, *Journal of Finance,* 44(5), Pp. 1368–1388.

Schwandt, T., 2000. Three epistemological stances for qualitative inquiry: Interpretivism, hermeneutics and social constructionism in N.K. Denzin and Y. S. Lincoln (Eds.) Handbook of qualitative research. 2nd ed. London: Sage.

Semra, K. & Ayhan, K., 2010. Investigating causal relations among stock market and macroeconomic variables: evidence from Turkey. *International Journal of Economic Perspectives,* 4(3), pp. 501 - 507.

Sharma, P. & Vipul, S., (2016). Forecasting stock market volatility using realized GARCH model: International evidence. *The Quarterly Review of Economics and Finance,* Volume 59, pp. 222 – 230

Shang,Y. and Zheng. T., (2021) Mixed-frequency SV model for stock volatility and macroeconomics. *Journal of Ecnomic Modelling.* ISSN 95 (2021) 462-472.

Shiller, J. Robert (1990), "The Volatility of Stock Market Prices", *Science, New Series*, Vol. 235, No. 4784, pp. 33-37.

Shaw, E.S., (1973),Financial Deepening in Economic Development. Oxford Univ. Press,

Sirucek, M. (2012) The Impact of Money Supply on Stock Prices and Stock bubbles, MPRA Paper No. 40919, Mendel University: Faculty for Business and Economics.

Silverman, D., 2013. Doing qualitative research: a practical handbook. London: SAGE.

Singh, M. (2008), The Dynamics of BSX and NFUTIDX Nifty: Volatility, Liquidity and Regulatory Framework, Doctoral Thesis, University Business School, Panjab University, Chandigarh, pp. 227-240

Singh, D. (2010). Causal Relationship between Macroeconomic Variables and Stock Market: A Case Study for India. Pakistan Journal of Social Science, 3(2), 263-274.

Singh, S. (2016), The Impact of Derivatives on Stock Market Volatility: A Study of the Sensex Index. *Journal of Poverty, Investment and Development*. ISSN 2422-846X. An International Peer-reviewed Journal Vol.25, 2016

Singh, M.; Mishra, S.; and Das, B. (2017). Macro-Economic Analysis of Global Economic Recession 2007- 2009 and Policy Measures that Enabled Recovery of the US Economy.

Sopipan, N., Kanjanavajee, N. & Sattayatham, P., (2012), Forecasting SET50 index with multiple regression based on principal component analysis. Journal of Applied Finance and Banking , 2(3), pp. 271 - 294.

Srnivasan,T.N. and Vani A. (2009) India in Global and Regional Trade: Determinants of Aggregate and Bilateral Trade Flows and Firms' Decisions to Export Working paper No. 232, India council for research on International Economic Relations.

Steelman, A. and Weinberg, J. A., (2015), The Financial Crisis: Toward an Explanation and Policy Response , Economic Quarterly Issue 1Q, pp. 5-21

Surbakti, E.H., Achsani,N.A. and Maulana T.N.A. (2016) The Impact of Macroeconomic Variables on JCI's Stock Return Volatility in Pre and Post Global Economic Crisis International Journal of Scientific and Research Publications, Volume 6, Issue 3, March 2016 ISSN 2250-3153

Szabłowska, E. (2010). The financial crisis and securitization. *Journal of Education Culture and Society. 2010.* 10.15503/jecs20101-37-48.

Talla, J. (2013) 'Impact of Macroeconomic Variables on the Stock Market Prices of the Stockholm Stock Exchange (OMXS30)'. Master of Science Thesis. Jönköping University: Jönköping.

Taulbee, N. (2001). Influences on the Stock Market: Examination of the Effect of Economic Variables on S&P 500. *The Park Place Economist*, 9, 20.

Taylor, J. B. (2009*) The Financial Crisis and the Policy Response: An Empirical Analysis of What Went Wrong,* Working Paper, No. 14631. *Cambridge: National Bureau of Economic Research.*

Timmermann, Allan & Granger, Clive. (2002). Efficient market hypothesis and forecasting. *International Journal of Forecasting*. 20. 15-27. 10.1016/S0169-2070(03)00012-8.

Titman, S., & Warga, A. (1989). Stock Returns as Predictors of Interest Rates and Inflation. *The Journal of Financial and Quantitative Analysis, 24*(1), 47-58.

Tobin, J. (1969) A General Equilibrium Approach to Monetary Theory. *Journal of Money, Credit and Banking,* 1, Pp. 15-29.

Tripathy, N. (2011). Forecasting Volatility of Indian Stock Market and Macro Economic Variables. *International Journal of Arts & Sciences*. 4. pp.225–238.

Tursoy, T., Nil, G. & Rjoub, H., 2009. The effects of macroeconomic factors on stock returns:Istanbul stock market. *Studies in economics and Finance*, 26(1), pp. 36 - 45.

Udegbunam, R.I. and Oaikhenan, H.E. (2012): Interest Rate Risk of Stock Prices in Nigeria: Empirical Test of the Duration and Convexity Model. *Journal of Emerging Market Finance*, Vol. 11, No.1.

Van Aarle, B., Garretsen, H. and Gobbin, N. (2003): Monetary and Fiscal Policy Transmission in Euro-Area: Evidence from a Structural VAR Analysis. *Journal of Economics and Business,* Vol. 55, Nos 5 & 6.

Verick, S. and Islam, I. (2010) The Great Recession of 2008-2009: Causes, Consequences and Policy Responses, *Discussion Paper Series* No. 4934, Bonn: IZA.

Walter, J. (1989) Monetary Aggregates: A user's guide, *FRB Richmond Economic Review*, 75(1), Pp. 20-28.

Williams, T. A., 2011. stock market reaction to selected macroeconomic variables in Nigerian economy. *CBN Journal of Applied Statistics*, 2(1), pp. 61 - 71.

Wee, R.Y. (2017) Biggest Stock Exchanges in The World.

Wongbangpo, P. and Sharma, C.S. (2002). Stock Market and Macroeconomic Fundamental Dynamic Interactions: ASEAN-5 Countries. *Journal of Asian Economics*, 13, 27-51.

Yadav, Sameer. (2017). Stock Market volatility : A study of Indian Market, *Global Journal for Research Analysis*. 6. 629-632.

Yaya, O. and Shittu, O. (2010). On the Impact of Inflation and Exchange Rate on Conditional Stock Market Volatility: A Re-Assessment. *American Journal of Scientific and Industrial Research.* 1. 115-117.. 10.5251/ajsir.2010.1.2.115.117.

Young ,P.(2006) Industrial production and stock returns, Faculty of Business Administration , Simon Fraser University

Zheng Z, Qiao Z, Takaishi T, Stanley HE, Li B.(2014) 'Realized volatility and absolute return volatility: a comparison indicating market risk'. *PLoS One*. 2014;9(7):e102940. Published 2014 Jul 23. doi:10.1371/journal.pone.0102940