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Financial Risk and Financial Performance of Banks in Egypt

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Dedication

To my dear parents for spending their lives building mine

To my wonderful wife for filling my life with love and support

And to my lovely daughter, the most beautiful blessing I have ever had

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Abstract

This research focuses on the two main dimensions of bank performance; profitability and risk using a sample of the listed banks in Egypt. The lack of this type of research in Egypt is the main motive for this thesis, especially after years of political and economic instability in the middle east; in addition to the major regulatory reforms implemented by the Central Bank of Egypt through its banking reform program in the last few years. Therefore, this research examines the most important intra- and extra-bank profitability determinants, using data collected from the unconsolidated quarterly financial reports of the eleven banks listed consistently on the Egyptian Stock Exchange for the period (2005-2015), in addition to country data collected from Euromonitor International and Trading Economics databases. Moreover, the effects of the 2007/2008 Global Financial Crisis and the Arab Spring are considered. This is done along with estimating a panel vector auto-regression model under a generalized method of moments framework to investigate the Granger causality between two main financial risk types for banks; credit and liquidity risks. Furthermore, testing the effect of regulatory capital on bank profitability after applying Pillar I of Basel II in Egypt since 2013 is conducted through using additional data collected from Thompson Reuters databases based on the consolidated statements of the sample banks from the first quarter 2014 until the second quarter 2016. Findings of this research confirm the dynamic nature of the estimated models indicating profit persistence during the sample period, also the results show a general resilience of the sample banks to the effects of the Global Financial Crisis and the Arab Spring. Findings show that the effect of capitalization is positive when profitability is measured in terms of assets and negative when profitability is measured in terms of equity, as a result of the fall of leverage when increasing the equity to total assets ratio; while regulatory capital shows a negative relationship with bank profitability. This implies the need to be more conservative in applying further stages of Basel regulations in Egypt. Additionally, the intra-bank determinants of profitability show more significant effect than most of the extra-bank determinants. Liquidity risk, operational efficiency, and financial structure show negative relationships with bank profitability; while bank size, revenue diversification, and interest rate affect bank profitability positively. However, credit risk, economic growth, inflation, and money supply growth do not show significant effect on bank profitability in the estimated models. Finally, the results show a unidirectional Granger causality running from liquidity risk to credit risk of the sample banks, implying the importance of past values of liquidity risk in predicting future exposure to credit risk.

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Chapter.1 Introduction

1.1 Background

Performance management is considered to be a very important economic issue nowadays, it helps organisations to align their strategies with operational goals. This makes performance management one of the top priorities of any organisation, especially in today's competitive business environments. Therefore, bank management is always keen to develop more efficient ways of measuring and managing their performance (Aguilar, 2003). Tabari *et al.* (2013) argued that banks are amongst the most important financial institutions that play a vital role in wealth creation and currency circulation of any country. Therefore, better bank performance will have positive effects in improving a country's overall economic conditions as well as increasing the quantitative levels of output. Therefore, research in banking is paid a great attention in different countries with varying economic conditions, both in developed and developing countries. A large body of the financial literature focuses on investigating bank performance and how different factors might affect the stability of banking industry in different parts of the world. Rose and Hudgins (2013) stated that the most important dimensions of bank performance are; profitability and risk, and that the main objective of any financial institution is to achieve a desired amount of profit at acceptable level of risk. Therefore, this research tries to investigate bank profitability and different external and internal factors expected to affect bank profitability. In addition to investigating financial risk types, focusing on credit and liquidity risks, that affect bank profitability and the interrelationships among those risks that will have direct and indirect effects on bank profitability in Egypt. The current research used the data of all the listed banks in Egypt focusing on the period (2005-2016) in different analyses as will be illustrated later.

Previous studies conducted researches to investigate different internal and external factors that affect bank profitability in different developed and developing economies. One important study by Kosmidou (2008) investigated the most important bank-specific, industry-specific and macroeconomic factors affecting bank profitability in Greece for a sample of 23 commercial banks over the period 1992-2000. Her study found a significant positive effect of capitalization and bank size variables on bank profitability. While, negative relationship were discussed between bank profitability on one hand and liquidity risk, banks' assets to GDP, stock market capitalization to banks' assets, and

concentration on the other hand. Also, Ben Naceur and Omran (2011) used the data of 173 commercial banks from ten countries in the MENA region, including Egypt, to investigate the effects of the financial development, market structure, institutional factors, and regulations on bank performance in those countries. The authors found significant effects of capitalization, credit risk, stock market development, and inflation on bank performance. Additionally, another important study by Trujillo-ponce (2013) investigated the main profitability determinants for Spanish banks during the 1999-2009 period. The findings of this study supported a positive impact of capital adequacy ratio, loans to total assets ratio, customer deposits, bank efficiency, and a negative impact of the ratio of doubtful assets on bank profitability. Similarly, Pervan *et al*. (2015) conducted a study to identify profit persistence in the Republic of Croatia. Their analysis included a comprehensive set of bank-specific, industry-specific, and macroeconomic factors. The estimated models included; size, market share, solvency risk, credit risk, intermediation, operating expenses management, industry concentration, market growth, GDP growth, and inflation. The authors found all of the previously mentioned variables significantly affecting bank profitability with the exception of market share variable.

In the same line, Saona (2016) conducted a study using data of banks in seven Latin American countries collected for the period 1995-2012 to investigate intra- and extra- bank drivers of profitability. The first group of bank drivers, considered by the authors, included those factors that are controllable by bank management. While, the second group included the extra-bank factors comprising both industry-specific and macroeconomic factors that are not affected by managerial decisions. Intra-bank determinants included; capital adequacy ratio, functional diversification, bank loans, bank deposits, bank size, credit risk, and bank concentration. Extra-bank determinants included; financial development, legal enforcement and regulatory system, inflation, per capita GDP growth rate, reserve requirements and economic crises. Also, a more recent study by Trad *et al.* (2017) examined whether Islamic banks, as compared to conventional ones, differ in terms of factors determining performance and risk characteristics and whether this is reflected on countries' financial stability using a sample of 78 Islamic banks in 12 countries. Bank-specific and macroeconomic variables were tested in this study for their effect on soundness of Islamic banks, as explained by bank profitability measured by ROA and ROE, and risk, measured by credit risk and insolvency risk, for the period 2004-2013. Intra-bank variables included; bank size, capital adequacy, asset quality, and liquidity, while extra-bank variables included GDP, inflation and exchange rate. Indeed, the previously

mentioned studies, in addition to other studies, adopted the viewpoint of classifying the bank profitability determinants into intra- and extra-bank factors. However, a detailed discussion of each of these factors will give some insights about the best way to measure each of them and the expected possible impact of each one on bank performance.

Additionally, many studies focused on the study of financial risks that might affect bank performance. Financial risks are considered pure risk indicators that result in actual losses for the bank if not accurately and carefully measured and monitored through a coherent risk management system that protects the bank from adverse effects and expected losses. Santomero (1997) concluded that the main financial risk types that need to be controlled for any bank include; credit, foreign exchange, interest rate, and liquidity risk. However, credit risk and liquidity risk have been always considered the most important types of financial risks that affect bank performance. Examples of previous studies that focused on credit risk and liquidity risks as the main financial risk types that affect bank performance include; Santomero (1997), Giesecke (2004), Kosmidou *et al.* (2008), Iannotta *et al.* (2007), Saunders and Cornett (2007), Athanasoglou *et al.* (2008), Chen *et al.* (2018), Driga (2012), Abdel-Megeid (2013), Tabari *et al.* (2013) and Imbierowicz and Rauch (2014); among others. Credit risk management is one of the most important risk issues that highlights the importance of controlling a bank's credit exposure to provide the needed protection from its adverse effects. Therefore, one important issue in the risk management literature is how to manage credit risk and the effect of other types of risks on credit risk levels, especially in banks with its crucial role in a country's economy. Imbierowicz and Rauch (2014) conducted a study that examined the most important risks affecting bank profitability; credit and liquidity risks. This study investigated the causal relationship between liquidity risk and credit risk by empirically analysing the relationship between both of them in non-default and default commercial banks in the United States of America for the period 1998-2010, using a variety of different subsamples and tests. Their results declared that there is no reliable relationship between both risk types.

When it comes to the main context of the thesis, Egypt, it can be noted that the country went through severe political and economic events in the last ten years such as; the 2007/2008 Global Financial Crisis and the Arab Spring with its serious economic consequences on the whole region including Egypt. The real economy in Egypt was affected by the global crisis; losses arose mainly from problems in tourism sector, oil prices volatility, and effects on foreign investments in Egypt. Therefore, services sectors were the most affected among other

sectors, which is relatively important for the Egyptian economy as 70% of Egyptian foreign exchange earnings came mainly from Suez Canal and tourism. These sectors were hit by the crisis, especially the tourism sector which declined by around 3% during the crisis period. However, the banking sector in Egypt was reported to have some resilience against the effects of the crisis according to the report prepared by the Egyptian ministry of finance (MoF) in 2010 after the 2007/2008 Global Financial Crisis (MoF, 2010).

Moreover, the Arab massive demonstrations that prevailed in most of the Arab countries in the last 9 years, commonly known as the Arab Spring, represented another source of political and economic instability. The Arab Spring affected not only Egypt, but also all of the countries in the MENA region, with very serious effects on tourism, oil prices, foreign direct investment (FDI), GDP, international trades and inflation rates, as will be discussed in details in Chapter 2. However, a recent report by the International Monetary Fund (IMF) stated also that the Egyptian banking system has shown resilience to the hard shocks prevailed in the world and the Arab region; including the Global Financial Crisis and the Arab Spring (IMF, 2017). These serious events were accompanied by major regulatory changes of the Egyptian banking sector during the last ten years. The Central Bank of Egypt (CBE) started the first wave of a comprehensive reform program in 2004 that aimed at addressing many points of importance to the Egyptian banking industry. Then, preparation for the application of Basel II regulations was undertaken under the second wave of the CBE's reform program that was extended up to March 2012. Followed by the application of first pillar of Basel II accord during the 2012/2013 fiscal year.

1.2 Research Motivation

In the light of the previous background, it can be concluded that the main determinants of bank profitability were investigated in many countries around the globe in different studies that examined diverse internal and external factors which affect bank profitability. However, very few studies were conducted in Egypt; which is a country that witnessed two major events during the last ten years; the 2007/2008 Global Financial Crisis and the Arab Spring. What's more interesting about that is the reports published by the Egyptian Ministry of Finance and the IMF, suggesting that the Egyptian banking industry was resilient to the effects of different shocks, although the Egyptian economy has been affected dramatically. These arguments are based mainly on the fact that the Egyptian financial system is weakly integrated into the world financial system on one hand.

While on the other hand the regulatory authorities in Egypt keep imposing strict regulations to protect the soundness and stability of the whole banking system, especially during times of adverse political and economic conditions. Therefore, the banking industry in Egypt has witnessed a period of great changes recently in all aspects. The banking reform program that started in the early 2000s, had two major waves of regulatory reforms ended in 2012 with a decision to apply pillar I of Basel II as a result of great efforts made throughout a three-year-plan, developed with the help of the European Central Bank in cooperation with seven other European national banks. This decision represented a very important step in the history of banking regulations in Egypt, which points out the need for more intensive studies investigating the new regulatory reforms in Egypt and how it would affect bank performance. Also, the CBE is following two basic strategies in applying Basel regulations; simplicity and communication. As a result, the CBE allowed only the application of the basic approaches of pillar I and postponed the application of the internal models with more advanced methodologies until the Egyptian banking sector fully digests the first pillar. This further indicates the need for more studies in this area to help fully understand the effects of applying the first pillar, and to increase awareness about Basel regulations in Egypt. What is worth mentioning here is that the CBE is doing a good job in the process of communicating Basel regulatory reforms; however, this is done mostly on a strategic level and the level of headquarters and is not well communicated to lower levels and the level of business lines. Therefore, increasing awareness and communicating Basel regulatory reforms to all levels in banks will give a good opportunity to all bankers to be part of the Egyptian regulatory reform process. This should help to fully digest the current regulations in the near future and move forward, in a good pace, to more advanced regulatory reforms. This represents a challenge for academic research in the area of bank performance in Egypt. Having that said; Egypt is considered a very interesting and unique context to study bank performance, which is more challenging in the light of the low transparency levels in Egypt.

Moreover, among the main determinants of bank profitability are the credit risk and liquidity risk that represent also the major types of financial risks for banks. It can be found that the classical theories of banking support the view that both risks are closely linked. Industrial Organization models of banking, such as the framework of Monti-Klein and the Financial Intermediation perspective in a Diamond and Dybvig (1983) or Bryant (1980) settings, showed such links through highlighting that a bank's assets and liabilities structures are closely connected, especially when talking about borrower defaults and fund

withdrawals. Additionally, some previous studies derived, mostly from a theoretical perspective, some results which show the relationship between credit and liquidity risks and their effects on bank performance and stability, such as Goldstein and Pauzner (2005), Cai and Thakor (2008), Acharya *et al.* (2010), Gorton and Metrick (2012), Acharya and Viswanathan (2011), and Acharya and Mora (2015). While, Imbierowicz and Rauch (2014) is among the most important studies that investigated the causal relationship between credit and liquidity risks. They mentioned in their research that they couldn't find any other studies that investigated the causal relationship between credit and liquidity risks in an empirical way and on a broad basis across all commercial banks in a given market. Furthermore, very few studies are conducted in this area after 2014, such as the study of Ghenimi *et al.* (2017); however, they also concluded no meaningful causality between both risks. The lack of conclusive results on the relationship between these two key elements of bank performance provides a strong motivation to investigate such relationships in a country with unique circumstances like Egypt. Therefore, Egypt as a developing country that passed through serious political, economic, and regulatory changes needs every single effort that can help in improving the business environment and enhancing the soundness of its financial system.

1.3 Research Questions and Research Objectives

Therefore, the main objective of this thesis is determined to be the investigation of different bank-specific and macroeconomic determinants of bank profitability using a sample comprising the listed banks in Egypt during the period (2005-2015) to illustrate the effect of each of the independent variables on the dependent variables, which will help in answering the first research question "*How did bank-specific and macroeconomic factors affect bank profitability in Egypt during the sample period?*". Moreover, the model also takes into consideration major serious shocks during the sample period to test the effect of the 2007/2008 Global Financial Crisis and the Arab Spring on profitability of the listed banks in Egypt. This will help to answer the second research question "*How did the Financial Crisis and the Arab Spring affect Egyptian bank profitability during the sample period?*". Additionally, the Granger causality is also tested between two major financial risks among the main internal determinants of bank profitability; credit risk and liquidity risk. Furthermore, the thesis will focus on credit risk and liquidity risk of banks in Egypt, due to their major importance in the banking literature. They are considered to be pure risk indicators that result in actual losses to the bank if not accurately and carefully measured and

monitored through a coherent risk management system to protect the bank from adverse effects and expected losses. The main focus here will be to illustrate the impact of the two risk types on each other, and to answer the third research question "*What was the causal relationship between credit risk and liquidity risk of banks in Egypt during the sample period?*". Finally, the effect of regulatory capital on bank profitability will be tested in Egypt for a more recent sample period after applying the first pillar of Basel II accord in Egypt in 2012/2013. This will help in answering the fourth research question, which is "*What was the effect of regulatory capital on Egyptian bank profitability during the sample period?*".

Therefore, the thesis is intended to provide an empirical evidence of different interrelationships affecting bank performance with its two main dimensions; profitability and risk. Therefore, it can concluded that testing different models would help in achieving the following research objectives;

1) Describing the main explanatory variables both bank-specific and macroeconomic factors determining profitability of the sample banks to answer the first research question "*How did bank-specific and macroeconomic factors affect bank profitability in Egypt during the sample period?*".
2) thtoton the Egyptian political and economic systems, and empirically testing the effects of these serious shocks on the Egyptian banking sector to answer the second research question "*How did the Financial Crisis and the Arab Spring affect Egyptian bank profitability during the sample period?*".
3) Investigating the causal relationship between two internal determinants of bank profitability; credit and liquidity risks. This is to uncover the ambiguity of the relationship between those two important risk variables and to answer the third research question "*What was the causal relationship between credit risk and liquidity risk of banks in Egypt during the sample period?*".
4) Testing the impact of applying the first pillar of Basel II in Egypt using more recent data, as the most important regulatory reform in the recent history of the Egyptian banking sector. This is will help answer the fourth research question "*What was the effect of regulatory capital on Egyptian bank profitability during the sample period?*".

1.4 Research Contribution

Most of the previous studies estimated dynamic profitability models to account for profit persistence to test the effect of past values on current bank profitability. The Generalized Method of Moments (GMM) estimator is the most commonly used estimator for bank profitability models in previous studies, as it is suitably designed to account for endogeneity problems that accompany these types of models and might affect its accuracy. However, it can be found that very few studies were conducted investigating the dynamic nature of bank profitability in Egypt; such as Ben Naceur and Omran (2011) who investigated bank performance in ten countries including Egypt. This implies the need for updated studies that test the main determinants of bank profitability in Egypt with more recent data and more comprehensive models. This is needed especially after major changes that have taken place in the Egyptian political and economic environments throughout the last ten years. In addition to the major regulatory changes in the banking sector of Egypt following different waves of the reform program lead by the CBE and the application of the first pillar of Basel II since 2012/2013. Therefore, testing the effects of these major events on the stability and soundness of the banking industry in a country with such exceptional circumstances like Egypt would represent an important contribution of the current research.

Therefore, this thesis will focus on presenting a comprehensive background on Basel regulatory framework with all its stages and the effect of each stage on the world banking and the Egyptian banking in specific. In addition to a comprehensive analysis of the effect of the Arab Spring in the middle east with needed evidence and numerical as well as graphical representations. This will provide for a good contribution to knowledge and the body of literature in this regard that can be used by future researches in the field. While, the thesis's main contribution is based on estimating the internal and external factors affecting profitability of the Egyptian banking industry following the serious events that affected the economy (the Global Financial Crisis and the Arab Spring), in addition to measuring the specific effects of these events on the Egyptian banking industry for the first time after the recent relative political instability in Egypt. Moreover, the new major regulatory change in the Egyptian banking industry implies the need of continuous monitoring and review which could be improved through better academic efforts to empirically test the effects of applying such regulatory reforms. Therefore, the measurement of the effect of the recent regulatory reform following the banking reform program that ended

recently in Egypt is another contribution, and this research has the lead in measuring the effect of such regulatory reform on the Egyptian banking industry, which is currently the focus of the Egyptian government and is still under investigation. This will help in identifying the potential benefits and costs of the new regulatory reform in an empirical way for the sample of the listed banks in Egypt.

Additionally, profit persistence was considered for all the estimated models. Also a set of different measures of the estimated variables have been used to conduct the analysis utilizing the dataset collected from multiple sources over years, which represents another important contribution given the reported low levels of transparency in developing countries like Egypt following the serious political turmoil that hit the whole region during the period of the Arab Spring that makes collecting such data a very challenging task. Besides, the thesis explored the interrelationships involved in bank profitability models through investigating the causal relationship between bank credit and liquidity risks, that was inconclusive in previous literature in both developing and developed countries. The results found in previous literature indicated that the relationship between both risks could hypothetically be either positive or negative. Which suggests the need for more empirical investigation of the causal relationship between both risk types in different contexts to draw clearer conclusions about such relationships and how it affects bank stability. Therefore, analysing the causal relationship between credit and liquidity risks in an empirical way will be conducted to highlight some important findings about results of the interaction between the two types of bank risk and how they can affect each other and thereby affecting the overall bank stability.

1.5 Methodology and Data

Data of eleven banks that are consistently listed on the Egyptian Stock Exchange was collected for the sample period (2005-2015) from the unconsolidated audited quarterly reports of the sample banks. The source of this data is the institution responsible for data dissemination for the listed companies in Egypt, called Egypt for Information Dissemination (EGID). The unconsolidated financial statements were used as the main source for financial data in this research following Trujillo-Ponce (2013) to avoid differences among accounts of headquarters and branches that might negate each other which improves the consistency and comparability of the reported results. This main dataset was then used to measure the main dependent and independent variables employed

in this thesis. The developed models incorporate bank-specific and macroeconomic factors, or intra- and extra-bank determinants, that are expected to affect bank profitability. Which is important for developing countries like Egypt that need to have more academic research in this area to help in economic development, and improvement of investment opportunities. Egypt is in a great need for every single effort that might help in the development of the Egyptian economy especially after a long period of financial and economic instability following the Global Financial Crisis and the Arab Spring throughout the last ten years.

Accounting for the effect of the two major economic and political shocks is done through including dummy variables for the Global Financial Crisis (2007-2009), the Arab Spring and political instability (2011-2013), while remaining years were considered as periods of relative stability (2005, 2006, 2010, 2014 and 2015). Additionally the same dataset is used in a separate model to identify any potential causal relationship between two main financial risk types, credit and liquidity risks, whose effects on bank profitability are also tested in the main model. Moreover, an additional dataset is collected through Reuters Databases from the consolidated quarterly financial reports of the sample banks for a more recent period from the first quarter of 2014 to the second quarter 2016. The second dataset contains information concerning the regulatory capital of the sample banks for a shorter sample period, that starts after the application of the first pillar of Basel II in Egypt since 2012/2013. This dataset is used to test for the effect of regulatory capital on profitability of the sample banks in the most recent available years. Additionally, country data was collected from two main sources including; Euromonitor International and Trading Economics databases.

A deductive approach, which is to test a theory rather than generating one, is adopted, which is more appropriate to meet the main objective of this research. The panel data modelling is applied to the sample banks to run different statistical analyses and test the main research hypotheses. Stata 14 software package is also used throughout the statistical analyses sections. Different statistical analyses, including descriptive statistics, correlation analysis and different regression models were performed. The basic assumptions of the classical linear regression model are also tested, while the Hausman test is conducted to determine the appropriateness of the fixed effects versus the random effects estimation methods. The system GMM estimator as well as the fixed effects estimator are used to test the hypotheses of the main model of the thesis concerning the main intra- and extra-bank profitability determinants. The statistical code developed by David Roodman “xtabond2” that was used in his

paper (Roodman, 2009) is used to run the system GMM estimation. Also, the statistical code developed by Inessa Love, which was applied for the first time by Love and Zicchino (2006), is used to estimate a panel vector autoregression (PVAR) model under a GMM framework. Moreover, the three-model-selection criteria proposed by Andrews and Lu (2001) were used for selecting the order of the PVAR model. Finally, the causal relationship between credit risk and liquidity risk is measured using a Granger causality Wald test which is included in the package of tests of Love's statistical code.

1.6 Research Findings

The main findings of the thesis reflect the resilience of the sample to the effects of the Global Financial Crisis and the Arab Spring through the analysis of the main model of bank profitability determinants. Moreover, this model highlights profit persistence for the sample which confirms the dynamic nature of the model. These results confirms the report of the IMF in 2017 stating that the Egyptian banking industry was resilient to the effects of different shocks including; the Global Financial Crisis and the Arab Spring. Which was due to the strict policies adopted by the CBE through implementing its banking reforms program with its different waves that ended in 2012, as well as the weak integration of the Egyptian financial system into the world financial system. Moreover, bank capitalization as measured by the traditional measure of equity to total assets showed mixed results on profitability. Capitalization affects profitability positively when measured by the ROA, while its affects profitability negatively when measured by the ROE. This is in line with the results of previous studies on different countries. However, the negative effect of bank capitalization on profitability as measured by ROE is better explained through; the negative effect on the equity multiplier in case of increasing capital, leading to decreased leverage or indebtedness of the bank rather decreasing wealth creation from capital.

On the other hand; measuring the effect of regulatory capital on bank profitability, as measured by ROA, of the sample banks showed the opposite results. This is also in line with the views of both Ayadi *et al.* (2016) and Tran *et al.* (2016); who reported that banks tend to keep higher regulatory capital ratios compared to the traditional measure of capital (equity to assets). Banks tend to view regulatory requirements as constraints that lead them to misallocate their resources which affects profitability negatively. Therefore, regulatory capital ratios are considered less conservative than traditional measures of capitalization, especially during

times of global or regional shocks. However, the effect of regulatory capital on profitability of the sample banks was measured for a relatively recent short period of time following the application of Basel II in Egypt in 2013. This should be taken into consideration when considering the negative effect of regulatory capital on bank profitability of the sample, as more research efforts will be needed in the future to measure the effects over a longer period of time and using larger samples.

Furthermore, the liquidity risk measure (loans to total assets) proved to negatively affect bank profitability of the sample through its effect on bank solvency and ability to meet demands. Also, the positive effect of non-interest income activity on bank profitability is evident in the tested models indicating the importance of alternative sources of income for banks that can be used to mitigate the negative effect of decreased liquidity (increased liquidity risk), which will help in improving bank profitability. In addition to the negative effect of the lack of operation efficiency as measured by cost to income ratio, indicating that more efficient banks, with better technological and managerial tools, earn higher profits. The positive effect of bank size matches most of the previous studies, reflecting the ability of larger banks to employ the advantages of economies of scale to improve operational efficiency and launch better marketing campaigns, which affects their profit earning activities positively. The effect of financial structure variable, as measured by the ratio of customer deposits to total liabilities, is negative on bank profitability of the sample banks. This result contradicts the expected positive effect of customer deposits on bank profitability as discussed in previous studies. However, the negative impact of financial structure is in line with what was suggested by Trujillo-Ponce (2013) that; during deposit wars banks tend to increase interest rates to attract depositors, which might have a negative effect on bank profitability. This was the case with the Egyptian banking industry deposit wars during the period of economic and financial stability to attach more sources of finance. In this case, banks are encouraged to resort to other medium and long-term wholesale financial resources to finance loan as an alternative to customer deposits.

However, the only macroeconomic variable that showed a positive effect on bank profitability is the interest rate variable. While credit risk, economic growth, inflation, and money supply growth did not show significant effect on bank profitability of the listed banks in Egypt in both the ROA and ROE models. Finally, a first-order PVAR model was estimated under a GMM framework to test the Granger causality between credit risk and liquidity risk using a Granger causality Wald test. The results highlights a unidirectional causality running from liquidity

to credit risk. According to the pioneer concept of Granger causality, this result means that past values of liquidity risk measurements can be used to predict future exposure to credit risk. Which will give banks an advantage of expecting and preparing to contain potential effects of credit risk through the ability to expect the future quality of their loan portfolios.

1.7 Thesis Structure

This thesis is organized into seven chapters; the next six chapters discuss the research context, bank regulatory framework, data and methodology, analysis and results, and the final chapter concludes the whole thesis. Chapter two presents an overview of Egypt as the context of this research, to make the reader familiar with the country of interest and to provide a proper understanding of the current situation in Egypt the light of all historical, background, and economic conditions. Therefore, chapter two presents an overview of different historical, geographical, demographical, and political aspects of Egypt. Furthermore, an overview of the Egyptian economy with its different stages and developments is provided. In addition to describing the Egyptian banking industry in terms of; structure, competition, and stages of regulatory reforms. Additionally, this chapter discusses the Arab Spring with its different stages and how it affected the economies of the whole region including Egypt. A detailed discussion of political and economic environments in the MENA region following the Arab Spring is also presented in this chapter, as well as different local and regional economic effects and how it affected the Egyptian economy.

Chapter three discusses banking regulations and the role of the Basel Committee on Banking Supervision (BCBS) with different versions of its Basel Accords in building the basis for a comprehensive regulatory framework adapted to various banking industries around the world. A detailed discussion of Basel I, Basel II, Basel 2.5, and Basel III is provided in this chapter with an extended discussion of the application of Basel regulations worldwide and in Egypt, as the research context of the thesis. This chapter takes a general scope that aims at providing a general background on Basel regulations based on professional reports and academic studies focusing on Basel regulatory framework and its application around the world. Furthermore the chapter addresses the application of Basel regulations in Egypt, explaining different regulatory reforms adopted in Egypt following the application of Pillar I of Basel II in late 2012 and early 2013. This background chapter is intended to clarify the general framework adopted by the BCBS throughout different stages as well as making the reader aware with the

current stage of applying Basel regulations in Egypt. This is important in order to provide the conceptual basis needed to justify the investigation of the effects of regulatory capital on bank profitability in Egypt in the most recent years, as discussed in the analysis chapter.

Chapter four presents a review of relevant literature to present the necessary theoretical background of the main research area. A comprehensive discussion of relevant previous studies is presented at the beginning of the chapter with a focus on the most recent ones after 2013. Furthermore, different research objectives, estimation methods, variables description, and research findings of previous studies are discussed in this chapter to provide the necessary theoretical base needed in further stages of the research. Then, a discussion of bank profitability measures, different risk types, and different bank profitability determinants is provided in separate sections. Comparisons between the findings of relevant studies are also discussed, which helps in identifying the base of expected relationships among the main variables of the thesis and help specify the literature gap that need to be filled within the thesis.

Chapter five focuses on explaining the datasets used in this research collected from different sources. The chapter also provides a detailed explanation of the sample of the listed banks in Egypt with relevant background information of each bank. In addition to presenting a comparison between sample banks to allow for a clearer presentation of the research sample including; size comparisons as well as comparing stock market values, deposits, loans, and net income. Moreover, descriptions of all the variables used in the research are also presented in this chapter, explaining different measurements of dependent and independent variables. As well as breaking down the profitability ratios into their components similar to the discussion of Rose and Hudgins (2013), and using the DuPont analysis to help in explaining different interrelationships in the analysis chapter following other similar studies of bank profitability. Also a description of the main model of the thesis is provided in this chapter, in addition to a discussion of the research approach used and regression models' specifications. What is more, this chapter provides a discussion of different econometric methods and techniques used in statistical analyses including fixed effects, random effects, GMM, and PVAR models. Also, a discussion of different pre and post estimation tests is necessary and is presented in this chapter to provide a complete picture of the econometric techniques used to test for the main research hypotheses that are also discussed in this chapter.

Chapter six presents the statistical analyses needed to test the main research hypotheses and to achieve conclusions about potential answers of the main research questions. Different statistical analyses are conducted in this chapter using Stata 14 to investigate different factors that affect bank profitability in Egypt, including bank-specific and macroeconomic factors and to test the impact of the Global Financial Crisis and the Arab Spring on bank profitability. In addition to testing the Granger causality between liquidity and credit risk of the sample banks. As well as testing the impact of regulatory capital on bank profitability for a more recent period for the sample of the listed banks in Egypt, in an additional analysis section. Chapter seven presents a summary of the main objectives, findings, and contributions of the whole thesis. Additionally, it presents the conclusions of the whole thesis based on findings of different statistical analyses under different estimation methods. In addition to discussing various limitations and recommended work for future academic research.

Chapter.2 Research Context

2.1 Introduction

The Arab Republic of Egypt is one of the oldest civilizations that emerged from the Nile Valley more than 7000 years ago. Situated at the north-eastern corner of Africa, Egypt remains a country at a crossroads with a very special location that played a major role in both ancient and modern history of the country. The most recent history of Egypt witnessed massive popular demonstrations or revolutions in January 2011 and June 2013 that resulted in a great political instability with three new presidents who ruled Egypt in less than 3 years. This resulted in multiple trials of interim and elected governments who tried to enhance the economic and political progress throughout the last few years. However, Egypt still suffers from the consequences of the tough economic conditions and the serious drop in tourism following the local and regional political instability as will be discussed later in this chapter. These unstable conditions have great effects on all Egyptian industries. Additionally, the banking industry in Egypt witnessed some reforms and developments that started during the 1990s and continued till recently after the Egyptian revolutions and still going on. Therefore, this chapter will present an overview of Egypt as the context of this research to make the reader familiar with the country of interest and understand the current situation in the light of all historical, background, and economic conditions. The chapter will also present an overview of the Egyptian economy as a whole with its different stages and developments, in addition to a detailed description for the Egyptian banking industry with its structure, competition, and different stages of regulatory reforms.

A very few studies were conducted in the area of bank performance in Egypt, may be due to the unavailability of historical detailed data for all banks operating in Egypt. However, recent improvements in the banking sector of Egypt that started during the 2000s and is still in progress, have resulted in a better transparency practices and better compliance with international regulations such as Basel regulations. Therefore, more research efforts are expected in the future in this area. Moreover, the performance of banks would be affected by the macroeconomic environment of the country in which they operate, as stability of a country plays a major role in enhancing economic growth and improving investment opportunities. The Egyptian economy is still recovering from the effects of the Arab Spring and the great political instability witnessed in Egypt in

the last few years. This period witnessed a major deterioration in the macroeconomic conditions, which resulted in slowing economic growth substantially in Egypt following the events post revolutions. Therefore, more academic research efforts should be dedicated to this research area to play its role in developing the Egyptian economy and promoting sustainable development and welfare of Egypt in the future. As Egypt is the research context of this thesis, the following represents a summary for some of the key points that explain the reasons behind choosing Egypt as the research context;

- The lack of this kind of research that investigates bank performance in Egypt.
- Helping the Egyptian economy to improve and reach stable and acceptable levels of economic growth through investigating factors affecting performance of banks in Egypt.
- Being familiar with the bank environment in Egypt as a home country.
- Developing countries like Egypt need to have more academic research in this area that would help in economic development, and improvement of investment opportunities which is a great need of the Egyptian economy especially after a long period of political and economic instability following the Arab Spring.
- Having major regulatory reforms following the Egyptian Banking Reform Program that ended with applying Basel II in 2013. This makes Egypt a very good example of a developing country that made some recent developments in its regulatory framework that might be tested for its effectiveness.

2.2 Egypt in Context

According to the Central Agency for Public Mobilization and Statistics (CAPMAS); Egypt is a transcontinental country occupying the northeast corner of Africa and southwest corner of Asia. The Sinai Peninsula represents one important bridge between the two continents; Africa and Asia. Furthermore, Egypt is bordered by the Mediterranean to the north, Gaza Strip and the Red Sea to the east, Sudan to the south, and Libya to the west with a total area of around one million square kilometres. Although Egypt is an African Country, Sinai Peninsula occupies the northeast corner of Egypt and is located in Asia (CAPMAS, 2015). Indeed, Ancient Egypt is considered the cradle of civilization as it experienced some of the earliest developments of agriculture, writing, urbanization, and organized religion in history. The River Nile is considered to be

an important reason for this great civilization with a great flow from the south to the north of Egypt that is running for around 1,800 kilometres. This great flow represented the main source of water needed for agriculture throughout the long history of the country (Beaumont, 1976). Furthermore, Egyptian land lies between 22-32 latitudes in the northern hemisphere, as it spans about ten latitudes with one quarter of its total area in the South of Cancer Tropic. Therefore, all of the Egyptian regions lie inside the dry hot region with the exception of a very narrow strip that belongs to the Mediterranean climate. Accordingly, Egypt's climate is warm in winter and a bit hot in summer. Egypt’s location provides a huge amount of solar radiation during the whole year, so this special location gives Egypt the ability to depend on solar energy with no negative effects on environment (CAPMAS, 2015).

Additionally, Egypt is one of the most populous countries, where most of the population live in its big cities, namely Cairo, Giza, and Alexandria. Also large populous areas in Egypt include other regions on the banks of the Nile Delta or around other important economic areas like the Suez Canal. Traditionally, possibilities for the expansion of human settlement were limited to the Delta area and the Oases of the Western Desert in Egypt. However, the discovery of some natural resources such as; ore, iron, oil, phosphates, and manganese, contributed to changing the economic and demographical maps of Egypt, in addition to the growth of touristic activities along the Red Sea Coast. Besides, Egypt is characterized by a strong population growth that presents a pessimistic scenario when compared to the constant supply of agricultural land. However, there is a more optimistic scenario calling for extension of the cropped area horizontally by developing new areas that can be cultivated, which is the more expensive way, and also vertically by increasing productivity on the existing cultivated area. This optimistic scenario is being pursued recently by all successive governments that took over in the last few years, in addition to other development projects undertaken to help in the economic and political stability of Egypt. The overall geographical and demographical conditions of Egypt contribute to the political and economic characteristics of the country which will be highlighted in the following sections.

2.3 Political Environment

Egypt is considered to be the cradle of civilization with a very long history dating back to around 5000 BC. By around 3500 BC, ancient Egypt consisted of two main kingdoms; kingdom of Upper Egypt and kingdom of Lower Egypt, until it

has been united by King Mena since 3100 BC. During the next 3000 years, about thirty dynasties continued to build the history of ancient Egypt, as reported by the State Information Services (SIS, 1999). Moreover, foreign conquerors were attracted to Egypt through history due to its great geographical location between the two continents, and its agricultural wealth due to the existence of the River Nile. Therefore, foreign conquerors ruled Egypt for more than 25 centuries. Egypt was ruled by the Assyrians; 669 BC, the Persians; 525 BC, then the Roman; 31 BC, followed by the Arab; 642, the Mamelukes; 1250, the Ottoman Empire; 1517, the French; 1798, dynasty of the Ottoman Albanian commander Muhammad Ali; 1805 and finally the British; 1882 (BBC, 2015). The rule of Muhammad Ali in the early nineteenth century represented one of the most important periods of the Egyptian history. Ali introduced industrialization and modernization that influenced the development of the country. Additionally, he introduced cotton as one of the major export crops in Egypt and Cotton is still a main source of foreign exchange for Egypt today (Youssef, 2007). However, policies of Muhammad Ali led to enlarging the public debts at that time, which led to the intervention of French and British creditors in 1887 to establish the `Caisse de la Dette' in order to control the fiscal receipts of the government of Egypt to repay the external debts. Then, Egypt was declared as a protectorate by the British from 1914 until it was recognized as a sovereign state in 1922. However, the British continued to maintain military power in the country until 1952 (Ikram, 1980 and Hatem, 1994).

A military revolution, in 1952, has ended the British control over Egypt. Then, Muhammad Naguib was the first President of Egypt and he served from the declaration of the Arab Republic of Egypt in 1953 to 14 November 1954. Naguib was followed by Gamal Abdel Nasser, who is considered to be the leader of the 1952 revolution. Nasser’s administration implemented some major changes; the most important one was the introduction of state ownership which characterized this period following the 1952 revolution. In addition to the nationalization of the Suez Canal Company in 1956, which had been owned and operated by the joint British-French enterprise since its construction in 1869 (SIS, 1999). The era of Nasser’s rule has been called a time of re-establishing the Arab pride, during which access to education, housing, and health services were made possible to the Egyptians. In addition to major modernization projects that were built such as Helwan and the High Dam. In 1967, most of the Egyptian air force was destroyed on the ground by the Israeli armed forces when seventeen Egyptian airfields were attacked. This started the war between Egypt and Israel to free the Sinai Peninsula from the Israeli occupation. Nasser resigned as a result of

Egypt's defeat in 1967. However, he relented after massive popular demonstrations of support following his resignation. Nasser continued what was called the War of Attrition in an attempt to regain the lost Sinai until he died in 1970 (SIS, 2013a).

Anwar Sadat followed Nasser and became the president of the Arab Republic of Egypt since 1970 for eleven years until his assassination on 6 October 1981. During Sadat's era, the October War of 1973 was launched against Israel during the Muslim holy month of Ramadan. Egyptian and Syrian military forces crossed ceasefire lines and entered the Sinai Peninsula of Egypt and Golan Heights of Syria, respectively. This victory restored the Egyptian pride and led to regaining the entire Sinai Peninsula from Israel in exchange for a peace agreement. The Egypt–Israel Peace Treaty was signed in the historic Camp David accords on 26 March 1979. Egypt regained a full control of Sinai in May 1982. Muhammad Hosni Mubarak followed Sadat after his assassination in 1981. Mubarak undertook an ambitious economic reform program in 1991 to reduce the size of the publicly owned organizations and expand the role of the private sector in what was known as the "Privatization Trend". Mubarak's rule lasted for twenty-nine years until the period of political instability, known as the Arab Spring or the Arab Uprisings, when he was overthrown by a revolution in February 2011 (SIS, 2013a). Therefore, Egypt has a rich political environment that has been always active and changing, which to a great extent shaped the Egyptian economy during different political eras.

2.4 Evolution of the Egyptian Economy

The Egyptian economy depends mainly on agriculture; tourism; Suez Canal revenues; cultural and media production; petroleum exports; taxation; and remittances of Egyptians abroad in the Gulf countries, European countries, and the United States. Barro (1991) discussed that some factors in the political environment, like stable governments, can affect the economic environment significantly. Therefore, the political system may influence the economy of a country which is clear in the case of Egypt, as Egyptian variant political systems had a great effect on the country's economic development through history. According to Hatem (1994); the modern history of the Egyptian economy has witnessed a lot of different phases throughout its different political systems. During the period between the mid-1950s and the mid-1970s; the public sector in Egypt played a significant role in all important sectors of the economy; like banking sector, textile industry and insurance services industry. During this

period, the Egyptian government placed many restrictions on the private sector that limited opportunities for private businesses. Ikram (1980) stated that, during the period between the mid-1950s and the mid-1970s, the government relied on a centralized structure as the main determinant of the national economic policy. The state-owned enterprises and the government, acting as the main vehicle for growth, accounted for around 74 percent of Egyptian gross investment.

During the 1970s, President Sadat started taking Egypt towards market economy, which was known during this period as the “open door policy” which led to a remarkable economic growth during this period. In addition, Hatem (1994) mentioned that Egypt had many economic problems during the period of the Gulf war in the 1990s due to the decrease of foreign income from the Suez Canal and from tourism. Hatem also pointed out that this period witnessed some changes in the economic and investment policies in Egypt, and some organizations started to have more attention such as international joint venture firms and private companies. During the 1990s following the Gulf War, many Arab countries gave Egypt some generous grants that reached approximately $5.5 billion and they wrote off about $7 billion in debt (CBE, 2010). The United States also wrote off around $7.1 billion in military and other debt. Additionally, a Paris Club agreement was concluded in 1991 which resulted in rescheduling about $20.6 billion of debt, followed by a $300 million granted from the World Bank as a structural adjustment loan (CAPMAS, 2007).

Additionally, HSBC (2003) stated that, during the 1990s, some state structural reforms and a stabilization program of the International Monetary Fund (IMF) along with collaboration with the World Bank helped to improve the macroeconomic performance of Egypt during this period. After 11th of September attacks in the United States, the pace of economic reform slowed down in Egypt and more excessive spending on national projects increased the budget deficits of the country. Additionally, the global downturn had an influence on the economy of Egypt by reducing foreign earnings from all sources such as Suez Canal, tourism, and migrant remittances. In the early 2000s, tourism industry started to recover very fast and signs of improved economic conditions were signalling. Then, the world economy confronted the serious effects of the 2007/2008 Global Financial Crisis that affected the economies of many countries.

2.4.1 The 2007/2008 Global Financial Crisis

The period that preceded the Egyptian revolution in January 2011 witnessed the spill-over of the 2007/2008 Global Financial Crisis. The increasing number of defaults in the housing/mortgage sub-prime markets with the increasing asset prices resulted in instability in the American financial market that first emerged during the summer of 2007, then it had serious effects on the world economy and reached serious levels during the fall of 2008. The problem resulted in a collapse in the mortgage market and brought down banks and other organizations that had major investments in this sector, and major insolvencies followed. The credit freeze that affected the whole world, and were not great in emerging economies, was the result of the major write-downs during this time. The whole financial system was hit, significant financial organizations in America and Europe were liquidated and many others were threatened by the effects of the crisis. The result was what is known as the 2007/2008 Global Financial Crisis that is considered the worst since the Great Depression during the 1930s. The real economy was immediately affected in most of the advanced countries, and the lack of appropriate financial regulations capable of protecting the world economy was evident. The next chapter discusses some details about the lessons of the financial crisis that were recognised by the world's financial system and taken into consideration in some regulatory reforms by the Basel Committee in later versions of Basel accords. What is worth mentioning here is that Egypt, as one of the emerging countries, has a financial system that is not greatly integrated into the global system; therefore, the Egyptian financial system was, to a great extent, protected from such financial shocks, but was vulnerable to real economy shocks; as reported by the Egyptian Ministry of Finance "MoF" (MoF, 2010).

According to the report prepared by the Egyptian MoF; after the 2007/2008 Global Financial Crisis; Egyptian banks were protected against the effects of the financial crisis as a result of the weak integration into the world's financial system. However, this was not the case concerning effects on the real economy that may arose from loss in tourism sector, oil prices volatility, and effects on foreign investments in Egypt. The most significant impact on real sector included services that represented almost 70% of Egyptian foreign exchange earnings mainly from Suez Canal and tourism. These sectors was hit by the crisis, especially the tourism sector which declined by around 3% as can be observed from figures (2.14) and (2.15). Then the tourism industry started to recover ; however, a new hit was there in early 2011 that witnessed the spark of the Arab

Spring which had major effects on tourism in the whole region, and of course in Egypt. Additionally, Suez Canal receipts showed a decline by around 8.4% following the crisis in the fiscal year 2007/2008. Moreover, the remittances from Egyptians working abroad was also affected and went down by around 8.8%, especially those from Egyptians working in the Gulf following the effects of the Crisis (MoF, 2010).

Moreover, Egypt's exports sector was affected by the crisis as it represents the linkage between the external market and Egyptian real economy. Two main industries were affected; the ready-made garments and the food industries. These two industries had some large markets in Europe, America, and also in the Arab region. Additionally, private investments were affected by the declining foreign investments during this period, which had a relative effect on infrastructure and real estate investments. However, the impact of the 2007/2008 Global Financial Crisis on banks in Egypt was contained due to the weak integration with the global financial system, as mentioned earlier. What is more, the reform plan adopted by the Central Bank of Egypt (CBE) during the 2004-2008 period helped the banking sector to withstand the effects of the crisis. The reform plan involved many aspects such as; encouraging bank mergers to create stronger larger banking institutions, getting rid of bad debts in the banking portfolios, and restructuring banks from both financial and administrative perspectives, and improving banking supervision to help the banking sector withstand difficult economic situations. The CBE assigned some strict regulations for the basics of credit risk management and assigning reserves for some important loans. The reform plan created a strong financial position of EGP 74 billion at the end of the plan in 2008, compared to EGP 37 billion at the beginning of the plan.

The massive popular demonstrations of 25 January 2011 was the result of many factors that started with the high rate of poverty in Egypt during that time which reached 50% in 2011. In addition to socioeconomic and political instability that prevailed during that time (SIS, 2013b). Therefore, the spread of the Arab Spring and the political instability in the whole Arab region started in 2011. Egypt needed to strengthen its economic structure to be able to face exogenous shocks, and to be able to improve productivity and competition, especially with the increased political instability that continued after the second popular revolution in 2013. Additionally, Egypt needed to address market failures and build good trust in governance after years of political and economic instability. Therefore, interim and elected governments have tried to make some economic and political progress throughout the period of political instability following the revolution of

January 2011. Egypt started to progress with confidence towards building its political system, after the ratification of the constitution in January 2014 and the election of the new President in June 2014. The political transition period started to move towards a more stabilized system. The period of the political instability in the Arab region has affected many countries in the region, especially Egypt. The Egyptian economy suffered from serious effects of the political instability that affected all industries including the financial sector, which is discussed in a bit more details in the following section.

2.4.2 The Arab Spring

The Arab Spring refers to the massive popular demonstrations that were originated in Tunisia in December 2010 and then spread across the Arab world. Sedamor *et al.* (2016) mentioned that the massive popular uprisings in some Arab countries that is commonly known as the Arab Spring is the biggest event witnessed by the Arab countries in the recent history. This was started in Tunisia in 2010 with the Tunisian revolution, known as the “Jasmine Revolution”, then other similar revolutions, that overthrew established regimes, followed in Egypt, Libya, and Yemen. Bad democratic conditions, high unemployment, corruption and the spread of ruling families across the Arab world urged the public to start their uprisings, the first movement was in Tunisia in late 2010. According to Cockburn (2016), January 2011 witnessed the first consequence of the massive protests in Tunisia that remained for several weeks and ended by the resignation of President Ben Ali. Several Protests in neighbour countries followed; like Egypt, Lebanon, Yemen, Bahrain, Libya, Morocco, Iraq, Algeria, and Syria. Resignation of President Mubarak followed in Egypt, President Ali Abdullah Saleh fled from Yemen, President Muammar Gaddafi was killed in Libya. However, the situation in Tunisia is now better with two free elections being held in 2011 and 2013. However, Syria is witnessing a catastrophic situation since mid-2012 with a bloody civil war that killed around 350,000 people and pushed out around 4.4 million as refugees. President Assad is still in power, or it can be described as partial power in Syria. While Egypt is still fighting to survive the economic consequences of the political unrest during the last few years. Khan (2014) mentioned that other countries, such as Jordon and Morocco, went through some serious political changes but their governments kept their positions. Therefore, political unrest in these countries was not as serious as the situation in Tunisia, Egypt, Libya, and Yemen.

In Egypt, Mubarak's rule witnessed political corruption that rose dramatically until the parliamentary elections of 2010 that were accused of a clear corruption and led to massive popular demonstrations in January 2011 which was the end of Mubarak's rule. Mubarak resigned On 11 February 2011, and transferred authority to the Supreme Council of the Armed Forces (SCAF). Egypt had some great turbulence in this transitional period under the rule of the SCAF, yet the SCAF has enjoyed a wide legitimacy from the people in Egypt and a confidence in their ability to supervise free elections. In June 2012, Mohamed Morsi won the presidential elections and was announced as the first elected civilian President of the Arab Republic of Egypt. However, turbulence and instability continued when president Morsi issued a decree, in late 2012, stripping the judiciary of the right to challenge his decisions. Under the pressure of popular protests president Morsi rescinded his decision. In June 2013, Morsi appointed Islamist allies as regional leaders in thirteen governorships of Egypt, including member of a former Islamist armed group accused of a massacre of tourists in Luxor during Mubarak's era.

Following Morsi's policies, massive popular demonstrations in June 2013 called on Morsi to quit in an attempt to stop the Muslim Brotherhood from controlling Egypt. On 3 July 2013 Morsi was unseated, and the army chief Abdul Fattah Al-Sisi announced the implementation of the Egyptian road map. After suspending the constitution, the military passed the country's administration to the Chief Justice Adly Mansour as the only one eligible to rule the country in this stage. One month later, hundreds of civilians were killed as security forces storm pro-Morsi protest camps in Rabaa square, followed by declaring the Muslim Brotherhood as a terrorist group. In June 2014, former Defence Minister Abdul Fatah Al-Sisi won the presidential elections. In addition to Egypt's war against terror in several areas of Egypt, especially Sinai, President Al-Sisi has been trying to make some economic, political, and structural reforms to reach the required future economic growth and development of Egypt after years of economic and political instability.

2.4.3 Reasons Behind the Arab Spring

Sidamor et al. (2016) stated that the unemployment, inequality, and corruption were the main stimuli for the massive uprisings in Tunisia, Egypt, and Libya. Table (2.1) presents the unemployment rates during the (2005-2015) period for the ten countries that witnessed the Arab uprisings. The table illustrates that the unemployment rates for those countries were high during the period that

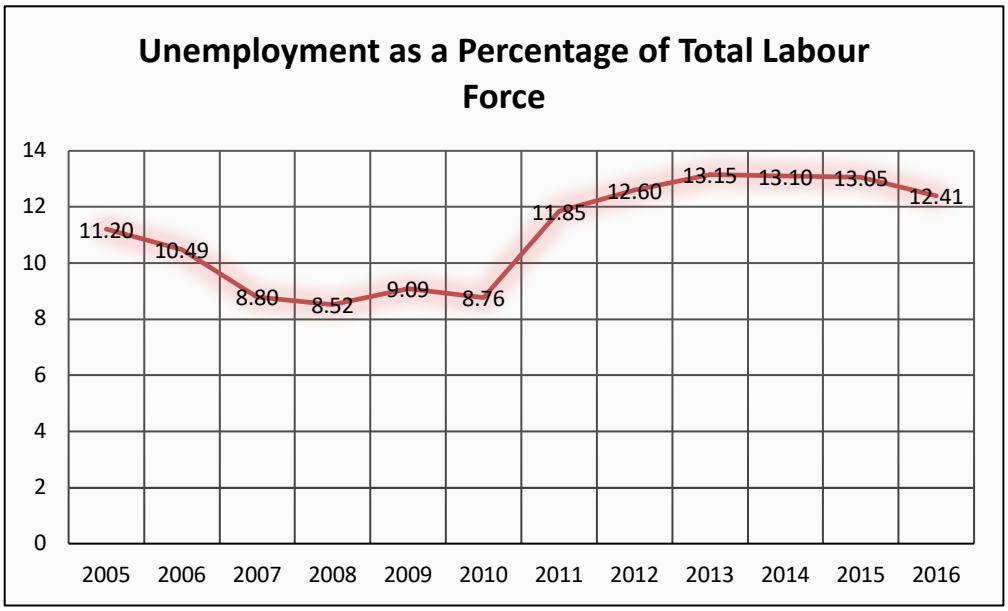
preceded the Uprisings and the same trend continued during the years of the Arab Spring. The highest average rate among all of the Arab countries during this period was reported in Libya, where the average unemployment rate was 17.64% between 2005 and 2014, while Bahrain reported the lowest rates. Most of the countries in the table reported rates, according to the World Bank data, that are above the world's weighted average rate, around 6.2%, during the same period. Very high unemployment rates were reported during the year of 2011 in Libya and Tunisia; achieving 19.57% and 18.33%, respectively. In the same line, Khan (2014) argued that the depressing combination of corruption, income and wealth inequalities, unemployment, and undemocratic regimes provided a perfect environment for the Uprisings. Additionally, figure (2.1) illustrates the unemployment rates in Egypt during the (2005-2016) period. The average unemployment rate in Egypt recorded (11.08%) which is a high rate compared to the world's weighted average unemployment rate. The highest rate (13.15%) was recorded for the year 2013 with an upward trend observed for the period (2010-2013) which reflects a more deteriorating situation for unemployment in Egypt during the periods of the Egyptian revolutions and political instability.

Table (2.1): Total Unemployment as a Percentage of Total Labour Force in the Arab Countries

Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Algeria	15.27	12.27	13.79	11.33	10.16	9.96	9.96	10.97	9.82	10.21	11.21	10.20
Bahrain	0.99	0.90	0.84	0.83	1.07	1.13	1.14	1.20	1.22	1.15	1.08	1.01
Egypt	11.20	10.49	8.80	8.52	9.09	8.76	11.85	12.60	13.15	13.10	13.05	12.41
Iraq	9.42	9.06	8.65	8.19	8.81	8.58	8.19	7.97	8.02	7.93	8.08	8.09
Lebanon	8.39	8.71	8.98	7.24	6.36	6.46	6.44	6.41	6.38	6.28	6.23	6.26
Libya	18.46	18.12	17.39	16.55	17.19	17.62	19.57	19.03	18.31	17.13	16.09	16.24
Morocco	11.01	9.67	9.56	9.57	8.96	9.09	8.91	8.99	9.23	9.70	9.46	9.30
Syria	9.11	8.17	8.42	10.92	8.14	8.61	8.63	8.67	8.67	8.45	8.39	8.25
Tunisia	12.87	12.51	12.36	12.44	13.29	13.05	18.33	17.63	15.93	15.06	15.22	15.51
Yemen	11.80	11.61	11.34	11.34	12.51	12.90	13.06	13.25	13.51	13.47	14.02	13.52

Source: World Development Indicators (WDI, 2020)

Figure (2.1): Total Unemployment as a Percentage of Total Labour Force in Egypt

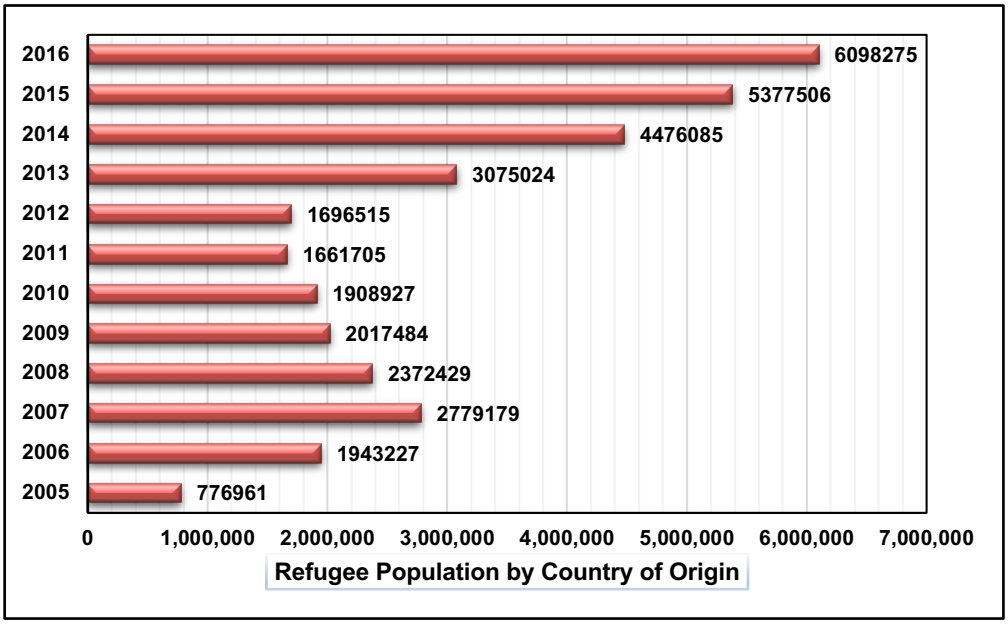


Source: World Development Indicators (WDI, 2020)

2.4.4 The Regional Political Unrest

Therefore, the overall political instability of the Arab region started initially with early movements of the Arab Spring that broke out in Tunisia due to reasons discussed above, followed by Egypt and most of the countries in the Arab region. The political unrest prevailed in Tunisia, Egypt, Lebanon, Yemen, Bahrain, Libya, Morocco, Iraq, Algeria, and Syria during this period. However, some Arab countries got back to the political stability status later in the following years, whereas Tunisia, Egypt, Libya, and Yemen witnessed some major changes in their governments and rulers. Additionally, Syria is still suffering from one of the most serious civil wars in the Arab history and other civil wars still running in Yemen and Iraq. What is more, foreign interventions in several countries of the region exist since 2011 following the spark of the Arab Spring. Besides, the number of refugees from the Middle East and North Africa (MENA) region has been affected and shown dramatic increase in the recent years following the Arab Spring. The following figure (2.2) presents the refugees by country of origin in the MENA region for the 2005-2016 period. The figure shows the lowest number of 776,961 refugees as reported in 2005 compared to a very high number in 2016 of 6,098,275 refugees. The increasing number of refugees reflects the severity of wars and instability in the region that resulted in this large numbers of refugees in the region, and specially from Syria that witnesses one of the most violent civil wars in the history of the region.

Figure (2.2): Refugees by Country of Origin for the MENA Region



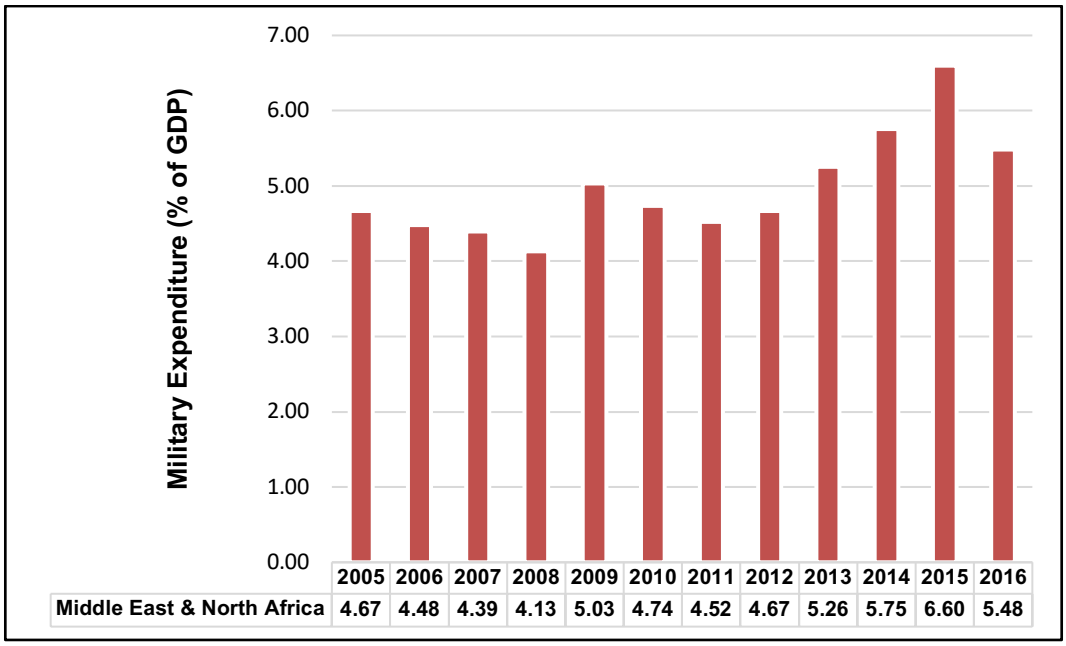
Source: World Development Indicators (WDI, 2020)

The Institute for Economics and Peace (2016) reported Syria as the least peaceful country in the world with the lowest Global Peace Index (GPI) out of 163 countries ranked in the report. While Libya, Yemen, and Iraq came at the bottom of the list of the peaceful countries according to their GPI, with ranks of 154, 158, and 161, respectively. Egypt had the rank of 142, while the situation in Tunisia is much better with a GPI rank of 64. The situation in Yemen deteriorated due to the running civil war and the intervention of the Gulf countries led by Saudi Arabia in this war. Furthermore, the existence of the Islamic State of Iraq and the Levant (ISIL) represents a major threat to the peace and stability in the region with the strongest forces of ISIL outside Syria and Iraq that exist in Libya. As a result, the war against ISIL in the region led by the USA, the intervention of Russia in the Syrian war to support Assad's government, the intervention of the Gulf countries in the civil war of Yemen, in addition to the war against terrorism and the terrorist attacks in Egypt have affected the overall stability of the Arab region greatly. The existence of ISIL in the region and the continued terrorist attacks in some countries would suggest persisting political instability and more foreign intervention in the region.

This suggests that violence, wars, and political instability have affected the Arab World greatly and resulted in severe economic impact for some countries with major effects on economic growth, foreign investments, international trade, and tourism. The Institute for Economics and Peace (2016) reported the MENA region as the least peaceful region, and Europe as the most peaceful.

Furthermore, this political unrest and the existence of civil wars, ISIL, and terrorism encouraged countries in the MENA region to direct part of their national resources toward militarization. Arab countries with civil wars or even their neighbours feel the great risk of political instability and continue building up their military capacities. Figure (2.3) presents the military expenditures as a percentage of GDP for the MENA region for the period 2005-2016. The military expenditures in the region showed a gradual increase in the years of political instability in the region as previously discussed and it achieved its peak in 2015 with 6.60% of total GDP which reflects the building up of military capacity to face the increased risk of wars and terrorism in the region.

Figure (2.3): Military Expenditure (% of GDP) for the MENA Region



Source: World Development Indicators (WDI, 2020)

2.4.5 Economic Impact of the Arab Spring

Khan and Milbert (2012) argued that the Arab countries did not have any economic vision following the start of the uprisings. This was due to the great focus on the political side attempting to provide better political systems to help recover from the effects of the Arab Spring. Therefore, the Arab governments put the political reform as their first priority and considered the economic reform a logical consequence that would follow the recovery of stable political systems. Unlike the European countries that adopted the liberal market-oriented European Union (EU) economic model, the Arab countries did not have any economic model to adopt. The great potential of the Arab world to build an Arab union to

provide basis for cooperation among the whole region, similar to that provided by the EU that might improve the economic and social well-being in the region, was not one of the options for the Arab counties. Khan (2014) mentioned that the only model adopted by the Arab countries following the Arab Spring was the trend towards public satisfaction through dedicating more resources for subsidies and job creation. Unlike the trend that was adopted by most of the Arab countries before the broke-up of the Arab Spring, that was mainly directed towards empowering the private sector and promoting the development of private businesses through the provision of better infrastructure and better investment conditions. One clear example was recorded by the Institute for Economics and Peace (2016) that reported Syria as the country with the highest economic impact of violence in the world with around 54% of its GDP dedicated for violence containment expenditures. The Arab Spring had a very bad economic impact on the Arab region which was clear through many economic indicators as will be discussed in the following pages.

- **GDP Growth**

Table (2.2) presents the GDP per capita growth rate for the countries in the Arab region that witnessed the Arab Spring. It shows that 2011 was a year of a major economic effect on these countries. According to the World Development Indicators, GDP per capita growth rates turned to be very low, negative, or not reported in most countries during this year with a dramatic negative growth reported for Libya; that reached -62.38% compared to 3.94% in the previous year. According to Khan (2014), this percentage is very rare and the main cause was the decline in the oil production in Libya from 1.7 million barrel per day (MBD) in 2010 to less than 0.5 MBD in 2011. The main source of revenue for Libya is mainly the oil production; therefore, the severe decline in this source combined with the United Nations-sanctioned freeze on foreign assets of Libya contributed to the overall dramatic decline in the Libyan GDP per capita growth. Additionally, the table shows the steady growth rates during the period (2005-2010), and a major drop for the following years (2010-2016). While the growth rates turned to be positive again in Egypt during (2014-2016) period, and Tunisia during (2012-2016) period.

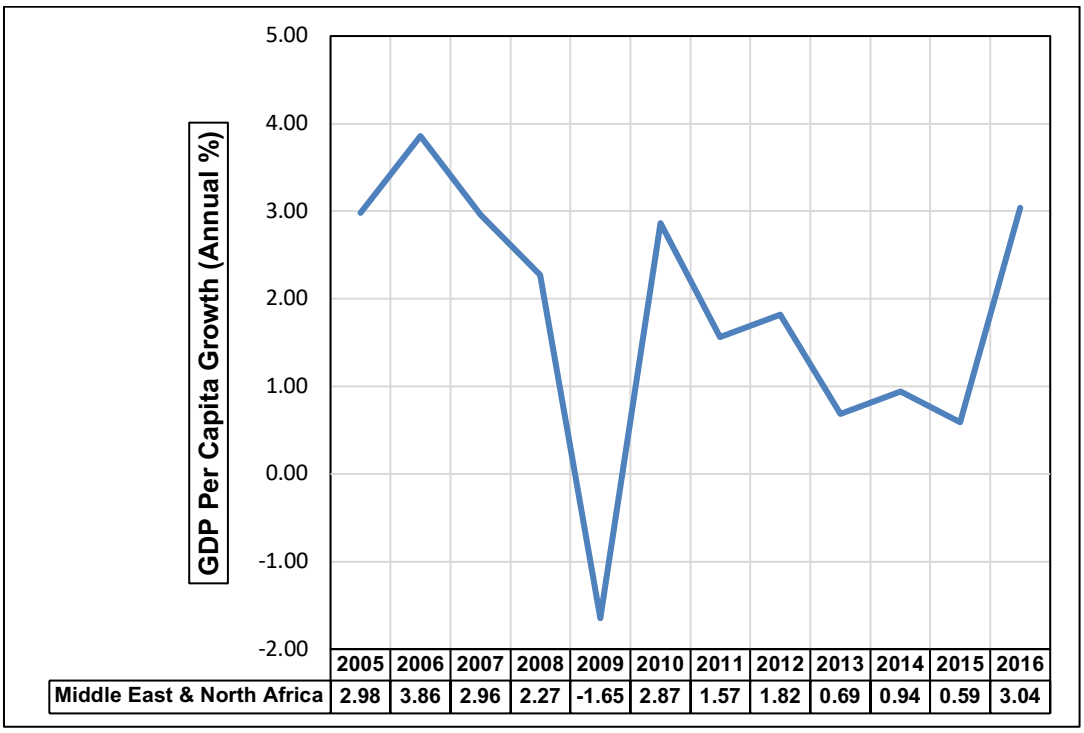
Table (2.2): GDP Per Capita Growth (Annual %) for the Arab Countries

Country Name	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Algeria	4.44	0.21	1.81	0.74	-0.13	1.75	0.98	1.40	0.76	1.71	1.60	1.10
Bahrain	-0.35	-1.23	0.19	-1.26	-3.55	-0.35	-0.99	1.99	4.21	2.71	0.18	-0.44
Egypt	2.60	4.97	5.23	5.27	2.74	3.08	-0.36	-0.01	-0.11	0.62	2.09	2.13
Iraq	2.04	8.05	-0.30	6.42	1.28	3.65	4.10	9.78	3.49	-2.97	-0.86	11.94
Lebanon	-0.08	0.40	9.17	9.31	8.95	4.98	-3.92	-3.52	-3.90	-3.77	-3.74	-1.10
Libya	10.16	4.90	4.79	1.24	-2.01	3.94	-62.38	121.78	-14.07	-24.50	-9.66	-3.90
Morocco	2.08	6.32	2.32	4.67	2.96	2.49	3.84	1.58	3.06	1.23	3.10	-0.22
Syria	3.12	1.15	1.35	-	-	-	-	-	-	-	-	-
Tunisia	2.62	4.27	5.64	3.14	1.95	2.44	-2.89	2.99	1.88	1.95	0.14	0.15
Yemen	2.61	0.28	0.45	0.76	0.99	4.73	-15.11	-0.39	2.01	-2.80	-18.80	-15.75

Source: World Development Indicators (WDI, 2020)

However, it can be found that the overall GDP per capita growth rate for the whole MENA showed positive values and a better overall percentage than individual percentages for the Arab countries that showed severe negative values in some countries. This reflects the fact that the economic effect of the Arab Spring hasn't spilled over to all countries, one good example is the effect on tourism as will be discussed later. However, the overall percentage of GDP per capita growth is still low for the region. Political instability hasn't lasted long for some countries like Morocco where the protests ended in 2012 when the government responded with some changes in the constitution, also Algeria regained political stability quickly, and also Bahrain, in addition to some minor effects of the Arab Spring on other countries such as Jordan, Saudi Arabia, Kuwait, Qatar, United Arab Emirates, and Oman (Cockburn, 2016). Therefore, figure (2.4) shows a less serious effect on the average GDP per capita growth rate of the MENA region and positive rates were present during the instability period (2010-2016).

Figure (2.4): GDP Per Capita Growth (Annual %) for the MENA Region

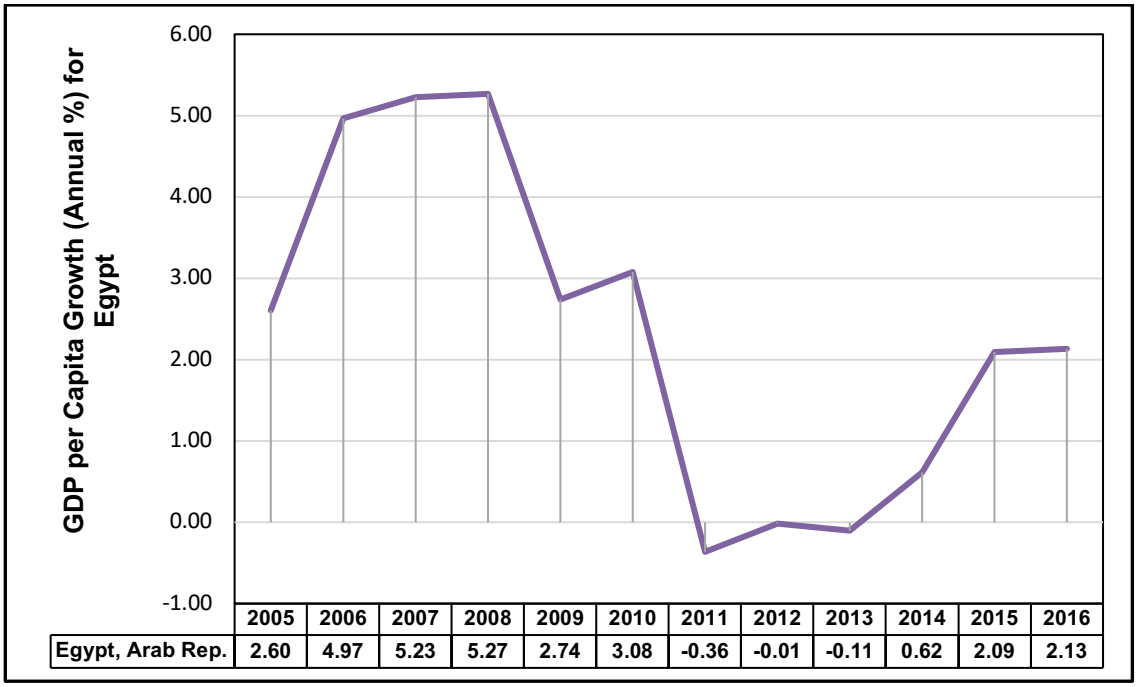


Source: World Development Indicators (WDI, 2020)

Egypt was one of those countries that was seriously affected by the Arab Spring. Hosny *et al.* (2014) stated that the Arab Spring has resulted in a great transformation in the political and economic environments of the Arab region, with a tremendous effect on Egypt that has entered in a vicious cycle of political

and economic instability as a consequence of the Arab Spring. This political instability resulted in lower investor confidence and a hard way of economic recovery. However, IMF (2017) stated that the political transition period in Egypt has ended and the political roadmap, that was agreed in July 2013, has been completed. This was done after introducing the new Egyptian constitution in January 2014, in addition to electing the new president Elsisi in June 2014, and finally the election of a new parliament in January 2016 which brought the transition period to its end. Therefore, the overall economic situation of Egypt shows a recent improvement that accompanied this political stability. The annual percentage of GDP per capita growth shows the highest value of 5.27% in 2008 then the growth rate declined in the following years, after the Global Financial Crisis and the political instability in the Arab region. However, the severe decline in the GDP per capita growth rate was evident in 2011, which was the first year of Egyptian revolutions and the great political instability in the whole region. The lowest growth rate can be shown in figure (2.5) in 2011 as the GDP per capita growth rate recorded a negative value of -0.36% and the negative rates continued in the following years. The growth rate turned to be positive again in 2014 with a value of 0.62%.

Figure (2.5): GDP per Capita Growth (Annual %) for Egypt

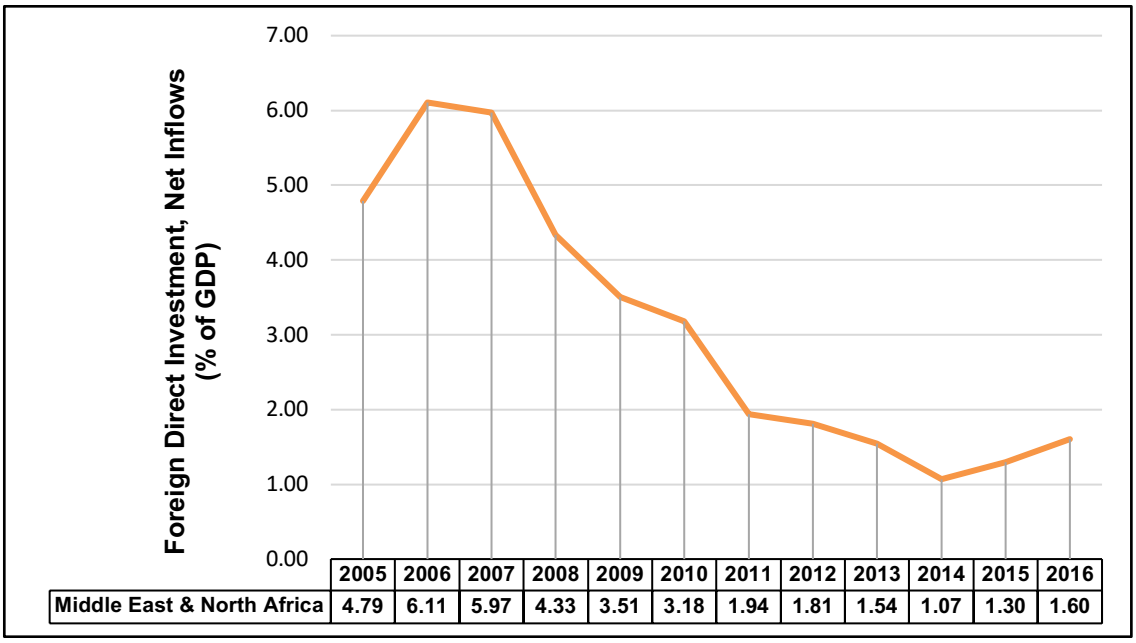


Source: World Development Indicators (WDI, 2016)

- **Foreign Direct Investment (FDI)**

Gui-Diby and Renard (2015) mentioned that there are great motives for developing economies in Africa, such as Egypt, to move towards diversified economies which should enhance economic growth and moderate its volatility. This trend towards more diversified economies can be achieved through devotion of more financial and technological resources that can be brought by national private investors, mobilization of governments' resources, or attracting foreign investors who are more capable of bringing more advanced technologies and enhance economic growth. Therefore, FDI is very important for developing countries and the overall political and economic stability of a country directly affects investors' confidence and the amount of FDI for the country. what is important to mention here is that sound business environment is a vital factor to attract FDI; therefore, governments should provide a good base for FDI. Factors such as; political stability, infrastructure, qualified labour force, and ease of institutional procedures are very important to attract investors. As a result, political instability witnessed by the Arab region is one factor that affected FDI in many Arab countries including Egypt. The economic impact of the Arab Spring was deep and persisting for some Arab countries with some serious impact on FDI that showed a steady decline for the overall percentage of the region as shown in figure (2.6). The FDI as a percentage of GDP for the MENA region reached its lowest values of 1.07% in 2014, compared to the highest value of 6.11% reported in 2006. The decreasing trend in the values of FDI in the MENA region is the logical outcome of the political instability and the uncertainty surrounding the economic conditions in many countries. The ongoing civil wars in the region and foreign intervention in many countries do not provide a good ground for increasing FDI, and highlights a great deal of uncertainty surrounding investments opportunities.

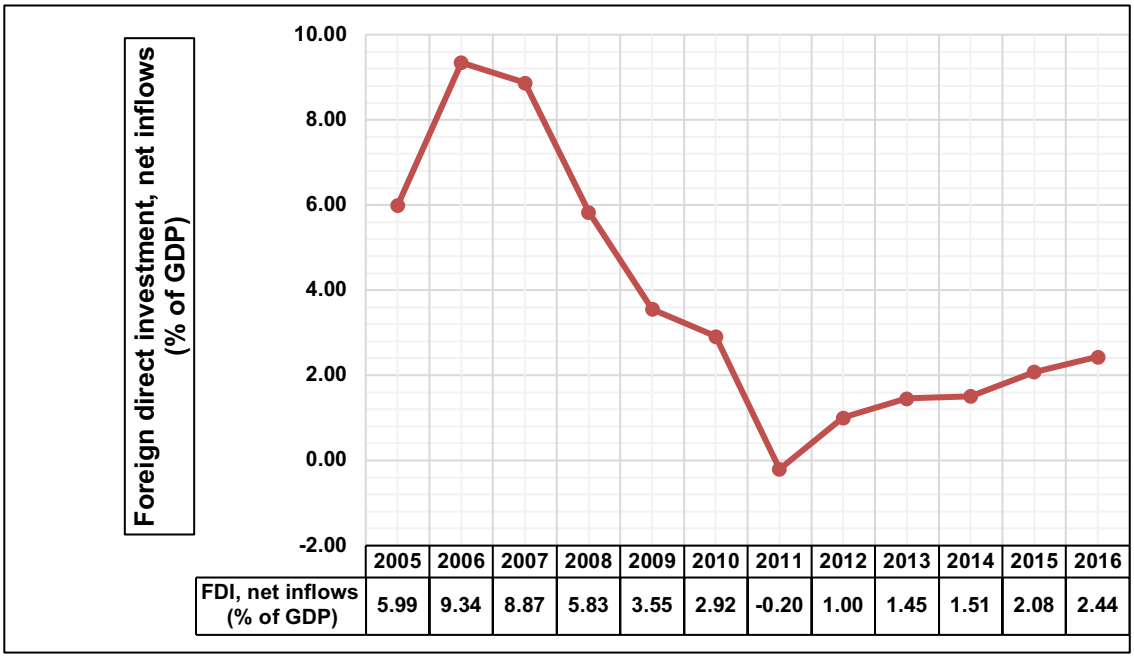
Figure (2.6): Foreign Direct Investment, Net Inflows (% of GDP) for the MENA Region



Source: World Development Indicators (WDI, 2016)

Egypt's FDI has been affected by the tough economic and political environments as illustrated in the following figure (2.7). The figure shows how the net inflows of FDI as a percentage of Egyptian GDP reached its highest value in 2006 (9.34%), then the following years showed a decline in the percentage during the 2007-2008 financial crisis, as the world economy got affected by the crisis, and also during the period of the Arab Spring. The period of the Arab Spring witnessed the lowest net inflows of FDI as a percentage of GDP in Egypt, as it reached (-0.20%). Then the following years showed an upward trend that reached a positive percentage of (2.44%) in 2016 which accompanied the relative political stability in Egypt and a more convenient business environment for foreign investors.

Figure (2.7): Foreign direct investment, net inflows (% of GDP), Egypt



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
FDI, net inflows (% of GDP)	5.99	9.34	8.87	5.83	3.55	2.92	-0.20	1.00	1.45	1.51	2.08	2.44

Source: World Development Indicators (WDI, 2016)

- **Inflation**

Table (2.3) illustrates the inflation rates as measured by annual percentage change in consumer prices for the Arab countries during the 2005-2016 period. The first year of the Arab Spring, 2011, witnessed some high inflation rates of 19.54%, 15.52% and 10.06% in Yemen, Libya and Egypt, respectively. Additionally, the last reported percentage for inflation in Syria was reported in 2012 with a very high percentage of 36.70%. While, the inflation rates in Egypt and Yemen are the highest among other Arab countries during the recent years following the Arab Spring. Khan (2014) reported that high inflation rates in some countries following the Arab Spring represents a dangerous economic sign that should be approached by the respective governments as it might result in serious long-run effects. The trade-off between inflation and growth is one important factor that should be taken into consideration, as the increased inflation might have negative effects on growth on the long run even with acceptable growth rate, especially in developing countries.

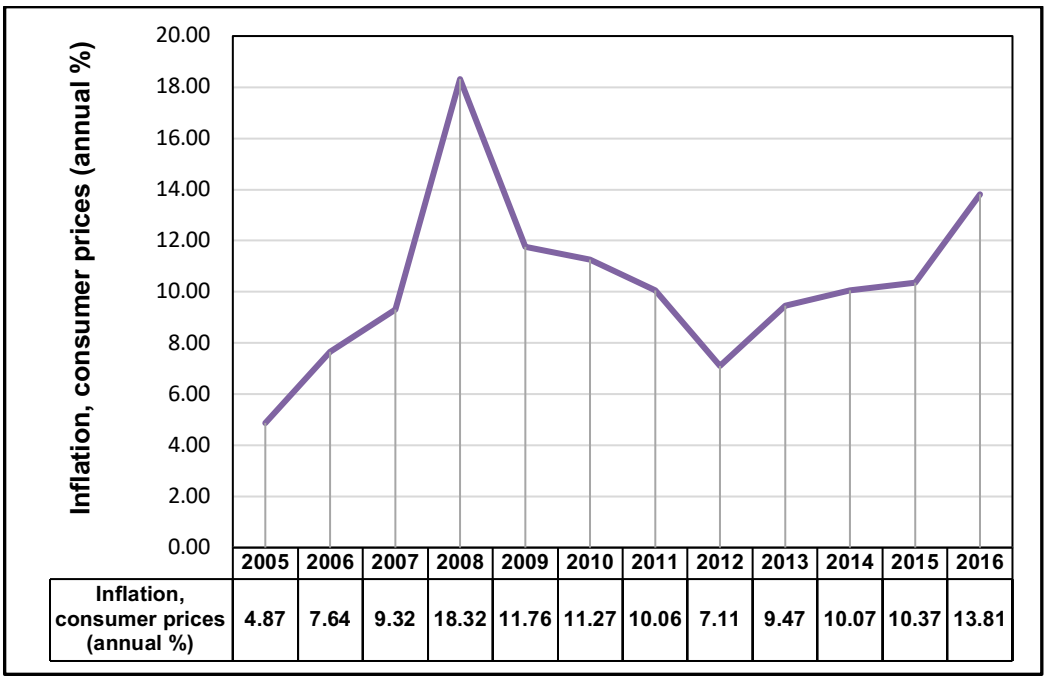
Table (2.3): Inflation, Consumer Prices (Annual %) for the Arab Countries

Country Name	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Algeria	1.38	2.31	3.68	4.86	5.74	3.91	4.52	8.89	3.25	2.92	4.78	6.40
Bahrain	2.59	2.01	3.26	3.53	2.80	1.96	-0.40	2.76	3.30	2.65	1.84	2.80
Egypt	4.87	7.64	9.32	18.32	11.76	11.27	10.06	7.11	9.47	10.07	10.37	13.81
Iraq	36.96	53.23	-10.07	12.66	6.87	2.88	5.80	6.09	1.88	2.24	1.39	0.56
Lebanon	-	-	-	-	1.20	3.98	4.97	6.58	4.82	1.85	-3.75	-0.78
Libya	2.65	1.46	6.25	10.36	2.46	2.80	15.52	6.06	2.61	-	-	-
Morocco	0.98	3.28	2.04	3.71	0.97	0.99	0.91	1.29	1.88	0.44	1.56	1.64
Syria	7.24	10.02	3.91	15.75	2.92	4.40	4.75	36.70	-	-	-	-
Tunisia	2.02	3.23	2.97	4.35	3.66	3.34	3.24	4.61	5.32	4.63	4.44	3.63
Yemen	11.81	10.84	7.91	18.98	5.41	11.17	19.54	9.89	10.97	8.10	-	-

Source: World Development Indicators (WDI, 2016)

Additionally, the following figure (2.8) shows the annual percentage of inflation in Egypt in the period (2005-2016). The highest percentage is observed in the year 2008 (18.32%), according to MoF (2010), inflation has reached the highest percentage in Egypt in 2008 due to the increased food and oil prices following the Global Financial Crisis. Then, due to the declining demand and the steady fall in the world commodity prices, inflation decreased in 2009 to reach (11.76%). While inflation rates showed a decreasing trend in the following years that witnessed the Egyptian revolutions. The CBE adopted a very tight monetary policy after the popular uprisings in Egypt in order to preserve the Egyptian economy during the period of political instability; as mentioned by Hosny (2014) in his study of the monetary policy in Egypt. Additionally, El-Baz (2014) added that the CBE's main objective was to maintain price stability and strengthen the financial system which was a must during this period, since one of the main reasons of the Egyptian revolutions was the very bad and unfair social and economic conditions in Egypt.

Figure (2.8): Inflation, Consumer Prices (Annual %), Egypt



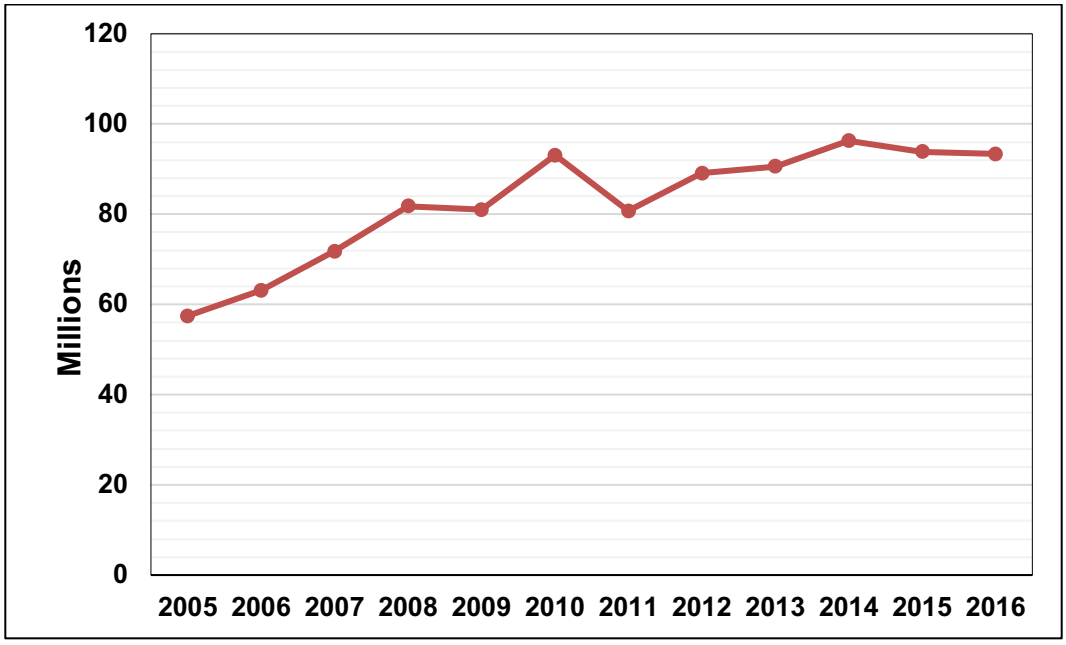
Source: World Development Indicators (WDI, 2016)

- **Tourism**

According to Mansfeld and Winckler (2015), the Arab Spring had tremendous effects on the tourism industry in the Arab countries. The effect extended to both non-oil countries as well as the Gulf Cooperation Council (GCC) that includes

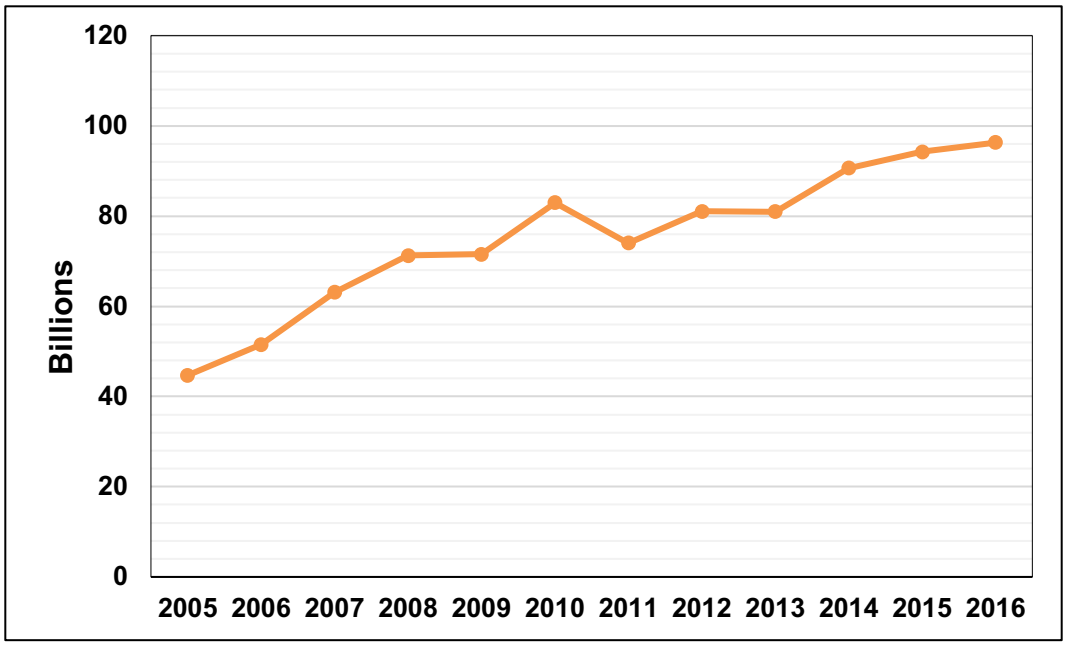
United Arab Emirates (UAE), Qatar, Oman, Bahrain, Kuwait, and Saudi Arabia. The tourism industry is of great importance to many of the Arab countries, as it represents an important contributor to a country's GDP and a source of foreign currency on one hand; on the other hand, tourism represents a mean of providing employment opportunities and a good standard of living for touristic cities. The tourism industry has been improved greatly in the Arab world during the 2000s. The growth of tourism continued during 2009/2010 even with the existence of some bad economic impact of the 2007/2008 Global Financial Crisis. The following two figures (2.9) and (2.10) show how the number of arrivals of international tourism in the MENA region increased form around 57 million in 2005 to more than 93 million in 2010 with an overall increase in international tourism receipts of 86% between 2005 and 2010 to reach around 83 billion dollars in 2010.

Figure (2.9): International Tourism, Number of Arrivals for the MENA Region



Source: World Development Indicators (WDI, 2016)

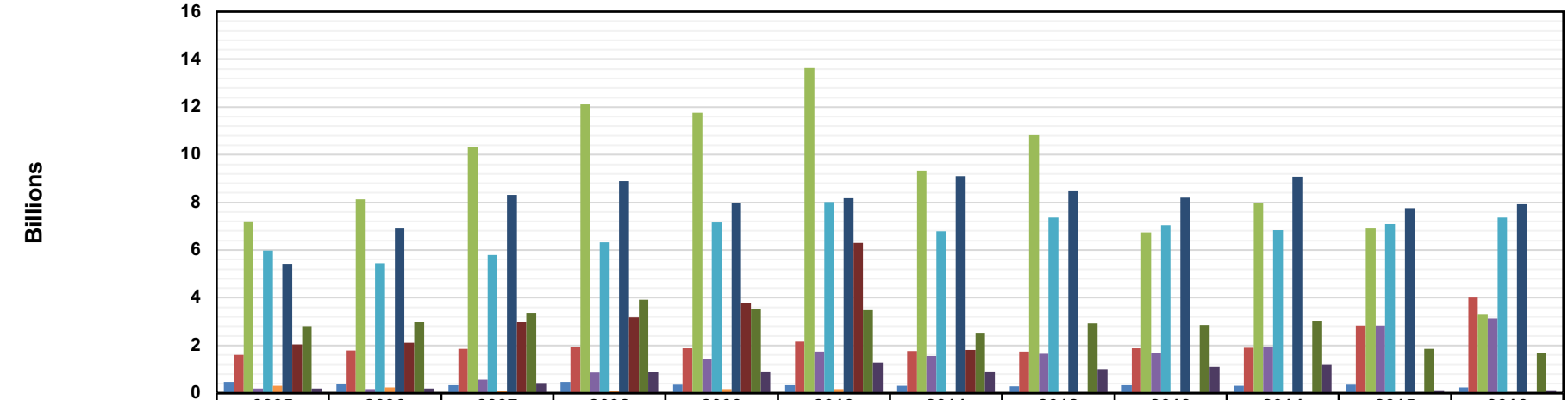
Figure (2.10): International Tourism, Receipts (Current US$) for the MENA Region



Source: World Development Indicators (WDI, 2016)

Therefore, it is obvious that the Arab Spring comes with some serious effects on the tourism industry in the MENA region in 2011 with a decline of around 13% in the number of arrivals from international tourism and a decline of around 11% in the international tourism receipts. However, the tourism performance started to improve in the following years as the effect was not equal in all Arab countries. Figure (2.11) shows the effect of the Arab Spring on the ten countries that were mostly hit by the political instability events. The figure shows that Egypt, Syria, and Tunisia had high international tourism receipts in 2010, and they also suffered a great drop in their receipts in 2011. Syria lost almost 71% of its international tourism receipts in 2011, while Yemen, Egypt and Tunisia lost around 30%, 32%, and 27% from their receipts, respectively. Then a considerable increase in the receipts of most countries existed in 2012, in addition to some minor changes in the following years with the exception of Egypt that witnessed a major drop in international tourism receipts in 2013. The figure shows total receipts of around 6.8 billion as compared to 13.6 billion in 2010, this major decline was due to the second revolution in Egypt during 2013.

Figure (2.11): International Tourism Receipts (Current US$) for the Arab Countries

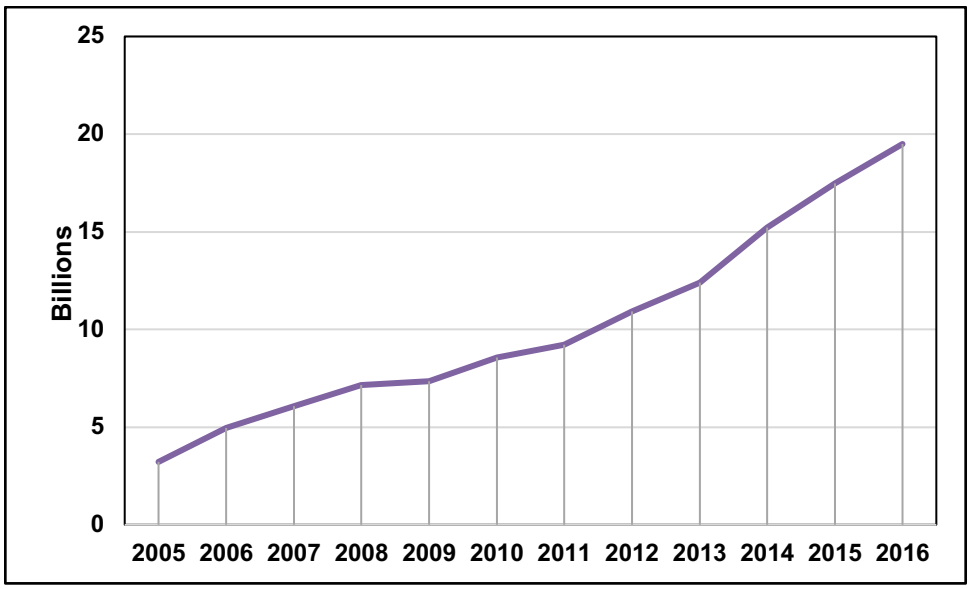


	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Algeria	477,000,000	393,000,000	334,000,000	473,000,000	361,000,000	324,000,000	300,000,000	295,000,000	326,000,000	316,000,000	347,000,000	246,000,000
Bahrain	1,603,000,00	1,786,000,00	1,854,000,00	1,927,000,00	1,873,000,00	2,163,000,00	1,766,000,00	1,752,000,00	1,875,000,00	1,913,000,00	2,827,000,00	4,021,000,00
Egypt, Arab Rep.	7,206,000,00	8,133,000,00	10,327,000,0	12,104,000,0	11,757,000,0	13,633,000,0	9,333,000,00	10,823,000,0	6,747,000,00	7,979,000,00	6,897,000,00	3,306,000,00
Iraq	186,000,000	170,000,000	555,000,000	867,000,000	1,432,000,00	1,736,000,00	1,557,000,00	1,640,000,00	1,682,000,00	1,938,000,00	2,833,000,00	3,120,000,00
Lebanon	5,969,000,00	5,457,000,00	5,796,000,00	6,317,000,00	7,157,000,00	8,026,000,00	6,797,000,00	7,361,000,00	7,032,000,00	6,835,000,00	7,087,000,00	7,373,000,00
Libya	301,000,000	244,000,000	99,000,000	99,000,000	159,000,000	170,000,000						
Morocco	5,426,000,00	6,900,000,00	8,307,000,00	8,885,000,00	7,980,000,00	8,176,000,00	9,101,000,00	8,491,000,00	8,201,000,00	9,070,000,00	7,765,000,00	7,922,000,00
Syrian Arab Republic	2,035,000,00	2,113,000,00	2,972,000,00	3,176,000,00	3,781,000,00	6,308,000,00	1,816,000,00					
Tunisia	2,800,000,00	2,999,000,00	3,373,000,00	3,909,000,00	3,524,000,00	3,477,000,00	2,529,000,00	2,931,000,00	2,863,000,00	3,042,000,00	1,869,000,00	1,706,000,00
Yemen, Rep.	181,000,000	181,000,000	425,000,000	886,000,000	899,000,000	1,291,000,00	910,000,000	1,005,000,00	1,097,000,00	1,199,000,00	116,000,000	116,000,000

Source: World Development Indicators (WDI, 2016)

Additionally, Mansfeld and Winckler (2015) stated that the quick recovery for tourism performance in the MENA region was present in the following years due to the fact that the GCC benefited from the Arab Spring on part of the tourism performance. Tourism flourished in the GCC after the Arab Spring and many of the Gulf tourism and international tourism have been transferred inside the GCC. One of the most positively affected countries in the tourism sector was UAE, and specially Dubai. Figure (2.12) shows that the international tourism receipts for the UAE, as the most important touristic country in the GCC, witnessed major increases during the (2009-2016). Despite the effects of the Global Financial Crisis and the political instability in the MENA region following the Arab Spring, international tourism receipts for the UAE exceeded $19 billion in 2016 as compared to only $3.2 billion in 2005.

Figure (2.12): International Tourism Receipts (Current US$) for UAE

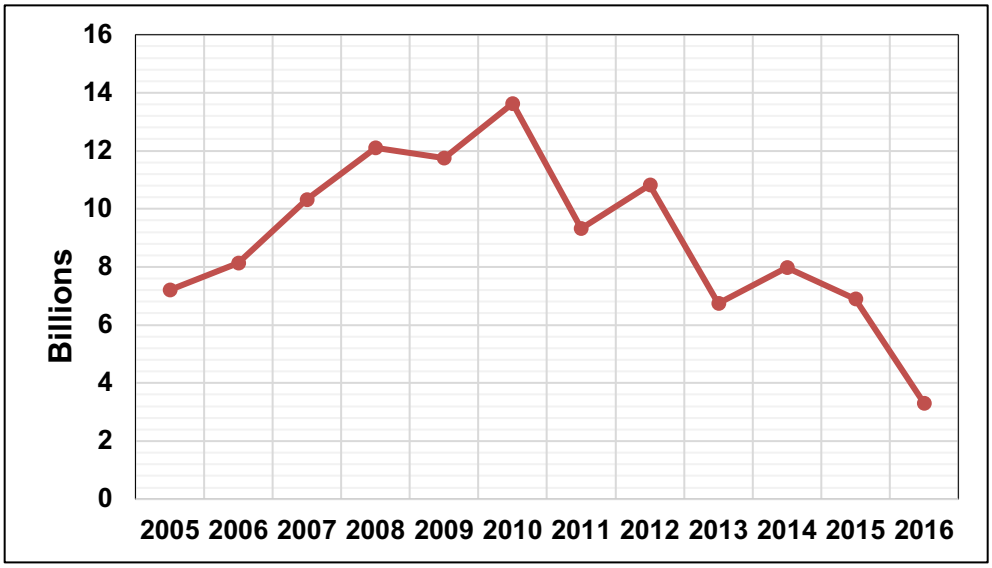


Source: World Development Indicators (WDI, 2016)

Additionally, the following figure (2.13) shows the international tourism receipts of Egypt during the period (2005-2016). It can be observed that international tourism receipts followed an increasing trend from 2005 through 2008. However, international tourism receipts decreased from $12.10 billion in 2008 to $11.76 billion in the following year (2009) when the world economy was suffering from the effects of the Global Financial Crisis. Another major decrease in international tourism receipts of Egypt was in 2011, the year that witnessed the spark of the first Egyptian revolution, as the international tourism receipts recorded only $9.33 billion with a rate of change of almost (-32%) from the figures of 2010. Another major decrease of international tourism receipts is recorded in 2013, with a rate

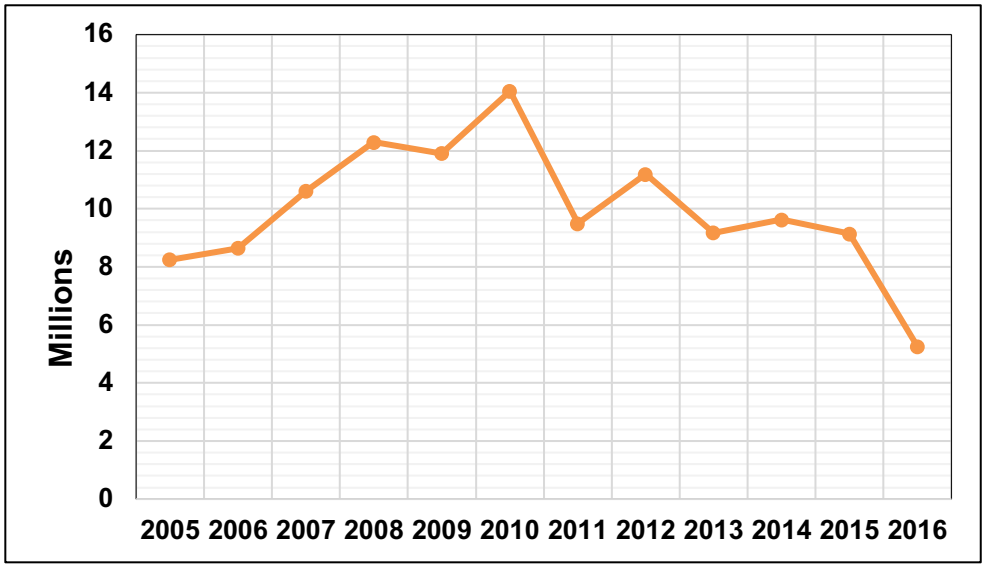
of change of almost (-38%). The rate of change turned to be positive again with the relative political stability in 2014, and the international tourism receipts recorded around $8 billion. Then, the decreasing trend continued until it reached the lowest level in 2016 with only $3.31 billion, as compared to the highest receipts of international tourism of $13.63 billion recorded in 2010 before the major political events in Egypt. The same trend of international tourism is also clear from figure (2.14) that shows international tourism of Egypt in terms of number of arrivals for the same period.

Figure (2.13): International Tourism Receipts (Current US$), Egypt



Source: World Development Indicators (WDI, 2016)

Figure (2.14): International Tourism (Number of Arrivals), Egypt



Source: World Development Indicators (WDI, 2016)

Therefore, it is obvious how the Arab Spring had serious economic impact on the whole Arab region, especially countries that were hit directly with political instability through massive popular demonstrations and civil wars. Egypt was among the countries that was mostly affected by the Arab Spring directly through the great political instability following the two revolutions in 2011 and 2013 that changed the political environment dramatically during these periods. In addition to the indirect effect on Egyptian economy through the political and economic instability of the whole region as previously discussed. Steps on the way of political and economic reforms have been taken in Egypt recently. The following section will view some of the recent economic reforms in Egypt that affected the whole economy and the Egyptian banking industry accordingly.

2.5 Egypt's Recent Economic Reforms

The political instability during the Arab Spring period and the resulting economic effects on the whole region including Egypt affected all sectors and provided for an urgent need of an economic reform program to help in economic recovery for Egypt. However, IMF (2017) stated that the Egyptian banking system has been resilient to the hard economic and political events in the world and the Arab region. Those events include the Global Financial Crisis and the recent political turmoil in the Arab region with two consecutive revolutions in Egypt in 2011 and 2013. The Egyptian banks stood with well capitalization and enough liquidity throughout those hard times according to the IMF. The recent situation reflects an average regulatory capital ratio for Egyptian banks of 13.7%, return on equity of 19%, with non-performing loans amounting to 6.8%, and a ratio of loan-loss provisions of almost 100%. This indicators reflect the resilience and soundness of the Egyptian banking system that were sustained throughout the years of economic and political instability globally, regionally, and locally. The IMF's report described Egypt as a country that suffered since a long time from low non-inclusive growth and a lot of unemployed people, especially with the high number of young people entering the labour force every year (almost 700,000). In addition to the high fiscal deficits and the damaged tourism as a result of the terrible political conditions during the last few years. The low revenues from taxes and the high rates of public spending, especially on subsidies, have led to deficits and high rates of public debt in the years of political and economic instability following the Arab Spring. While the high inflation rates and the fixed exchange rate regime in Egypt have led to decreasing international reserves and overvaluation of the Egyptian pound.

During the 2014/2015 fiscal year, the public debt of Egypt reached 89% of GDP as compared to 70% before the political turbulence that started in early 2011, with one-third of the budget spending devoted for interest which represented around 9% of GDP. The slow growth of the Egyptian economy with the adoption of accommodative monetary policy by the CBE through increasing the overall money supply to support the economy, led to increasing inflation rates. High inflation rates accompanied with the fixed exchange regime resulted in overvaluing the Egyptian pound and problems with the balance of payments. Then, deficits of the current account grew, accompanied with decreasing FDI, and an overall decrease in the foreign exchange reserves to 3.5 months of imports in 2014/2015 fiscal year as compared to 7 months in 2009/2010. Therefore, policy adjustment measures were initiated by the authorities in Egypt in 2014/2015. The government devaluated the local currency by 5% and raised interest rates to contain inflation. In addition to increasing fuel and electricity prices with a future gradual plan of further price increases to phase-out the subsidies, which resulted in decreasing fiscal deficit by around 1.5% of GDP. The decision to impose the Value-Added Tax to replace the General Sales Tax, issuance of the new Civil Service Law, the construction of the Parallel Suez Canal, investing in power generation projects, and discovering new gas fields in the Mediterranean have also led to a recovery in the real growth to 4.2% in 2014/2015 fiscal year (IMF, 2017).

While the Egyptian Ministry of Planning “MoP” (2016) reported that Egypt realized good growth rate during the fiscal year 2015/2016 of 4.3%. This shows the relative improvement in the Egyptian economy, given that the tourism sector has not yet fully recovered and given the limited resources of foreign currencies which provided limited purchasing power for production requirements and hence affected the manufacturing sector. Moreover, the most important sectors that grew well during 2015/2016 and contributed greatly to the overall growth percentage of the Egyptian economy are; the construction sector that grew by 10.8% during 2015/2016 and contributed 24% of the overall growth of the Egyptian economy, and also the communications sector that grew by 8.4% as compared to 2014/2015. While the banking sector grew by 4% during 2015/2016 and contributed 7% of the economy’s overall growth. Additionally, the Egyptian government is trying hard to improve the investment climate and providing more flexible business environment through legislative adjustments and new investment regulations. This has resulted in an increase in the total investments in Egypt with 16.7% during 2015/2016.

Besides, the growth in public revenues reached 5.6% during 2015/2016, however the public expenditures grew by a higher percentage of 11.5% due to the increase in expenditures dedicated to social protection programs (45% of total public expenditures), interest payments (30% of total public expenditures), in addition to subsidies and other social privileges (24.6% of total public expenditures). Therefore, the budget deficit for 2015/2016 grew by 21.5% to stand at 12.2% of GDP. The domestic public debt for the 2015/2016 fiscal year reached 89.5% of GDP with a rate of increase of 25%. While the growth rate of money supply, as measured by the domestic liquidity measure (M2), reached 18.6% for 2015/2016 to record an overall share of GDP of 75.6%. Total deposits also grew with 20.6% to reach EGP 2.12 trillion at the end of the fiscal year 2015/2016. Net international reserves decreased to reach $17.1 billion by the end of 2015/2016 due to some committed payments on behalf of the Egyptian government. Additionally, total transactions of the Egyptian economy during 2015/2016 resulted in an overall deficit in the balance of payments of $2.8 billion. On the other hand, the number of tourist arrivals in 2015/2016 to reach around 7 million as compared to around 10 million during the last year 2014/2015 which resulted in an overall deficit for the tourism sector of around $323.5 million (MoP, 2016).

During August 2016, the Egyptian authorities imposed the Value-Added Tax and increased fuel prices by an average of 35%. Additionally, the last quarter of 2016 witnessed a great spread between the official exchange rate and the parallel market exchange rates as the premium reached 50% by end of October 2016. The result was an overvaluation of the Egyptian pound and a growing deficit in international reserves. The banking system was resilient as indicated by the aggregate financial soundness indicators with an overall capital as a percentage of risk-weighted assets of 13.7%, with growing deposits and nonperforming to total loan ratio of 6.8%. During November 2016, the CBE adopted a floating exchange rate regime and devalued the local currency by 32.5% against the US Dollar. The exchange rate is allowed to be determined by the market and the CBE released the restricted policy of changing buy and sell rates by banks. However, before the devaluation of the Egyptian Pound in November 2016, the CBE took some precautions to maintain the resilience of the banking system. The CBE performed stress tests that proved the adequacy of capital and liquidity buffers that ensures the soundness of the Egyptian banking system under the new policies of devaluing the local currency and increasing interest rates. Nevertheless, the precautions of the CBE wouldn’t be able to protect some small

banks from the effects of serious shocks as reported by the stress tests performed by the CBE (IMF, 2017).

On the other hand, the floating regime and the devaluation of the Egyptian Pound was expected to have moderate effects on banks' credit risk in the light of small corporate and individual dollarization. Nevertheless, A full range of necessary stress tests needed more sufficient bank data to evaluate all the inherent risks. Therefore, the CBE decided to adopt a development policy for the banking system to ensure the provision of sufficient bank data and a close monitor of the effects of the new policies on the banking system, especially for small banks, during the adjustment period that follows the new financial policies of the CBE. In the meantime, the CBE requested the help of the IMF in performing bank-by-bank stress tests needed to assess any potential risks on the banking system. Also in this regard, the CBE adopted a process of enhancing its supervisory framework to promote transparency and provide necessary data that will help in complying with Basel III regulations. In addition to improving CBE's capacity to controlling systemic risks, developing more complicated methods needed for stress tests and enhancing banking governance (IMF, 2017).

IMF (2017) reported that the Egyptian government is targeting to maintain the flexible exchange rate regime and accumulate international reserves. Additionally, the Egyptian government has a gradual plan to increase the pre-tax cost recovery ratio on fuel products to 100% by 2018/2019, and to eliminate subsidies on electricity during the next five years. Additionally, the Egyptian government is planning to issue a new licensing law that is intended to provide more flexible requirements for industrial licensing and make it easier for investors to engage in new businesses in Egypt. This is done in the light of the awareness of the Egyptian authorities that the ease of doing business is very crucial for the Egyptian economy, as the rigid regulations and licenses requirements, barriers to entry, inflexibility in the labour force, and getting financial support are among the key factors that hinder investors. Table (2.4) shows the World Bank's rank of doing business of Egypt, the overall rank of the ease of doing business is 122 out of 190 economies in 2017 that is 4 positions better than that of 2016. There is improvement in some aspects of doing business in Egypt as measured by the World Bank in the table such as; starting a new business, getting electricity, and protecting minority investors. Therefore, the current situation of the Egyptian economy as discussed earlier reflects some ambitious plans by the Egyptian government sought with the help of the IMF. The banking sector is a crucial part of this plan and started playing an integral role in the recovery of the Egyptian economy. The following section will discuss a general overview of the Egyptian

banking sector, while a more detailed description of the sample banks will be discussed in the methodology and data chapter.

Table (2.4): Ease of Doing Business in Egypt

Topics	Doing Business 2017 Rank	Doing Business 2016 Rank	Change in Rank
Overall	122	126	↑4
Starting a Business	39	70	↑31
Dealing with Construction Permits	64	63	↓1
Getting Electricity	88	129	↑41
Registering Property	109	105	↓4
Getting Credit	82	78	↓4
Protecting Minority Investors	114	129	↑15
Paying Taxes	162	162	-
Trading across Borders	168	157	↓11
Enforcing Contracts	162	162	-
Resolving Insolvency	109	105	↓4

Source: World Bank's Doing Business Indicators (World Bank, 2017)

2.6 Overview of the Egyptian Banking Sector

The banking industry started operating in Egypt since the establishment of the first bank in 1856. However, the banking industry has changed dramatically since the introduction of the private sector and joint venture banks during the 1970s, the period of the "Open Door Policy" under Sadat's rule. The CBE has not issued any new commercial banking license since the 1970s. Any new foreign or domestic commercial bank should purchase an existing bank to enter the market. Examples of purchases of existing banks include the acquisition of National Societe Generale Bank (NSGB) by Qatar National Bank Group (QNB), also Emirates National Bank of Dubai (NBD) bought the Egyptian share of BNP Paribas, and recently the Arab African International Bank Acquired Bank of Nova Scotia in Egypt. There are three types of banks operating in Egypt; commercial banks, specialized banks which are all owned by the state, and business and investment banks. Banks that are operating in Egypt can also be classified into

public sector, private sector and joint venture, or foreign banks according to ownership. Three large publicly owned banks are currently operating in Egypt; Banque Misr, Banque du Caire, and National Bank of Egypt which are considered to be amongst the largest operating banks in Egypt with a very large branch networks. These banks have a significant market share in services of retail and corporate banking. They are also considered to be major participants in the equity capital of many joint-venture banks.

Private banks' main activities in Egypt focus on trade-related financial services provided to the private business sector. This implies a less dominant role played by private banks in the market which has a great effect on competition. One more factor that affects competition among banks of Egypt is the regulatory barriers to entry. The CBE has not issued any new commercial banking license since 1970s, as mentioned earlier, because it considers the number of existing banks large enough for establishing a fairly competitive market. This policy has a great effect on the level of competition, in addition to the trend of the CBE that does not favour the expansion of private banks in areas dominated by the networks of public banks. There are thirty eight registered banks currently operating in Egypt, according to the latest reports published by the Central Bank (CBE, 2015 and CBE, 2016a). Two banks have recently got an approval for ceasing their operations in Egypt are; Bank of Nova Scotia, and the National Bank of Oman. The following table presents those thirty eight banks with their respective registration dates.

Table (2.5): Registered Banks in Egypt

#	Bank	Registration Date
1	Banque Misr	18/1/1958
2	National Bank of Egypt	1/1/1961
3	Egyptian Arab Land Bank	18/1/1958
4	The Principal Bank for Development and Agricultural Credit	11/8/1977
5	Industrial Development & Workers Bank of Egypt (S.A.E)	27/5/1976
6	Banque Du Caire	18/1/1958
7	The United Bank	25/6/2006
8	Bank of Alexandria	18/1/1958
9	Misr Iran Development Bank	26/6/1975
10	Commercial International Bank (Egypt) S.A.E	13/8/1975
11	Barclays Bank Egypt S.A.E.	13/8/1975
12	Societe Arabe Internationale de Banque	9/9/1976
13	Blom Bank - Egypt	24/3/1977
14	Credit Agricole Egypt S.A.E	12/5/1977
15	Emirates National Bank of Dubai S.A.E.	14/7/1977
16	Suez Canal Bank	9/3/1978
17	Qatar National Bank Alahli S.A.E	13/4/1978
18	Arab Investment Bank	29/6/1978
19	AL Ahli Bank of Kuwait - Egypt	29/6/1978
20	Bank Audi S.A.E	29/8/1978
21	Ahli United Bank - Egypt	3/10/1978
22	Faisal Islamic Bank of Egypt	14/6/1979
23	Housing and Development Bank	24/9/1979
24	Al Baraka Bank of Egypt S.A.E.	8/5/1980
25	National Bank Of Kuwait - Egypt (NBK) Abu Dhabi Islamic Bank - Egypt	26/5/1980
26	Abu Dhabi Islamic Bank - Egypt	24/7/1980
27	Union National Bank – Egypt "UNB-E"	15/10/1981
28	Egyptian Gulf Bank	28/1/1982
29	Arab African International Bank	10/6/1982
30	HSBC Bank Egypt S.A.E	15/7/1982
31	Arab Banking Corporation – Egypt S.A.E	25/11/1982
32	Export Development Bank of Egypt	31/12/1984
33	Arab International Bank	5/6/2012
34	National Bank of Abu Dhabi	23/1/1975
35	Citi Bank N A / Egypt	16/10/1975
36	Arab Bank PLC	10/6/1976
37	Mashreq Bank	26/5/1977
38	National Bank of Greece	9/2/1978

Source: Central Bank of Egypt, Control and Supervision Sector (CBE, 2016a)

Ben Naceur and Kandil (2013) stated that during the 1990s, Egypt implemented a wide range of reforms intended to liberalize the banking system and strengthen the regulatory framework of the Egyptian banking industry. The growth of the banking system during this period and the trend of liberalizing the whole economy put some major challenges for the CBE as the regulator of banks in Egypt. The CBE has developed the regulatory and supervisory framework of the Egyptian banking industry with the help of some techniques and procedures of regulatory systems in other countries as will be discussed in the next chapter. The CBE and the Egyptian government have successfully drafted the new CBE and Banking Sector Law in 2003, in line with the recommendations of the Financial Sector Assessment Program of the IMF, to enhance the supervisory role, independence of the CBE and banks' efficiency and competitiveness.

Egypt witnessed some important economic and political events since 2008; starting with the 2007/2008 Global Financial Crisis and then the Arab Spring. However, the ambitious reform program that was carried out in the early 2000s has led to strengthening the financial sector in Egypt and its regulatory framework, in addition to the restructuring of banks owned by the state that have major share of the Egyptian banking sector. Implementation of these policies helped the banking sector in Egypt to resist shocks and avoid bank runs (Nasr, 2012). Moreover, the financial system of Egypt showed resilience to the effects of the Global Financial Crisis as it was not strongly integrated into the world financial system. Accordingly, the Egyptian banking sector was able to withstand the effects of the crisis, and the banking reform program conducted by the Egyptian government in early 2000s proved its effectiveness and ensured the integrity of the banking sector through restructuring the banking sector and encouraging different mergers and acquisitions, raising banks' capital, and strengthening risk management systems (CBE, 2015).

Prior to the recent financial crisis; Egyptian banks preserved good capital to risk weighted assets and provisions to non-performing loans ratios. However, after the crisis these ratios have recorded further remarkable improvements; which reflect the resilience of the Egyptian financial sector to the crisis effects; in addition to the role of the CBE in mitigating the economic effects of the Arab Spring on the banking industry. The provision of cash when needed increased the level of confidence in the banking sector and helped avoid bank runs. The CBE guaranteed all bank deposits and issued circulars to address the issues associated with the crisis. These circulars limited transfers abroad and withdrawals of foreign exchange (Nasr, 2012).

Additionally, the macroeconomic environment of Egypt during the economic and political transition periods that followed the January 2011 and June 2013 revolutions resulted in political and economic instability as previously discussed. Additionally, a recent report issued by the IMF (2017) showed resilience of the Egyptian banking sector to different economic and political shocks during the last ten years. However, recent periods in Egypt showed some relative political stability, especially after the completion of the basic steps of the Road Map agreed immediately after the 2013 revolution. This political stability is very important to provide the desirable investment climate. According to the reports of the CBE; the Egyptian banking industry reported an overall aggregate financial position in October 2016 of LE 3,133.5 billion which represents 115.7% of GDP. Total deposits reported LE 2,224.2 billion that represents around 82% of GDP with an annual growth rate of around 28%. While total loans reported a value of LE 975.8 billion that represents 36% of GDP with an annual rate of Growth of around 37%. Furthermore, the Egyptian banking sector operates 3,910 branches of all banks and more than 9031 Automatic Teller Machines (ATMs), and around 13,201 debit cards and 3,825 credit cards (CBE, 2016b, and CIB, 2016).

The second wave of the banking reform program by the CBE, has also its positive impact on the application of Basel II regulations in Egypt. CBE (2009), mentioned that the second wave of the reform program started in 2009 to continue improving the Egyptian banking sector and structuring banks. The second wave of the program focused on improving banks' technological tools that will enhance banks' ability to apply Basel II. CBE (2016a) stated that the plan for applying Basel II accord was conducted during the second wave of the reform program that was extended until 2012. During the second wave of this reform program, the CBE signed a memorandum of understanding with the European central bank concerning the application of Basel II. According to CBE (2015); the Central Bank's Board of Directors issued an approval of the application of the minimum capital regulations based on Basel II accord in its meeting in December 2012. The instructions issued included the application of the instructions issued by the CBE to all banks. An exception would be the requirement of the minimum capital adequacy ratio; as the CBE stated a minimum ratio of 10% to be applied to all banks, except branches of foreign banks. Banks were instructed to apply such regulations as of December 2012, for banks with fiscal year ending in December, and as of June 2013, for banks with fiscal year ending in June. However, the CBE allowed a period of 6 months for all banks to comply with the new regulations. Regarding the second pillar of the Basel regulations, the CBE postponed applying it until the Egyptian banking sector fully absorbs and gets

familiar with the first pillar. The most recent reports of the CBE stated that they started considering also some of the Basel III reforms like the capital conservation buffer, liquidity coverage ratio, net stable funding ratio, and the leverage ratio. What is worth mentioning here is that the CBE conducts regular supervisions over the 38 banks operating in Egypt to ensure their compliance with banking laws and the set standards and regulations concerning the minimum regulatory capital, liquidity ratios and other regulations. In addition to supervising other qualitative standards in a way to ensure the overall soundness and resilience of the Egyptian banking system to evaluate bank performance from all important perspectives. These qualitative standards include; governance regulations, criteria to ensure eligibility and efficiency of key persons in banks, and efficiency of information systems.

2.7 Summary

This chapter presented an overview of the context of the thesis by discussing the country's political and economic environments. Moreover, the chapter discussed the effects of the Global Financial Crisis as well as the Arab Spring in general with a focus on their effects on Egypt, which should help in building a better understanding of the effects of these serious shocks on all sectors, especially the Egyptian banking industry. The chapter also discussed the reasons behind the Arab Spring and the caused regional and political unrest, which impacted the economy of the region; especially Egypt as one of the countries that was severely hit by the massive waves of this political unrest in the region following two public uprisings and so many changes in the political and economic environments of the country. Finally, this chapter discussed the most recent economic reforms in Egypt in the light of the discussed macroeconomic environment of the country. Moreover, the effect of the macroeconomic environment on the Egyptian banking industry was discussed. In addition to discussing a general background of the Egyptian banking industry and the efforts of the CBE in protecting the banking sector through different policies adopted while applying the banking reform program that ended with applying the first Pillar of Basel II. However, the next chapter will discuss in much more details the regulatory framework for banks and how different Basel accords apply to the world banking sectors and the Egyptian banking sector. Therefore, the next chapter is intended to add to the general background discussed in this chapter by providing focusing on the regulatory framework of the world banking in general and the Egyptian banking in specific.

Chapter.3 Banking Regulations

3.1 Introduction

Banking system can be generally described as a fragile system that needs government help in order to maintain its stability. Reasons for this fragility can be found by incomplete markets, negative externalities, and moral hazard between owners and depositors of banks. This has always encouraged regulatory bodies like central banks to maintain minimum regulatory requirements such as; entry barriers, reserve requirements and capital adequacy requirements (Tchana, 2014). Getter (2012) stated that banks face some serious risks due to the nature of their operations, such as; credit, liquidity, market, operational and solvency risk. Therefore, banks are required to keep a capital buffer to help protect against such risks that arise due to the risky nature of banking operations, since capital is considered to be the last line of defence for banks form bankruptcy. Bank capital is the difference between bank's assets and liabilities and a bank is said to be well-capitalized or solvent in case its capital reserves are kept above the minimum threshold levels. On the other hand, a bank may face problems of shut down when it is said to be undercapitalized if the capital reserves fall under the threshold levels. Well-capitalized banks are more resilient in case of default of one of its assets and are less likely to affect repayments of its obligations which provides protection for bank creditors.

Therefore, the Basel Committee on Banking Supervision (BCBS) started operating in 1988 with the aim of setting up rules and regulations to enhance soundness of operations of the banking system worldwide and enhancing global financial stability. The Committee reports to the Group of Central Bank Governors and Heads of Supervision (GHOS). The Bank for International Settlements (BIS) provides secretariat for the Basel Committee in Basel, Switzerland (Abdallah, 2013). Additionally, the recent Global Financial Crisis highlighted the need to more resilient micro- and macro-prudential regulations for banks, where the micro-level represents actions taken by banks' management and macro-level represents policies and regulations created on the country level or higher, which should help in ensuring a more stable financial system and help resist future crises (Guidara *et al.*, 2013). This Chapter discusses in details a general background on the Basel regulations with all its stages that evolved since 1988 by the BCBS, Basel I, Basel II, Basel II.5, and Basel III. In addition to discussing different types of risks in relation to the Basel

regulatory framework; credit risk, liquidity risk, market risk and operational risk. Furthermore, this Chapter discusses the effect of these regulations and different treatments of bank risk on the world banking with a specific focus on the Egyptian banking and the application of Basel regulations in Egypt.

3.2 Development of Basel Regulations

Following the collapse of the Bretton Woods system of managed exchange rates in 1973 the BCBS started to have its role in the financial market turmoil. The Bretton Woods system collapse resulted in huge foreign currency losses for banks. During1974, Bankhaus Herstatt in West Germany and Franklin National Bank of New York were closed due to massive foreign exchange losses. The German bank had foreign exchange exposures equal to three times the bank capital which, as a result, caused major losses for other unsettled international trades with the bank. As a result of this instability in the market, regulators and financial authorities all over the world decided that the increasing global capital flows and the integration of financial markets presented the need for a new regulatory framework to maintain the global financial stability (Jablecki, 2009). Therefore, governors of central banks in the G10 countries (The Group of Ten which included 11 countries namely; Belgium, Canada, France, Germany, Italy, Japan, the Netherlands, Sweden, Switzerland, the United Kingdom and the United States) decided to establish a committee for banking supervision in 1974 (BCBS, 2015). However, countries with limited global capital flows that are not fully integrated in the world's financial market were not exposed to such risks that urged the establishment of the BCBS. What is worth mentioning here is that the weak integration with the world's financial system has been always reported to provided protection against the consequences of many problems in the world's financial system as discussed in the previous chapter for the case of Egypt.

The committee established by the G10 countries was renamed later to be the BCBS with an aim to enhance the quality of banking supervision worldwide in the light of cooperation between the member countries to improve supervisory practices. The Basel Committee aims to achieve its objectives through establishing minimum standards by sharing common understanding of different regulations and supervision of banking across borders, which eventually helps in the identification of any potential risks for the financial systems worldwide. The Basel Committee's Decisions are recommendations that do not represent a legal requirement but provide guidance on sound practices that are expected to be implemented by national authorities. The implementation of the standards set by

the Basel Committee depends mainly on members' commitment as stated in its charter. In 2012, the Committee started monitoring the timely and accurate implementation of its recommendations with the aim of improving the regulatory framework of the banking system worldwide that will enable banks with international engagement to work in a stable regulatory environment (BCBS, 2015).

The Basel Committee's first meeting was held in 1975, and since then three or four meetings are held each year, and the Committee provides reports to the GHOS. Countries are represented in the Committee by their central banks and by the authority responsible for banking supervision where it is not the central bank (BCBS, 2015). The first proposal of the Basel Committee was the 1975 Basel Concordat and the main objective of this concordat was to determine the supervisory authorities over international banks' branches abroad and whether the home or the host country will be responsible for that. The 1975 Basel Concordat determined the responsibility for solvency and liquidity of a foreign bank subsidiary to be with the host country, while the home country supervises the liquidity of the foreign branches. However, all decisions taken by the Basel Committee were of minor effect until the introduction of the Basel I in 1988 (Jablecki, 2009). The Basel Committee started with the G10 countries, then expanded its membership in 2009 and again in 2014 to include 28 jurisdictions as shown in Table (3.1). The table shows the member countries with their institutions that are represented in the Basel Committee (Bank for International Settlements, 2013). The Basel Committee always aims to expand its activities and include a wider range of countries in its activities by encouraging cooperation with non-member countries. In addition to the expansion of the Basel Committee in 2009 and 2014 to include members and observers from a number of non-G10 countries invited by the Chairman of the Committee, the Basel Committee established the Basel Consultative Group in 2007 that is intended to deepen the engagement of non-member countries and other regional banking supervision bodies on the Basel Committee's supervisory issues. The Bank for International Settlements (BIS) provides the Basel Committee's Secretariat, and it comprises mainly professional supervisors from member institutions on temporary secondment. Also the Basel Committee established, jointly with the BIS, the Financial Stability Institute (FSI) to handle dissemination of the Basel Committee's standards (BCBS, 2015).

Furthermore, Datey and Tiwari (2014) stated that the BCBS is fulfilling its tasks through four subcommittees;

- **The Standards Implementation Group**; who work on information sharing and ensuring consistency in the implementation of regulations.
- **The Policy Development Group**; who work on identifying and reviewing emerging supervisory issues, in addition to developing policies that are intended to harmonize banking practices and supervisory issues.
- **The Accounting Task Force**; who work on developing the reporting guidance, participating in the development of the international accounting and reporting standards and ensuring the role of these standards in promoting bank risk management.
- **The Basel Consultative Group**; the main task of this subcommittee includes ensuring the engagement of non-member countries in the supervisory issues raised by the Basel Committee or new initiatives, through inviting senior representatives from non-member countries, international institutions, and regional group of banking supervisors to participate in the supervisory dialogue.

Table (3.1): Institutions represented on the BCBS

1	Argentina	Central Bank of Argentina
2	Australia	Reserve Bank of Australia
		Australian Prudential Regulation Authority
3	Belgium	National Bank of Belgium
4	Brazil	Central Bank of Brazil
5	Canada	Bank of Canada
		Office of the Superintendent of Financial Institutions
6	China	People's Bank of China
		China Banking Regulatory Commission
7	European Union	European Central Bank
		European Central Bank Single Supervisory Mechanism
8	France	Bank of France
		Prudential Supervision and Resolution Authority
9	Germany	Deutsche Bundesbank
		Federal Financial Supervisory Authority (BaFin)
10	Hong Kong SAR	Hong Kong Monetary Authority
11	India	Reserve Bank of India
12	Indonesia	Bank Indonesia
		Indonesia Financial Services Authority
13	Italy	Bank of Italy
14	Japan	Bank of Japan
		Financial Services Agency
15	Korea	Bank of Korea
		Financial Supervisory Service
16	Luxembourg	Surveillance Commission for the Financial Sector
17	Mexico	Bank of Mexico
		Comisión Nacional Bancaria y de Valores
18	Netherlands	Netherlands Bank
19	Russia	Central Bank of the Russian Federation
20	Saudi Arabia	Saudi Arabian Monetary Agency
21	Singapore	Monetary Authority of Singapore
22	South Africa	South African Reserve Bank
23	Spain	Bank of Spain
24	Sweden	Sveriges Riksbank
		Finansinspektionen
25	Switzerland	Swiss National Bank
		Swiss Financial Market Supervisory Authority FINMA
26	Turkey	Central Bank of the Republic of Turkey
		Banking Regulation and Supervision Agency
27	United Kingdom	Bank of England
		Prudential Regulation Authority
28	United States	Board of Governors of the Federal Reserve System
		Federal Reserve Bank of New York
		Office of the Comptroller of the Currency
		Federal Deposit Insurance Corporation

Source: (Bank for International Settlements, 2013)

The Basel Committee has a main and a very important objective which is to enhance international cooperation on banking supervision, that is to give no chance for any international bank to avoid consistent and adequate supervision. One important step by the Basel Committee to achieve this goal was through its first paper, the 'Concordat' first published in 1975. The Concordat sets out rules of sharing supervision on foreign banks branches, subsidiaries, and joint ventures between the home country and the host country. Then, some papers were published during the 1990s that ended with the document formulating 'Core principles for effective banking supervision' first published in September 1997. However, after many revisions this document was re-issued in 2012 and included 29 principles that cover supervisory powers, the need for early intervention and timely supervisory actions, supervisory expectations of banks, and compliance with supervisory standards (BCBS, 2015). A detailed background on different Basel Accords issued since 1988 is necessary to understand the world regulatory framework under which banks operate and how it affects management of bank performance. Therefore, the following sections detail the Basel Accords with its different stages and how they are evolving overtime to cope with changes in the world economy, in addition to discussing the implementation of such regulations in Egypt as the main context of this research.

3.3 Basel I

3.3.1 Main Framework

During the 1970s and 1980s, some international banks exploited geographical limits by relocating their main operations in countries with less strict regulations which induced the need for a common international banking regulations (Balin, 2008). Additionally, in the early 1980s the Latin American debt crisis highlighted the need for developments in the capital standards with a growing international risks. The Basel Committee's members agreed to start improving governance standards to achieve a more stable capital adequacy for their banking systems which resulted in an agreed weighted approach for measuring risk both on and off banks' balance sheet. The G10 countries approved the first capital adequacy accord in 1988, commonly known as the 'Basel Capital Accord' or the '1988 Accord'. Following the approval of the 1988 Accord, the international banking systems started to gain some equality in competition that did not exist before due to the existence of different national capital requirements (BCBS, 2015). According to Jackson *et al.* (1999); two major reasons directed the need to adopt

internationally uniform standards for capital requirements by the G10 countries of the Basel Committee. Firstly, they believed that the adoption of such standards would motivate internationally active banks to boost their capital positions and therefore help in strengthening the international soundness and stability of the banking system. The second objective lied in the need to create a fair competition or to reduce competitive inequalities among internationally active banks.

In the same line, BCBS (1988) stated that the 1988 Accord was intended to provide details of the minimum capital adequacy standards that the member countries agreed to adopt. It was also intended to provide incentives for countries outside the G10 countries with internationally-active banks to adopt such framework. However, it is important to mention that the 1988 framework originally emphasized capital adequacy in relation to credit risk only. The Basel Capital Accord required a minimum of 8% for the ratio of capital to risk weighted assets in banks by the end of 1992. The G10 countries confirmed by the end of 1993 that they applied the capital adequacy requirements to all the banks with material international banking activity. The 1988 Accord was subject to some amendments and refinements in the following years 1994, 1995, and 1996. The last amendment of the 1988 Accord was in 1996 concerning the 'Market Risk Amendment to the Capital Accord'. The credit risk was the main focus of the 1988 Accord, therefore this amendment came to address the market risk that is associated with exposure to foreign currency transactions, traded debt securities, equities, commodities, and options. This amendment to the 1988 Accord approved the use of banks' internal models 'Value at Risk Models' to calculate bank's market risk capital requirements, however these calculations were bound by some quantitative and qualitative restrictions (BCBS, 2015). Jablecki (2009) stated that the main focus of Basel I accord was to harmonize international banking and set common standards for capital adequacy. This accord determined a standard for risk assessment by requiring banks to keep a certain fixed percentage between bank's capital and its assets which is calculated as;

$$\text{Basel Capital Ratio} = \frac{Capital}{Risk\ Weighted\ Assets} \tag{3.1}$$

Basel I framework defined 'Constituents of Capital' by stating that bank capital should comprise two Tiers; the first one, Tier 1, or the core capital or equity capital, which includes the book value of common stock, non-cumulative perpetual preferred stock, share premiums, retained profit, general and legal reserves. This equity capital is the only element common to all countries. Whereas Tier 2, or the supplementary capital comprises all other capital;

revaluation of assets, undisclosed reserves, general provisions and reserves, hybrid instruments, e.g. cumulative preferred stock, long-term subordinated debt and investment fluctuation, however, these elements of supplementary capital may or may not be included in accordance with the national accounting and supervisory authorities of each country (BCBS, 1988 and Jablecki, 2009). A minimum of 4 % for Tier 1 ratio, and 8 % for the total capital ratio (with a maximum of 50 % for Tier 2 ratio) were required by Basel I (Abdallah, 2013). Additionally, Basel I defined the risk weights for assets in accordance with the following criteria; cash, gold and bonds issued by The Organization for Economic Cooperation and Development (OECD) governments are assigned no risk (0% weight), claims on agencies of OECD governments and local public sector entities are assigned 20% weight, while mortgage loans are assigned 50% weight, and 100% weight is assigned to all claims on private sector, non-OECD governments, real estate investments and all other assets (Jablecki, 2009). While the claims on domestic public sector entities, excluding central governments, and their guaranteed loans are left for national supervisory authorities at their discretion to be weighted at (0, 10, 20, or 50%) (BCBS, 1988). The implementation of Basel was much easier by the G10 countries, in addition to many emerging economies that adopted the framework of Basel I. By 1999 most countries applied the framework of Basel I (Balin, 2008). The transitional and implementation arrangements for the 1988 Accord is summarized in the following table.

Table (3.2): Transitional Arrangements of Basel I Accord

	Initial	End-1990	End-1992
1. Minimum Standard	The level prevailing at end-1987	7.25%	8.0%
2. Measurement Formula	Core elements plus 100%	Core elements plus 100% (3.625% plus 3.625%)	Core elements plus 100% (4% plus 4%)
3. Supplementary elements included in core	Maximum of 25% of total core	Maximum 10% of total core (i.e. 0.36%)	None
4. Limit on general loan-loss reserves in supplementary elements	No limit	1.5 percentage points or, exceptionally up to 2.0 percentage points	1.25 percentage points or, exceptionally and temporarily up to 2.0 percentage points
5. Limit on term subordinated debt in supplementary elements	No limit (at discretion)	No limit (at discretion)	Maximum of 50% of Tier 1
6. Deduction for goodwill	Deducted from Tier 1 (at discretion)	Deducted from Tier 1 (at discretion)	Deducted from Tier 1

Source: (BCBS, 1988, p.30)

3.3.2 Implementation

Basel regulations are not obligatory and national authorities might be using it as a reference and adapt their own regulatory frameworks. Cho (2013) stated that countries differ in both the scope and timing of implementing the Basel regulations. Some countries are considered early adopters of the comprehensive Basel frameworks, some are late adopters and might also apply Basel frameworks partially by not adopting all the regulations or all the pillars, and there are also non-adopters. Some other countries exist in between these two extremes with either late comprehensive adoption or early partial one. Basel I accord implementation has affected bank behaviour greatly and this effect has been the focus of some researchers in the early 1990s. Hubrich and Wachtel (1993) argued that the implementation of the Basel I in 1988 which was totally effective in America by early 1990s has led banks to hold government securities equal to more than 22% as compared to 15% of total assets in 1989. This was mainly due to the fact that government securities have a 0% weight in the calculation of the capital adequacy ratio, which means that banks need to have 0% capital backing for government securities. Hubrich and Wachtel substantiated the link between the regulatory change and this portfolio change in American banks during that period which as a result increased the attractiveness of government securities. Additionally, Hall (1993, p.408) stated that 'To the extent that a 'credit crunch' has weakened economic activity since 1990, Basle-induced declines in lending may have been a major cause of this credit crunch.'. Hall stated in his research that bank loans declined during the period 1990-1992 by $150 billion due to the introduction of the new Basel I accord which highlights the effect of Basel I on bank behaviour.

Jablecki (2009) stated that bank capital adequacy ratio improved for a group of 29 OECD countries over the period (1990-2001) from 8.5% to 12%. This is close to what was found by Peura and Jakivuolle (2004); that the average total capital ratio of banks in the G10 countries remained at 11.2%, with the ratio standing at 11.9% in America and below 11% in Europe. However, Jablecki (2009) argued that these descriptive statistics do not necessarily mean that the increase in prudence was a direct result of introducing Basel I accord. This increase in capital ratios might be due to competitive pressures which is more plausible here as it is noted that the increase in capital ratios is greater than the regulatory ratios. Jablecki (2009) suggested that the main problem lies in comparing the performance of banks with and without the regulatory requirements. While, Furfine (2000) concluded that banks might tend to compare the cost of building

strong capital ratios to costs of falling below or even getting close to the regulatory capital requirement. Costs of falling below the regulatory capital include not only the cost of official penalties due to incompliance with the required ratios, but also the possible loss due to reputation issues. Additionally, there is another cost type in case of falling below the required capital ratios, which is the cost of having to cut down lending or building more capital. Therefore, banks consider the cost of building strong capital adequacy that exceeds regulatory requirements as lower than costs associated with fixing the situation in case of failure.

Abdallah (2013), stated that Basel I regulations were criticised on the basis of giving equal risk-weighting to all credit without paying a proper attention to the credit quality involved, which might result in mismatching credit quality and capital levels in banks. Additionally, Basel I accord ignored the relevant term of credit exposure, that is to say that long-run exposure is more vulnerable to default risk than short-run exposure. Basel I did not recognize also how credit risk can be affected by portfolio diversification, which was recognized later during the 1990s through market risk by adding market risk that result from changing market conditions. The result of this amendment was a minimum of 8% capital to credit risk and market risk ratio. Lastly, Basel I did not include capital charges for an important risk type which is operational risk. Similarly, Rodríguez (2003) stated four main shortcomings of the Basel I framework; firstly, it used arbitrary risk categories and arbitrary weights in the calculation of the denominator of capital adequacy ratio with no relation to the default rates which is based on the assumption that all assets in a specific category have equal weights or one is 100% riskier than another. Secondly, the methodology of calculating the risk assumes that the risk of all assets in a portfolio is equal to the sum of the risk of each asset in the portfolio, disregarding the overall effect of the portfolio risk and the effect of the portfolio size which can greatly affect the portfolio risk. Thirdly, the framework assumed that government securities are risk-free when issued by OECD countries or being assigned lower risk weight when issued by non-OECD countries. However, sovereign defaults of Russia and Argentina in 1998 and 2002, respectively, highlights the riskiness of government debt. Finally, the Basel I Accord allowed the existence of the divergence between economic risk measures of regulatory capital, which is the main reason of the capital arbitrage that results in increasing the overall economic risk to improve the capital adequacy of banks.

Ben Naceur and Kandil (2009) stated that banks operating in Egypt used to be regulated through credit controls and portfolio restrictions prior to the 1990's

banking reforms. Therefore, this period of segmented banking sector with a very low competition and innovation levels created the need for a banking reform that appeared as part of the economic reform program started in 1990/1991. The reform program adopted the liberalization of the deposit and lending rates which helped in creating positive real interest rates. According to Bolbol *et al.* (2005), this was followed by eliminating the ceilings on lending to private sectors during 1992. Then, Ben Naceur and Kandil (2013) stated that Egypt started to implement the capital adequacy requirements following the general guidance of Basel I Accord in 1997. Furthermore, Ben Naceur and Kandil argued that the 2003 unified banking law has resulted in raising the capital adequacy requirement to 10% as opposed to 8% of the risk-weighted assets. In addition to some other regulatory reforms such as raising the minimum paid-up capital for national banks from LE 100 million to LE 500 million, enhancing the quality of off-site supervision by the CBE Supervision Department, and other reforms intended to prepare banks for the implementation of Basel II. As a result of this law, the Egyptian banking industry experienced some wide movements towards consolidating small and poor performing banks that could not cope with the new regulations. Moreover, foreign banks played a major role in this consolidation movement, especially with the restricted licensing trend by the CBE. Some foreign players took over other banks in Egypt to enter the Egyptian banking industry during this period including; Audi, Credit Agricole, Societe Generale, BNP Paribas, BLOM, Barclays, Piraeus.

In the same line, El-Shazly (2001) stated that as part of the new banking regulations introduced to the Egyptian banking environment throughout the 1990s and early 2000s, the CBE conducted both on-site and off-site bank supervision through visits of supervisory teams to banks to evaluate their financial conditions and management efficiency. The off-site supervision involved preparing regular reports for some screening ratios that evaluate bank performance. However, the new banking regulations introduced to the Egyptian banking created the need for more qualified supervisory staff who are capable of coping with the new prudential regulations and the measurements of new techniques and management efficiency. However, the lack of qualified staff and the weak financial compensations weakened the supervisory role of the CBE. El-Shazly (2001) reported that; by 2006 the CBE needed an average of two years to conduct a compressive on-site supervision of banks in Egypt. Additionally, the lack of necessary technologies and computational facilities made the off-site supervision even hard and mostly done through manual revision of monthly reports to the CBE's control department. El-Shazly (2001) argued that the CBE

tried to enhance the poor public disclosure of bank financial information through taking the decision to require banks to publish their financial statements on a quarterly basis. Before that; banks used to disclose only their annual financial statements which were mostly very brief, especially for public banks, with a more frequent access for the general public to banks listed on the stock exchange. According to law number 95 for 1992 all banks in the capital market were mandated to disclose their financial statements to the capital market authority that manages disseminating such information to the general public through selling it to interested parties. El-Shazly (2001) considered the market transparency of banks in Egypt as insufficient by that time due to the unavailability of many important measures such as non-performing loans and risk-weighted capitalization.

An important study by Ben Naceur and Kandil (2009) investigated the effects of capital regulations on the performance and stability of 28 banks operating in Egypt over the period of 1989-2004. Their study measured the effect of capital to total assets ratio on cost of intermediation and profitability of banks in Egypt during the sample period. Additionally, they measured both the progressive short term effect and the sustained long term effect of introducing capital regulations through some dummy variables representing the year of introducing the capital regulations, in line with the basic guidelines of the Basel Committee, and subsequent periods. The authors' overall results supported the importance of capital regulations for the performance and financial stability of the Egyptian banking system. Therefore, the results was in favour of the efforts made by the CBE to enforce capital regulations as a way of enhancing the performance and financial stability of the banking sector in Egypt.

3.3.3 Capital Arbitrage Under Basel Regulations

The application of Basel I capital requirements affected bank behaviour greatly, as banks tended to consider these capital requirements as an excessive burden. Banks developed some ways to circumvent these requirements, these techniques are usually called capital arbitrage and involve changes in the bank asset portfolio in a way by incorporating assets with the same risk or even more risk but with lower capital requirements. From arithmetic perspective a bank would increase its capital adequacy ratio either by increasing the numerator (bank capital) or by decreasing the denominator (bank assets) or its accompanying risk. Some banks utilized the deficiency of Basel I by either artificially inflating capital measures, e.g. gains trading, which increases capital

in the short run or by reducing the risk measures through securitization. Securitization is a broad concept that involves originating certain types of assets, such as mortgages and consumer loans, and then selling a pool of these assets to another institution (Special Purpose Vehicle 'SPV') that undertakes the task of selling these assets to investors in the form of securities with fixed income in which proceeds from this resale get back to the originating bank. According to Mohanty (2008); securitization can also be defined as the transformation of illiquid asset into tradeable securities in the financial markets. The following figure illustrates the process of securitization as presented by jablecki (2009).

Figure (3.1): Securitization Process

Source: (Jablecki, 2009)

Merton (1995) provided a very good example for a US bank that illustrate possibilities for arbitrage under Basel I regulations. Merton (1995) explained that:

If a bank were managing and holding mortgages on houses, it would have to maintain a capital requirement of 4%. If, instead, it were to continue to operate in the mortgage market in terms of origination and servicing, but sells the mortgages and uses the proceeds to buy US government bonds, then under the BIS rules, US government bonds produce no capital requirement and the bank would thus have no capital maintenance. However, the bank could receive the economic equivalent of holding mortgages by entering into an amortizing swap in which the bank receives the total return on mortgages, including the amortization features and prepayments and pays the returns on US Treasury bonds to the swap counterparty. The net of that series of transactions is that the bank receives the return on mortgages as if it had invested in them directly. However, the BIS capital calculation, instead of it being 4%, appears to produce a capital requirement using the swap route of about 0.5%. (pp. 468-469).

Despite the fact that observing the real size of securitization is not an easy task; however, Jablecki (2009) noted that securitization has gained a considerable growth in the late 1980s. He also blamed the Basel capital regulations for increasing the scope of securitization and transforming the bank model from 'originate and hold' to 'originate and distribute', and accordingly discouraging

banks form monitoring credit risk and quality of loans. Similarly, Mohanty (2008) argued that securitization allowed banks to manage their risk, return, and liquidity facilities on one hand; however, the simplified framework as imposed by the Basel I Accord provided good grounds for banks to cover part of their credit risk through capital arbitrage. Therefore, the Basel II framework provided risk sensitive capital requirements that takes into consideration the securitization activities of banks. It is required under such securitization framework to wholly deduct any highly subordinated positions from bank capital. Any first loss position should be deducted from capital under the internal-ratings based approach for any securitization activities. Banks investing in securitization positions by other institutions should deduct those low rated or unrated positions. Moreover, under Basel II framework supervisory authorities are required to ensure the proper capital allocation by banks against the economic substance of credit exposures for those transactions related to securitization activities. However, the development of the securitization framework under the Basel II Accord and its impact on the securitization market is heavily dependent on the risk management system of banks and different securitization transactions. The following sections provide a detailed discussion of the Basel II Accord and its accompanying modifications.

3.4 Basel II

The Basel Committee issued a proposal for a revised capital adequacy framework during 1999 that was intended to replace Basel I. The 'Revised Capital Framework' that is commonly known as 'Basel II' was announced in 2004 and was more risk-sensitive than Basel I. It took the committee around six years of extensive preparation during which they consulted many bodies including supervisory agencies, central banks and other observers. The new Basel II framework addressed three main pillars; minimum capital requirements, institutional supervision on capital adequacy and internal assessment, and disclosure issue and how it can be used effectively to enhance banking practices. In 2006, the Basel Committee agreed with the International Organization for Securities Commission to issue the 'Basel II: International convergence of capital measurement and capital standards: a revised framework - comprehensive version' that govern the treatment of banks' trading books (BCBS, 2015). The revised framework included the 2004 Basel II framework, the elements of the 1988 Accord that were not covered in the 2004 Basel II framework, the 1996 "Amendment to the Capital Accord to Incorporate Market Risks", and the 2005 paper on "The Application of Basel II to Trading Activities and the Treatment of

Double Default Effects" (BCBS, 2009a). The revised framework was intended to provide a strong risk management practises for the international banking system. The basic elements of the Basel I Accord were kept unchanged, such as the requirement for a minimum capital ratio of 8% of the risk-weighted assets, the basic structure for market risk calculation included in the 1996 amendment to Basel I Accord, and the definition of eligible capital. The BCBS started in 2006 publishing the comprehensive version of the Basel II framework for all banking authorities worldwide, to encourage them to adopt the framework in the time they believe is appropriate for them. However, during that time the Basel Committee acknowledged that the adoption of the Basel II framework might not be the best option for non-G10 countries in the near future. Therefore, non-member countries were encouraged to consider the implementation of the framework in the light of their respective domestic banking systems (BCBS, 2006)

Many countries adopted the implementation of the new Basel II framework, both member and non-member countries. Therefore, the Basel Committee started to work on getting a wider approval and implementation for the new framework. They emphasized the sharing of information between different jurisdictions to allow the approval of different approaches to risk measurement. The Basel Committee issued, during 2006, a guidance on information sharing, and in 2007 the Committee provided an advice concerning supervisory cooperation and allocation mechanism in the light of different operational risk measurements (BCBS, 2015). It's worth mentioning here that Basel II emphasized one important aspect which is the use of internally-generated risk assessments for banks that is necessary to calculate capital requirements. Additionally, the provision of different approaches for the assessment of credit and operational risks depending on the most appropriate approach for bank's operations and the nature of the country's financial market. The Basel Committee emphasized also the importance of the second and third pillars; supervisory review and market discipline, respectively. The role of banks in assessing their capital adequacy and the role of supervisors in evaluating such assessment is essential to complement the first pillar of capital adequacy requirement. In addition to the disclosures required in the third pillar that represent an important part of the framework to ensure that the market discipline will be an integral part of implementing the Basel II framework (BCBS, 2006).

Furthermore; the wide spread of capital arbitrage, as previously discussed, created the need for an important contribution by Basel II. This was the use of sensitive risk weights, that are meant to get rid of any kind of capital arbitrage, such as securitization that was common in the US. Additionally, it requires more

risky banks to hold more equity (Jablecki, 2009). Additionally, Jablecki (2009) argued that the Basel II framework strengthened the bank lending channel. The Basel II Framework is based on three main Pillars as discussed by (BCBS, 2006);

- The First Pillar: Minimum Capital Requirements.
- The Second Pillar: Supervisory Review Process.
- The Third Pillar: Market Discipline.

Therefore; the following sections provide some details of each pillar of the Basel II framework. The basic guidelines of calculating the minimum capital requirements as set by the Basel Committee in pillar I are discussed with necessary details for treatment of different risks; credit risk, operational risk and market risk. Additionally, an overview of the second and third pillars of the Basel framework; supervisory review process and market discipline is also discussed.

3.4.1 Minimum Capital Requirements

One of the most important objectives of Basel II framework is the provision of more risk-sensitive capital adequacy requirements, which was in response to the criticism of Basel I requirements that allowed banks to be exposed to higher risks while trying to improve capital adequacy through capital arbitrage. Therefore, Basel II framework required the inclusion of assets of the holding company, which prevents banks from probable manipulation through transferring their risk to subsidiaries. At the same time this requirement allows the inclusion of risks accompanying the whole group in assessing the risk of different subsidiaries, which is more logical assessment to the inherent risk (Balin, 2008). Therefore, BCBS (2006) stated that the revised framework is intended to include the consolidated entity of internationally active banks, as a way to ensure the integrity of banks with subsidiaries by preventing double-gearing effect. Sbarcea (2014); mentioned that the capital adequacy requirement under the Basel II revised framework kept the same required standard of 8% as a minimum for the capital to assets ratio. However, under Basel II the risk weighted assets should cover three risks; credit risk, market risk, and operational risk. BCBS (2006) defined eligible capital in a very similar way to that of the 1988 Accord. Therefore, the committee defined bank capital, for supervisory purposes, to include a percentage of at least 50% of the core capital or Tier 1 capital that includes equity capital (fully-paid common stock, and non-cumulative perpetual preferred stock), and published reserves from post-tax retained earnings. In addition to the

supplementary or Tier 2 capital that is allowed up to 100% of Tier 1 capital. Additionally, BCBS (2006) allowed banks to employ Tier 3 capital in case the national authorities allowed such type of eligible capital. Tier 3 includes short-term subordinated debt, with an original maturity of at least two years, and is allowed by the Committee in this case to meet only the part of capital requirements for market risks subject to specific limitations; a maximum of 50% of Tier 1 elements, a maximum of 250% of Tier 1 capital intended to cover market risks, that is to say that 28.5% of market risks need to be supported by Tier 1 capital. Moreover; Tier 2 capital may be substituted by Tier 3 capital up to the same limit of 250%. These basic elements for capital provide the basis for calculating the capital adequacy ratios for banks against risk-weighted assets values for credit risk, operational risk, and market risk that are discussed in more details in the following sections.

3.4.2 Capital Charges for Credit Risk

Basel II framework provided three basic approaches to calculate capital charges for credit risk; The Standardized Approach, The Internal Ratings Based Approach, and The Advanced Ratings Based Approach. The basic guidelines of each approach as provided by the BCBS is discussed below.

- **The Standardized Approach**

The Standardized Approach made a clear distinction between different types of bank assets and their accompanied riskiness in order to improve the risk sensitivity of capital requirements. Fixed risk weights are determined for different assets based on external credit assessment by rating agencies. In case a credit assessment is not available; the Standardized approach maintains a 100% credit risk weight, which means a capital requirement of 8%. Additionally, the Standardized Approach provides a preferential treatment, compared to Basel I, to retail exposures, where residential mortgages and other retail exposures receive lower risk weights. Small- and medium-sized enterprises are treated same as retail exposures, having lower risk weights (Cho, 2013). Balin (2008) stated that the Standardized Approach extended the approach used in Basel I Accord for weighting capital through the inclusion of market-based rating agencies. The sovereign debts, which were previously, under Based I, rated according to the classification of the sovereign under OECD, are rated under Basel II according to credit ratings that is determined by authorized rating agencies. The following table illustrates an example of risk-weighting sovereigns

and their central banks under the standardized approach for calculating capital requirements for credit risk.

Table (3.3): Risk weights for Claims on Sovereigns and their Central Banks

Credit Assessment	AAA to AA-	A+ to A-	BBB+ to BBB-	BB+ to B-	Below B-	Unrated
Risk Weight	0%	20%	50%	100%	150%	100%

Source: (BCBS, 2006)

Additionally, at the discretion of national authorities, lower risk weights can be assigned to debts that are denominated and funded in local currency. For example; national authorities have two alternatives under the Basel II Accord for bank debts, which can be used as risk-weighting options. The first option allows risk-weighting for bank debts at one step less favourable than the bank's sovereign. An illustrative example can be of a sovereign that have a credit assessment of (AA-), which implies a risk-weight of (0%) for the sovereign's debt; in the same case a bank in this sovereign will have a risk-weight for its debts of (20%). While the second approach follows a similar process of credit assessment and risk weighting as illustrated in table (3.4). The corporate debt is treated in the same way as bank claims except that the category that includes credit assessment of (BBB+ to BB-) is assigned 100% risk weight, all claims of BB- or lower is rated at 150%, while unrated debt is assigned 100% risk weight, and mortgages are assigned 100% weight for corporate and 35% weight for home mortgages (Balin, 2008).

Table (3.4): Risk weights for Claims on Banks

First Option						
Credit Assessment of Sovereign	AAA to AA-	A+ to A-	BBB+ to BBB-	BB+ to B-	Below B-	Unrated
Risk Weight	20%	50%	100%	100%	150%	100%
Second Option						
Credit Assessment of Bank	AAA to AA-	A+ to A-	BBB+ to BBB-	BB+ to B-	Below B-	Unrated
Risk Weight	20%	50%	50%	100%	150%	50%
Risk Weight for Short-term Claims	20%	20%	20%	50%	150%	20%

Source: (BCBS, 2006)

- **Internal-Ratings Based Approaches**

Basel II framework proposed two Internal-Ratings Based (IRB) approaches for determining capital requirements for credit risk. The main risk assessment inputs for these approaches are; probability of default (PD), loss given default (LGD), exposure at default (EAD), and maturity (M), where (PD) is used to indicate probability that a default will occur, (LGD) is used to indicate the incurred loss of an exposure in case of default, (EAD) is used to indicate the amount of facility that will be drawn in case of default, and (M) is used to indicate the remaining maturity for an exposure (Cho, 2013). The first approach of the IRB approaches is called **Foundation Internal-Ratings Based approach**, under which banks are approved by regulators to provide their own internal risk assessments based on developing their own PD models for risk weighting, while regulators provide the basic assumptions of assets' probability of loss (LGD), bank's exposure to an at-risk asset in case of default (EAD), and assets' maturity risk (M). The second internal-ratings based approach is the **Advanced Internal-Ratings Based approach**, which is similar to the foundation approach except for the fact that banks are allowed to determine their own estimates for PD, LGD, EAD, and M. Therefore, only large banks with more complex systems and higher capacities can implement this approach and put their own assumptions (Balin, 2008 and Cho, 2013).

Rodríguez (2003) mentioned that under the Advanced Internal-Ratings Based approach, banks are allowed to determine their own estimations of PD, LGD, EAD, and M to weight the risk of an asset. However, he mentioned that this option represents a problem due to the possible conflict of interest that might exist in this case. Although banks are considered more aware of their positions to estimate their own risk weights, however bank managers might underestimate assets' riskiness, knowingly or unknowingly, only for the purpose of diminishing regulatory capital requirements. Additionally, bank managers may prefer one approach for calculating credit risk capital charges over another approach only because it presents lower capital. Finally, the cost of implementing the internal-ratings approach for banks and for regulators, who must check the consistency of such systems, might be higher compared to the benefits of lower capital charges for banks, and a more stable banking systems for regulators. Therefore, Rodríguez emphasized the issue of complexity in this framework. On the other hand, Balin (2008) mentioned that the internal-ratings based approaches provide an incentive for banks to have more customers with lower default probabilities by allowing them lower risk-weighting which in turn results in lower reserve

requirements and better bank profitability. Additionally, internal-ratings based approaches promote bank's self-surveillance as excessive risks will cause banks to hold more reserves and hence lower profitability. Internal-ratings based approaches and the resulting better self-surveillance also result in decreasing cost of regulation and supervision through lowering cost of potential legal issues with noncomplying banks. Also the tailored risk weights are in favour of the private sector as the public debts are no longer considered as less risky by default, which helps to eliminate the hidden risks under category-based weights. Consequently, increase lending to the private sector will increase its depth in national economies and promote economic growth.

3.4.3 Capital Charges for Operational Risk

BCBS (2006, p.144) defined operational risk as "the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events'. One point of view by Dierik *et al.* (2005) stated that the new operational risk capital requirement under the Basel II framework is a reflection of decreasing the capital requirement for credit risk and not considered as an additional capital requirement, whereas the main purpose was to achieve the desired equality in capital requirements. In fact, there are three alternative methodologies provided by the Basel II framework to calculate the necessary capital charges for operational risk; the Basic Indicator Approach, The Standardized Approach, and the Advanced Measurement Approaches (AMA). The first two options are more simple that they are based on one proxy of the size and degree of risk in bank operations which is gross income calculated as the sum of both net non-interest income and net interest income of the bank. Additionally, the gross income that is used as an indicator in the calculation of the first two options is not adjusted for fees that are paid for outsourcing providers, as long as the outsourcing is not considered as a desirable option for operational risk mitigation. Also the indicator is adjusted for other irregular items and is smoothed by using three-year average excluding negative annual figures. Then the final step is multiplying the gross income indicator by a regulatory factor to calculate the capital charges.

- **The Basic Indicator Approach**

BCBS (2006) detailed the calculation of the gross income indicator in the Basic Indicator Approach as the average over three-year period, if positive, including any provisions, operating expenses (including fees paid to outsourcing providers as previously mentioned), excluding profits/losses realized from the sale of

bank's securities that are classified as part of the banking book, and excluding extra ordinary items and income from insurance. The regulatory factor for the Basic Indicator Approach is called "alpha" that is multiplied by the total calculated gross income. Based on the previous details, under the Basic Indicator Approach a bank is required to hold a minimum fixed capital charge equals to 15% of the calculated gross income. BCBS (2006) presented the equation of calculating the capital charges under the Basic Indicator Approach as follows;

$$K_{BIA} = [\sum(GI_{1\ldots n} \times \alpha)]/n \tag{3.2}$$

Where;

K_{BIA} = the capital charge under the Basic Indicator Approach

GI = annual positive gross income over the previous three years

n = number of the previous three years with positive gross income

α = 15% factor set by the BCBS

- **The Standardized Approach**

The calculation of the gross income indicator under the Standardized Approach is similar to that of the Basic Indicator Approach, using the average over three-year period, if positive, with similar adjustments. However, the regulatory factor under the Standardized approach is called Beta "*β*". Whereas, a different beta is applied to each category of the eight different categories of gross income determined by Basel II based on their relative riskiness. The eight different categories include; corporate finance, trading and sales, retail banking, commercial banking, payment and settlement, agency services, asset management, and retail brokerage. The average beta is set to equal Alpha "α", in a way that gives a priority to use the Standardized Approach over the Basic Indicator Approach only for banks that rely heavily on business lines with low beta factor such as retail banking. Additionally, the choice of the Standardized Approach by banks is subject to bank compliance with some qualitative factors in the process of managing bank's operational risk (Dierik *et al.*, 2005). BCBS (2006) detailed the calculation of the capital charge for operational risk under the Standardised Approach as the simple average of the three-year capital charges, where each year's capital charge is the average of capital charges for each of the eight previously mentioned business lines for that year. When the aggregate calculated capital charge for a given year is negative, then it is replaced with a value of "0" in the calculation of the total capital charge as illustrated in the following equation;

$$K_{TSA} = \{\sum_{years\ 1-3} max[\sum(GI_{1-8} \times \beta_{1-8}), 0]\}/3 \quad (3.3)$$

Where;

K_{TSA} = the capital charge under the Standardised Approach

GI_{1-8} = annual positive gross income in a given year for each of the eight business lines

β = a fixed percentage, set by the BCBS, of the required capital charge for each of the eight business lines as illustrated in the following table;

Table (3.5): Values of Betas under the Standardized Approach for Operational Risk

Business Lines	Beta Factors
Corporate Finance (β_1)	18%
Trading and Sales (β_2)	18%
Retail Banking (β_3)	12%
Commercial Banking (β_4)	15%
Payment and Settlement (β_5)	18%
Agency Services (β_6)	15%
Asset Management (β_7)	12%
Retail Brokerage (β_8)	12%

Source: (BCBS, 2006)

- **The Advanced Measurement Approaches**

The most advanced methodology for calculating capital charges for operational risk under the Basel II framework is the AMA, which consists of a class of approaches used to calculate capital requirements for operational risk based on bank's internal systems for operational risk measurement. This model has to take into considerations all actual loss data, both internal and external ones, in addition to scenario analyses and other factors of relevance to the overall business environment and internal control system. This model has to be based on one-year time horizon and a 99.9% confidence level in calculation of capital requirements, this is to achieve a statistical soundness comparable to that of the Internal-Ratings Based approach used to calculate capital charges for credit risk. Banks have also to comply with minimum operational risk management requirements under this model. Banks are free to adopt their own approach under this model, given a full consideration of the relevant properties of the model. This approach enhances the ability of banks to mitigate their operational risk capital charges through taking into considerations factors of the overall business environment and internal controls. Consideration of such factors

provides incentives for banks to mitigate their operational risk capital charges through a better risk management for operational risk, through for example providing better internal controls. Additionally, banks are allowed, under the AMA, to mitigate their capital requirements for operational risk through recognising insurance as a risk mitigant for up to 20% of a bank's operational risk capital charge under the AMA. However, certain eligibility standards for the insurance contracts and their providers have to be met for the inclusion of insurance as a risk mitigant (Dierik *et al.,* 2005).

3.4.4 Capital Charges for Market Risk

BCBS (2006, p.167) defined the last measured risk in pillar I of the Basel II framework as the market risk or 'the risk of losses in on and off-balance-sheet positions arising from movements in market prices'. Risks subject to this requirement are four types; interest rate, equity, foreign exchange, and commodity. Different complex methods are used to calculate market risk under Basel II framework. However, a choice between two general methodologies is provided to banks, these two different methodologies are the Standardised Measurement Approach and the Internal-Models Approach. The first approach uses a 'Building Block' methodology in which specific risk and general market risk for debt and equity positions is measured separately. The latter approach is much more complex requiring the bank to use their own internal risk modelling; therefore, the use of such approach is subject to the explicit approval of the supervisory authorities after complying with a set of conditions needed to apply such approach. These conditions are summarized by the BCBS (2006, p.162) as follow;

- Some general criteria relating to the risk management system adequacy.
- Qualitative set of standards used by management for the supervision of using models.
- Guidelines used to specify market rates and prices that have an effect on values of positions.
- Quantitative standards to stipulate some common statistical parameters in risk measurement.
- Stress testing guidelines.
- Procedures to validate the external review of the models used.
- Guidelines for the use of mixed methodologies; standardised and internal-models methods.

➢ The Standardized Measurement Method

The standardised measurement method for measuring market risk deals with four risk types under Basel II framework; interest rate risk, equity position risk, foreign exchange risk, and commodities risk.

• *Interest Rate Risk*

The interest rate risk is any risk pertaining to the bank's holding or taking positions in debt security or any other interest rate-related security including all fixed and floating-rate debt securities and any other instruments behaving like them such as non-convertible preferred shares. The capital charge for this risk type is measured based on different risk types; the specific risk of the instrument and general market risk (the interest rate risk in the portfolio). For the **specific risk** calculation; the capital charge is allocated to cover changes in the price of each individual security. For example, the capital charge for the government category with external credit assessment AAA to AA- receives a risk weight of 0% (BCBS, 2006). The following table provides examples of the capital charges for specific risk calculation for 'government' and 'other' categories.

Table (3.6): Capital Charges for Specific Risk of 'Government' and 'Other' Categories

Categories	External Credit Assessment	Specific Risk Capital Charge
Government	AAA to AA-	0%
	A+ to BBB-	0.25% (residual term to final maturity 6 months or less) 1.00% (residual term to final maturity greater than 6 and up to and including 24 months) 1.60% (residual term to final maturity exceeding 24 months)
	BB+ to B-	8.00%
	Below B-	12.00%
	Unrated	8.00%
Qualifying		0.25% (residual term to final maturity 6 months or less) 1.00% (residual term to final maturity greater than 6 and up to and including 24 months) 1.60% (residual term to final maturity exceeding 24 months)
Other	Similar to credit risk charges under the standardised approach of this Framework, e.g.: BB+ to BB- 8.00% Below BB- 12.00% Unrated 8.00%	

Source: (BCBS, 2006)

BCBS (2006) stated that the calculation of the capital charge for the **general market risk** is intended to cover changes in the market interest rates. Banks will have two options to measure the capital charge under this risk type; the Maturity

method and Duration method. Under the Maturity method long and short positions for debt securities or other interest-rate related exposures are being categorized in a 'maturity ladder' with 13 to 15 time-bands with a risk weight for each time-band intended to weight each position to reflect sensitivity in prices relative to the assumed changes in yield. The following table provides example of the time-bands and weights provided by the BCBS under Basel II framework.

Table (3.7): Time-Bands and Weights under Maturity Method

Coupon 3% or more	Coupon less than 3%	Risk weight	Assumed changes in yield
1 month or less	1 month or less	0.00%	1.00
1 to 3 months	1 to 3 months	0.20%	1.00
3 to 6 months	3 to 6 months	0.40%	1.00
6 to 12 months	6 to 12 months	0.70%	1.00
1 to 2 years	1.0 to 1.9 years	1.25%	0.90
2 to 3 years	1.9 to 2.8 years	1.75%	0.80
3 to 4 years	2.8 to 3.6 years	2.25%	0.75
4 to 5 years	3.6 to 4.3 years	2.75%	0.75
5 to 7 years	4.3 to 5.7 years	3.25%	0.70
7 to 10 years	5.7 to 7.3 years	3.75%	0.65
10 to 15 years	7.3 to 9.3 years	4.50%	0.60
15 to 20 years	9.3 to 10.6 years	5.25%	0.60
over 20years	10.6 to 12 years	6.00%	0.60
	12 to 20 years	8.00%	0.60
	over 20 years	12.50%	0.60

Source: (BCBS, 2006)

Additionally, the Duration method allows banks to design their own methods of calculating sensitivity of prices for each individual position on a separate basis. However, the use of such method needs to be consistent and requires review and approval of national authorities (BCBS, 2006).

- ***Equity Position Risk***

The capital charges that need to be calculated here are to cover any holding or taking of positions in equities or any other instruments that show a similar market behaviour, except non-convertible preference shares covered under the interest rate risk. The same methodology applied for debt securities is applied for equities, therefore the determination of the appropriate capital charge is calculated for two different risk types; the specific risk of holding or taking positions in equities, and the total market risk for holding or taking positions in equities. The specific risk in this case measures the gross sum of all short equity positions and all long equity positions. While the general market risk represents

the net sum or the difference between all the shorts and longs for the equity market. The minimum capital requirement for the general market risk is 8% and the same for the specific risk with the exception of the liquid and well-diversified portfolio is charged by 4% (BCBS, 2006).

- ***Foreign Exchange Risk***

The capital charge that should be calculated here is to protect against holding or taking positions in foreign currencies including gold. However, two different processes are needed here; the first one is the measurement of a single exposure of a currency position, then to calculate the inherent risk for the bank's mix of different currencies positions both short and long ones (BCBS, 2006).

- ***Commodities Risk***

A capital charge is needed to cover for the bank's holding or taking of positions in commodities that include any physical product that can be traded in the secondary market, e.g. precious metals, oil, and minerals. However, gold is not included within this category but it is treated under the foreign exchange risk. Due to the fact that the commodities market is less liquid than other markets such as interest rates and currencies markets, therefore price risk associated with commodities might be more complex and volatile. Additionally, the supply and demand fluctuations might have serious effects on the commodities prices. Three alternative approaches are available under Basel II to measure commodities position risk; the Simplified Approach, the Maturity Ladder Approach, and the Models Approach. However, the first two approaches are appropriate only for small traders with limited business operations, while major traders are more likely to use the latter one (BCBS, 2006).

- ***Treatment of Options***

National authorities will determine the most appropriate way needed to realize the complexities of dealing with options and calculation of price risk associated with options. For banks who do not write options but use only purchased ones, it is expected for them to use The Simplified Approach. However, banks who engage in the writing activity for options are expected to choose one of the intermediate methods; the Delta-Plus Method and the Scenario Analysis Approach, or to use The Comprehensive Risk Management Approach (BCBS, 2006).

- **The Internal Models Approach**

Banks adopting The Internal Models Approach need to seek the approval of supervisory authorities. Banks that engage in major multinational operations will need to seek approval based on a cooperation between the home and host country. The supervisory approval is subject to some general criteria described by the Basel Committee, in addition to some other requirements. **Qualitative standards** need to be determined by national supervisory bodies and are intended to assure the sound and appropriate risk management systems implemented in banks using the models approach to measure market risk. It is also necessary to specify **market risk factors** as part of a sound market risk management system, which means to specify market prices and rates that may affect value of the trading positions for a bank. The Basel II framework provided some general guidelines to ensure the sufficiency of the risk factors to measure the inherent market risk in the on- and off-balance sheet trading positions of banks (BCBS, 2006).

Although banks have flexibility in designing their own internal models for the measurement of capital charges for market risk, however the Basel II framework provided some **quantitative standards** for the capital requirements calculations. Additionally, banks should implement a comprehensive **stress testing** in case of using the models-based approach in the measurement of capital charges for market risk. Stress testing should identify all the events and influences that might affect bank's trading positions and might result in abnormal gains or losses. It was also necessary for the Basel II framework to specify the overall steps and guidelines for **external validation** processes which should provide sufficient guidance for banks to approve or validate the internally generated banks models by external auditors or supervisory bodies (BCBS, 2006).

Under some conditions set by the Basel II framework banks may use **a combination of the models-based approach, to measure some risk categories, and the standardized methodology**. However, banks that started to apply the models approach to one or more of its risk categories are not permitted under the Basel II framework to revert to the standardized methodology unless with recommendations from the supervisory authority to revert. Additionally, Basel II framework set no time limit for banks that use the combined methodology to change to the comprehensive model. Moreover, for the **treatment of specific risk** under the Basel II framework, if a value-at-risk (VaR) measure incorporates a specific risk that meets the requirements for a general

risk models, the capital charge may be based on the modelled estimate. Alternatively, and in case of not satisfying all the necessary requirements, the capital charge may be based on the specific risk charge in accordance with the standardized methodology calculation. Finally, the internally generated risk models need to be validated by qualified parties both after the development stage and in case of introducing major changes to the developed models. Therefore, the Basel Committee provided some **validation standards** that highlight how the validation processes are essential and should be conducted by adequately qualified parties and independent of the development process (BCBS, 2006).

3.4.5 Implementation of Pillar I in Egypt

Balin (2008) mentioned that the negotiations around the implementation of Basel II framework reflected two different perspective where many European members preferred to apply the Basel II framework to all banks, while on the other side there were the United States, Great Britain, and Canada who viewed the best implementation to include large international banks only. Therefore, all the member countries have approved their implementation by late 2008 for large international banks. However, implementation of Basel II showed some slow progress by emerging economies due to the complexity of its approaches on one side, and the lack of appropriate supervisory frameworks in these countries to ensure proper use of such complicated methodologies on the other side, which was the case in Egypt. Therefore, implementation involved only the simplified approaches in Egypt and some other emerging economies. Kaur and Kapoor (2011) also confirmed that smooth conversion to Basel II is proved to be a bit difficult task for some developing countries with the lack of skilled employees and sound risk management structures.

Cho (2013) explored the level of adoption of Basel II framework around the world's financial systems. Cho's results revealed that in Africa only two countries were among the early adopters of Basel II; South Africa adopted Basel II on a comprehensive basis in 2008, and Morocco adopted only the basic approaches in 2007. All other surveyed African countries partially adopted Basel II in later stages, including Egypt who formally announced the adoption of Pillar I of Basel II in 2012. Same applies to the Middle East, with the exception of Kuwait and Qatar who were among the earliest adopters of Basel II, even in the world, as they adopted the basic approaches of Pillar I in 2006. Whereas South Asian countries adopted the basic approaches of Pillar I in 2008 and the advanced approaches were gradually implemented after 2008. Also, Canada were reported

to apply the Basel II since 2007, while the United States have different implementation strategies. Moreover, the main feature of implementing Basel II in the East Asia Pacific region followed the same comprehensive approach and similar time frame of the member countries. Finally, the European Union applied the Basel II in two stages; 2007 for basic approaches, and 2008 for advanced approaches.

Therefore, Egypt is considered among the late adopters of Basel II regulations, which was achieved with the help of the European Central Bank. CBE (2009) mentioned that the Egyptian banking authorities started the first wave of a comprehensive reform program in 2004 that aimed at addressing many points of importance to the Egyptian banking industry. One of the main pillar of this reform program was the enhancement of the supervisory framework of the CBE to ensure better compliance of the risk-focused approaches. Additionally the information systems of the CBE was enhanced to upgrade the supervisory tools of the CBE. Another important pillar of the 2004 reform program was the privatization and consolidation trend to enhance bank capitalization and the restructuring of public banks. Furthermore, the second wave of the CBE's reform program started in 2009 with the main aim of continuing the improvements in structuring banks and development of SMEs, and the continuous enhancement of the banking supervision with a special focus on technological tools that will enable the CBE to apply Basel II regulations to banks operating in Egypt. The CBE believed that the application of Basel II regulations should be an integral part of its reform program for three main reasons;

- Basel II targets major risks affecting banking operations such as credit, operational, and market risks, which enhances the overall financial stability.
- Basel II enhances management of capital and the management of real risks.
- Complying with Basel II international practices enhances the competiveness of Egyptian banks and ensures the elimination of competitive inequality among banking organizations.

Therefore, preparation for the application of Basel II regulations was undertaken under the second wave of the CBE's reform program that was extended up to March 2012. As a part of the plan of implementing Basel II in Egypt; the CBE signed a memorandum of understanding with the European Central Bank, in cooperation with seven other European national banks; National Bank of Romania, Banca d'Italia, Banque de France, Bank of Greece, Deutsche

Bundesbank, Czech National Bank, and Bulgarian National Bank. The agreed program had a duration of three years and was implemented with the help of resident coordinator from the European Union, specifically Banque de France. The program involved capacity building of skilled banking supervisors, wide discussions with banks concerning Basel II regulatory issues through different discussion papers. In addition to quantitative studies aimed at assessing the impact of the application of Basel regulations, improving data collection tools that facilitates the implementation stages through the development of a new data warehouse, and finally the fine tuning of regulations. The program has ended with a decision in December 2012 to start applying Pillar I of the Basel II Accord as a formal requirement for banks in Egypt from December 2012 and June 2013 according to the fiscal year of each bank (CBE, 2016a).

The CBE followed two main principles in the process of Basel II implementation in Egypt; simplicity and communication. The former is very essential to cope with varying range of information and control systems in the Egyptian banking industry; therefore, the standardized approaches of Basel II were the main focus in the implementation of Basel II by the CBE. Additionally, communication is very important for the implementation of the new regulatory system to make all concerned parties aware of the comprehensive system introduced through Basel II Accord. The implementation program by the CBE was intended to take advantage of the previous experience of implementation by other countries in order to tailor the new regulatory framework to the national conditions of the Egyptian economy and the diversity of banks operating in Egypt with different strategies, control systems, and geographical coverage. The program stated from the beginning that the application of the standardized approaches of Basel II will be the most appropriate first step with an intention to work on the development of future implementation plans of further complicated approaches (CBE, 2009).

Similarly, the most recent compliance survey by the Financial Stability Institute (FSI) reported that the implementation of Basel II in Egypt during the recent years focused on the adoption of the standardized approaches for credit risk and market risk and the basic indicator approach for operational risk. However, some adjustments were undertaken by the CBE to tailor the new regulatory framework to the Egyptian banks while still adhering to the basic principles of Basel II. In 2010, a discussion paper was introduced to the Egyptian market including an overview of the internal ratings-based approaches for credit risk and a brief description of both the foundation and advanced internal ratings-based approaches. However, the final regulations in force involved only the

standardized approach. For operational risk, a discussion paper including an overview of the standardized approach as well as the advanced measurement approach was introduced in 2010; however, the final rule in force involved the basic indicator approach only (FSI, 2015).

3.4.6 Supervisory Review and Market Discipline

Dierik *et al.,* (2005) stated that under the supervisory review pillar II of the Basel II framework, the assessment of banks' capital adequacy is based on their own internal risk management methodologies. Supervisors play their major role in assuring the appropriateness of such methodologies to the overall risk profile and business strategies for different banks. The importance of such supervisory review is reflected in the decreasing non-compliance burden, which is the case when banks face different supervisory requirements from different national authorities in different countries. The supervisory process involves also the role of determining the necessity of holding more capital for additional risks that are totally or partially not covered under pillar I of Basel II framework.

Mohanty (2008) explained the main emphasis of this pillar is the empowerment of supervisors to have an active role through early and discretionary intervention to guarantee a country's financial stability that is considered a public good. Therefore, the supervisory review pillar of Basel II framework is based on four basic principles;

1- The availability of processes for each bank to calculate capital adequacy in relation to risk profile with an approach to maintain capital levels.
2- Supervisory authorities should monitor and review banks' processes and approaches to assess and maintain capital levels, in addition to monitoring banks' ability to comply with regulatory capital requirements. Supervisors should take actions against banks with unsatisfactory processes.
3- Supervisors should have high expectations for banks' capital adequacy, that is to say each bank is expected to hold capital levels higher than the regulatory capital.
4- In addition to supervisors' ability to ask for capital ratios that is above the minimum standard, they should also have the ability for quick intervention in case of not complying with the necessary capital requirements.

Kaur and Kapoor (2011) argued that the second pillar of Basel II framework involved all supervisors in the responsibility of managing the specific risks of banks and to evaluate and validate their risk management systems. The role of supervisors to monitor bank's risk profiles is essential to evaluate the need to hold capital levels above the minimum levels and determine the need for any actions to remedy any adverse effects of poor risk models at an early stage. Balin (2008) stated that under pillar II supervisors are entitled to evaluate internal bank models and change them to the simpler models if a bank is deemed unable to control their credit, market and operational risks through their implemented internal models.

The third pillar of Basel II framework deals with the enhancement of market discipline through improving disclosure for banks. Basel II framework provided a set of requirements and recommendations through its third pillar to enhance bank disclosure concerning the calculation of capital adequacy and risk assessment (Mohanty, 2008). Sbârcea (2014) stated that market discipline involves more detailed reporting of information regarding, for example, capital structure, capital adequacy, and risk exposures in regular publications that should be semi-annually for national banks and quarterly for international ones.

Dierik *et al.,* (2005) mentioned that banks have to publish some key data about their business profile and risk management systems as a precondition for their effective working of market discipline, where this requirement is applied for the top consolidated levels for banking groups. Therefore, both quantitative and qualitative information concerning capital structure and adequacy of capital and different risk types should be disclosed. Disclosure for credit risk includes for example data on credit risk mitigation techniques, credit exposures, asset securitization, portfolio structure geographical and sectoral distribution and impaired loans. Data on the use of internal-ratings based approach for credit risk, internal models used for capital charges of market risk, and compliance with operational risk requirements should also be disclosed. Moreover, Balin (2008) illustrated that Basel II framework enhanced market discipline where information concerning capital adequacy and risk management of banks is to be available for the general public not only supervisory authorities. The availability of capital surplus, risk-weighted capital adequacy ratios, and description of risk mitigation provide a way for shareholders to control banks. Therefore, pillar III improves market discipline and provides an additional control tool for shareholders through disclosure requirements and availability of detailed information for the public. Furthermore, Garside and Bech (2003) mentioned that the Basel Committee provided the necessary consistency of its disclosure standards with accounting

standards through coordinated work with the International Accounting Standards Board.

The supervisory review process is an integral part of the work of the CBE that is already in force through supervisory departments within the supervision and control sector in the CBE. The supervisory review process involves both onsite and offsite review processes to ensure compliance of different banks. The internal capital adequacy review process was only introduced in 2013. However, application of final rules for risks not captured in Pillar I of the Basel II, as detailed in Pillar II, is not in force in Egypt. The application of measurements for such risks as the interest rate, concentration, and liquidity risks is postponed to future stages when the application of Pillar I is more established in the Egyptian market. Moreover, the market disclosure is introduced through the requirement to adopt the International Financial Reporting Standards (IFRS) in 2008. In addition to the introduction of corporate governance regulations, in July 2011, providing the detailed principles of necessary tools for monitoring performance, and the introduction of the final rules in force to apply Basel II in December 2012 by the CBE. Therefore, banks in Egypt are now obliged to disclose the calculations of their capital adequacy requirements in the disclosure notes attached to their financial statements (FSI, 2015).

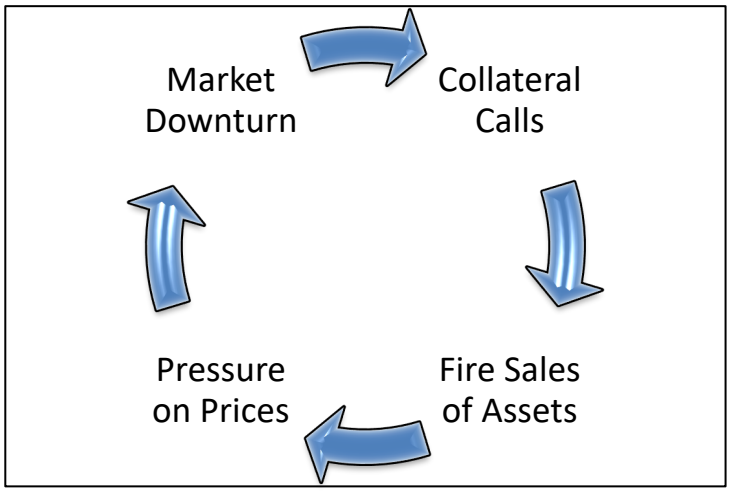
3.5 Basel 2.5

Blundell-Wignall and Atkinson (2010) argued that Basel Regulations failed as the main reference for regulating capital, both through Basel I and Basel II frameworks, and that the world suffered greatly from the Global Financial Crisis which is considered the hardest since the Great Depression. The authors argued that Basel regulations played a major role in the crisis, at least by not being able to stop its effects. Similarly, Resti and Sironi (2010) argued that Basel II framework has been deeply criticized as one of the main reasons for the 2007/2008 Global Financial Crisis. The authors stated that the Basel II framework was not fully effective when the financial crisis originated, however they also believed that the 2007/2008 Global Financial Crisis highlighted important weaknesses of Basel framework. According to Resti and Sironi (2010); these weaknesses include the **quality of regulatory capital.** As the authors stated that the largest banks in Europe, that suffered greatly during the crisis, were well-capitalized according to the regulatory risk-weighted capital ratios, months before the crisis originated, e.g. average Tier 1 capital ratio for large European banks exceeded the minimum required ratio of 4% to achieve around

8% ratio by the end of 2006. Additionally, the complex innovative instruments used as part of the capital reserves proved to be very poor in loss absorption during the crisis. Also, **the capital arbitrage between banking and trading book** is one of the issues that faced banks and was highlighted by the crisis, as some banks faced tremendous capital losses in their trading books related to debt instruments that originally belonged to the banking book. This shifts between the banking and trading books is due to the lower capital requirements specially under the internal model approach. In addition to problems related to pro-cyclicality, managing liquidity and systemic banks; where great financial support was provided by central banks to those banks that were interconnected through interbank market and other credit exposures. Therefore, bankruptcy of those banks was a source of great risk for systemic crisis. The bankruptcy of Lehman Brothers in 2008 was a clear example of the systemic risk in the financial system.

Bessis (2015) discussed the major lessons from the Global Financial Crisis and how the BCBS reacted to those lessons. One of the main problems that materialized during the financial crisis was the liquidity problem. During the crisis; financial institutions refrained from lending as the liquidity problems were major and no one expected who was next to fail, which further deteriorated liquidity problems with the special focus on short-term liquidity during this period. All the financial system was at risk, since the too-big-to-fail hypothesis has not prevented the fourth largest investment bank, Lehman Brothers, from falling in 2008 after operating for around 158 years. In addition to the failure of the AIG company which was the largest insurance company in the world during that time. Central banks tried injecting massive amounts of liquidity through purchasing financial assets; however, they couldn't prevent the liquidity crunch. Moreover, fair value accounting resulted in many assets losing value during this time, whether traded or not. Capital erosion was the expected result of the liquidity problems and loss in value of asset portfolios, which highlighted how the liquidity and solvency problems are part of the same mechanism. Additionally, the market downturn created the need to increasing the values of loan collaterals or decreasing the amount of debts to protect lenders, which provided an incentive for borrowers to sell their assets. Fire sales of assets added to the market turmoil in a pro-cyclical process that created a pressure on asset prices triggering more collateral calls, then fire sale of assets and a new round of market downturn. The following figure summarizes the pro-cyclicality process during the crisis.

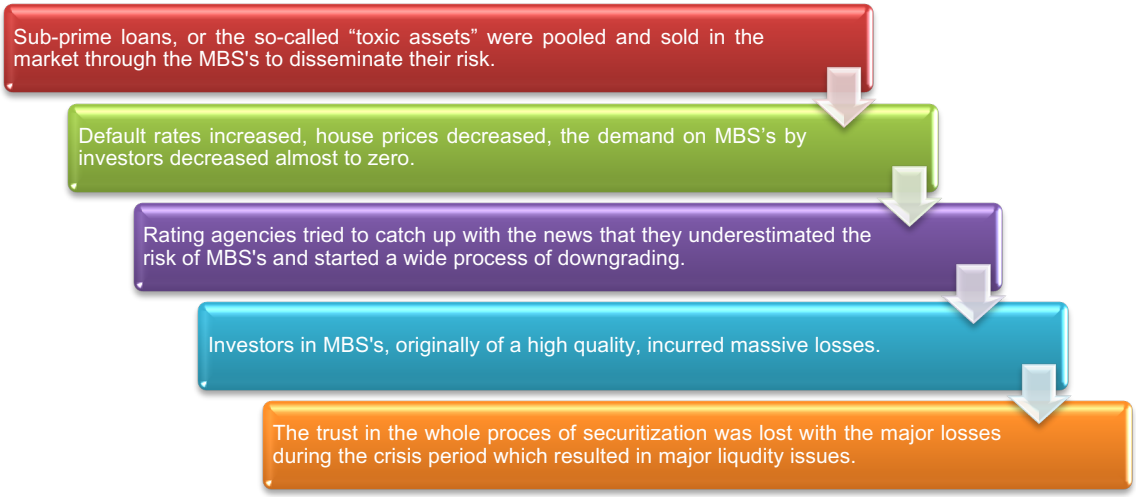
Figure (3.2): Pro-Cyclicality During the Global Financial Crisis



Also, securitization mechanism showed massive growth during the Global Financial Crisis. The simple but very profitable idea of Mortgage-Backed Securities (MBS) spread throughout the financial system through pooling mortgage loans into bonds sold to investors through other institutions (SPVs), as discussed earlier. Massive amounts of mortgage loans were used to create mortgage-backed bonds with billions of dollars, and the number of available houses started to decrease. Therefore, sub-prime loans found their way into the market through providing more flexible mortgage loans with variable interest rates, zero down payment, and no income verification. Banks issued large numbers of these toxic loans and increased their leverage dramatically. As a result, the default rates increased dramatically, while banks used the increase in default rates to issue more mortgage loans using the houses that were defaulted upon. The increasing house prices helped this mechanism to work effectively for banks. The default rates hit the roof with huge increase in the number of available houses in the market; up to the point where the supply of houses dramatically exceeded demand. The major increases in supply of houses put a downward pressure on prices and the prices started decreasing rapidly. Therefore, default rates were increasing and house prices were decreasing; the demand on MBS's by investors decreased almost to zero. The rating agencies started massive waves of downgrading of mortgage-backed loans to catch-up with the news. Investments in these assets caused major problems in liquidity for banks that were very highly leveraged. Investment banks couldn't pay their loans and experienced major losses that exceeded USD 4 trillion for the top five investment banks in USA. Bessis (2015) explained the effect of the securitization mechanism

and how it caused major liquidity problems for banks during the Global Financial Crisis, as illustrated in the following figure.

Figure (3.3): Securitization and Contagion of Credit Risk During the Global Financial Crisis



Following the Global Financial Crisis, the BCBS started some waves of reforms to the regulatory framework aimed at making banks more resilient based on the lessons of the crisis. Therefore, enhancements in the banking regulatory framework were issued through Basel II.5 and Basel III. Getter (2012) stated that the BCBS issued an important amendment to the Basel II framework as a result of the 2007/2008 Global Financial Crisis, this amendment is called Basel II.5. The two documents that are commonly known as Basel II.5 are "Revisions to the Basel II Market Risk Framework" and "Guidelines for Computing Capital for Incremental Risk in the Trading Book". Basel II.5 was mainly intended to better deal with measurement of credit risk in the trading book. Trading books for a bank refer to securities held for trading and not intended to be held until maturity, such securities are evaluated at current market values. On the other hand, securities intended to be held by a bank to maturity are reported at its original book value in the banking book, and can be moved to the trading books if the bank decides to trade these securities before maturity. Basel II.5 dealt with the placements of securities inappropriately in the trading book or the banking book based solely on better accounting treatment at a certain point of time.

Furthermore, BCBS (2009c) stated that the Global Financial Crisis revealed a very important source of risk which appeared due to the inadequacy of the amendment published in 1996 "Amendment to the Capital Accord to Incorporate Market Risk" to measure some risks. Therefore, in 2009, the Basel Committee

issued a supplementary framework to the value-at-risk-based trading framework. These revisions were meant to reduce arbitrage between banking and trading books. Additionally, the Committee added a requirement for stressed value-at-risk. This was in response to observation of high losses in banks' trading books during the crisis that were higher than the minimum requirements. The Basel Committee required banks that measure their trading book capital charges using the internal models approach to measure their general risk capital charges using a 10-day value-at-risk at a 99 percent confidence level and a stressed value-at-risk. The same applies to the calculation of specific risk for banks approved to model specific risks, and an incremental risk capital charges should be calculated to capture default as well as migration risk. Additionally, BCBS (2009b) specified certain guidelines for the calculation of incremental risk charge (IRC) in the trading book. The IRC detailed by BCBS (2009c) incorporated estimating default risk, which refers to direct risk of debtor's default or indirect risk due to a default event; and credit migration risk, direct loss from internal or external change in ratings or indirect loss due to credit migration event, for unsecuritized credit products over a one-year time horizon for capital with 99.9 percent confidence interval.

BCBS (2009a) confirmed that some great enhancements on Basel II framework were finalized in July 2009, which was then published as "Enhancements to the Basel II Framework". The enhancements focused on the area of securitization with a specific treatment of re-securitizations. The enhancements specified a timeframe for banks to comply by 31 December 2010. The enhancements provided for the Pillar I of Basel II required banks that use the Internal-ratings Based Approach to securitization to use higher weights for risks associated with re-securitization exposures. In addition to changing risk-weights for similar exposures under the standardized approach. Additionally, the enhancements to Basel II framework prevented banks from using ratings for exposures based on self-guarantees or similar support provided by the bank, this condition was provided under both the standardized approach and the internal-ratings based approach. For risk-weights of the securitization framework under Basel II, the enhancements required banks to comply with specific operational criteria to make sure that banks will not rely only on ratings provided by ratings agencies.

Moreover, the enhancements included additional revisions that were made to Pillar II of the Basel II framework in order to enhance firm-wide risk management and capital planning processes. While the revised version built on principals of Basel II, the main purpose of such revisions were to deal with problems encountered during the Global Financial Crisis relating to banks risk

management processes. The revisions were intended to help banks and supervisory authorities to better manage and mitigate bank risks that are identified through pillar II, and capture different risks in their internal processes for calculating capital adequacy. The revisions concerning pillar II tackled different points such as; the firm-wide risk, off-balance sheet exposures, risk concentrations, valuation and liquidity risks, reputational risk, sound stress testing and compensation practices. For the third pillar, the Committee revised the Basel II requirements to enhance public disclosure in some weak areas. The revisions enhanced disclosure requirements for banks by requiring continuous disclosure of banks' real risk profiles with the evolvement of the market, in which the bank's responsibility towards market participants was stressed in this concern (BCBS, 2009a).

Additionally, Čihák *et al.* (2012) argued that the 2007/2008 Global Financial Crisis caused a major debate around the appropriateness of bank regulations and supervision as one major cause of the crisis. They argued that the crisis has urged regulators to start changing the regulatory framework to help financial markets persist any future crises. Čihák *et al.* (2012) presented in their paper the World Bank's 2011-2012 fourth and most recent iteration of the Bank Regulation and Supervision Survey (BRSS); that included information of 143 jurisdictions worldwide. Their survey focused mainly on the state of bank regulations during the 2008-2010 period, comparing this period to the pre-crisis period, and comparing countries that were hit by the crisis to other non-crisis countries. The authors found that the crisis countries, as compared to the non-crisis ones, had more flexible capital regulations and lower actual capital ratios. Moreover, crisis countries had less strict regulations concerning non-banking activities, such as insurance and investment banking, in addition to the more flexible treatment of bad loans and loan losses. Finally, crisis countries did not provide good incentives for private sector to monitor bank risks. However, the overall progress of changing bank regulations and supervision in response to the financial crisis was reported to be slow. Some exceptions exist, such as the increased capital ratios, the more generous deposit insurance arrangements, and some bank governance and resolution reforms. An overall conclusion was that crisis countries comprising; United States, United Kingdom, Iceland, Ireland, Latvia, Belgium, Luxembourg, Netherlands, Austria, Denmark, Germany, Kazakhstan, Ukraine, France, Greece, Hungary, Portugal, Russia, Slovenia, Spain, and Switzerland, suffered from weak bank regulations and supervision.

What is worth mentioning here is that the CBE took into consideration all the adjustments made to the capital structure in Basel 2.5 concerning pillar I, and

included it in the final rule in force in accordance with the specified timelines determined by the Basel Committee. However, the CBE preferred to comply with the more conservative requirement of Basel II concerning the single “A” required for eligible guarantors under pillar I that were eliminated under Basel 2.5. Other revisions in pillar II were taken into consideration by the CBE in its draft regulations. The same applies for revisions related to market risk as most of these revisions were related to the internal models approaches that the CBE postponed its application (FSI, 2016). Furthermore, Getter (2012) stated that Basel III was intended to further reform Basel II framework in response to the 2007/2008 Global Financial Crisis. The recent Basel framework provided revisions to the definition of regulatory capital and required higher percentages to be held by banks. In addition to requiring banks to keep larger percentages of cash amongst bank assets, or to keep higher percentages of more liquid assets that are convertible to cash. The following section details some major reforms of the Basel III framework and the phase-in arrangements announced by the G-20.

3.6 Basel III

The Basel Committee recognised the need to strengthen the Basel II framework even after the Lehman Brothers, the 4th largest investment bank in the United States by that time, Collapsed in 2008 after 158 years of operations. Which was considered the largest bankruptcy filing in the United States history with holdings that reached $600 billion. Factors like inadequate liquidity buffer, poor governance and risk management, and too much leverage represented a dangerous combination for the banking sector that was demonstrated by the mispricing of credit and liquidity risk. Therefore, the Basel Committee issued ‘Principles for sound liquidity risk management and supervision’ in September 2008. In the following year the Basel Committee issued a package of documents to improve the Basel II capital framework in an effort to strengthen the regulation and supervision of internationally active banks, especially after the crisis of the financial market (BCBS, 2015).

During 2010, the nature and structure of the Basel III were approved and minimum capital requirements were announced in September 2010 before approving and issuing the new capital and liquidity standards in the Basel Committee’s meeting of December 2010. The approved Basel III standards were set out in ‘Basel III: International framework for liquidity risk measurement, standards and monitoring’ and ‘Basel III: A global regulatory framework for more resilient banks and banking systems’. The new Basel III framework revised and

improved the three main pillars of the Basel II and added some innovations including; additional layer of common equity to protect the earnings payouts, countercyclical capital buffer to reduce losses in credit outbreaks, leverage ratio calculated as the percentage of loss-absorbing capital to total assets and off balance sheet exposures in the denominator, liquidity requirements including minimum liquidity ratios that cover both one month period (liquidity coverage ratio or LCR) and the whole balance sheet period (net stable funding ratio or NSFR), and finally some requirements for supplementary capital, augmented contingent capital and cross border supervision requirements (BCBS, 2015). The following table presents the main reforms of Basel III.

Table (3.8): BCBS Reforms – Basel III

	Capital					Liquidity
	Pillar 1			Pillar 2	Pillar 3	Global Liquidity Standard and Supervision Monitoring
	Capital	Risk Coverage	Containing Leverage	Risk Management and Supervision	Market Discipline	
All Banks	**Quality and Level of Capital** Greater focus on common equity. The minimum will be raised to 4.5% of risk-weighted assets, after deductions. **Capital Loss Absorption at the point of non-viability** Contractual terms of capital instruments will include a clause that allows – at the discretion of the relevant authority – write-off or conversion to common shares if the bank is judged to be non-viable. This principle increases the contribution of the private sector to resolve the future banking crises and thereby reduces moral hazard. **Capital Conservation Buffer** Comprising common equity of 2.5% of risk-weighted assets, bringing the total common equity standard to 7%. Constraint on the bank's discretionary distributions will be imposed when banks fall into the buffer range. **Countercyclical Buffer** Imposed within a range of 0-2.5% comprising common equity, when authorities judge credit growth is resulting in an unacceptable build-up of systematic risk.	**Securitizations** Strengthens the capital treatment of certain complex securitizations. Requires banks to conduct more rigorous credit analyses of externally rated securitization exposures. **Trading Book** Significantly higher capital for trading and derivatives activities, as well as complex securitizations held in the trading book. Introduction of a stressed value-at-risk framework to help mitigate pro-cyclicality. A capital charge for incremental risk that estimates the default and migration risks of unsecuritized credit products and takes liquidity into account. **Counterparty credit risk** Substantial strengthening of the counterparty credit risk framework. Includes; more stringent requirements for measuring exposure; capital incentives for banks to use central counterparties for derivatives; and higher capital for inter-financial sector exposures. **Bank Exposures to Central Counterparties (CCPs)** The committee has proposed that trade exposures to a qualifying CCP will receive a 2% risk weight and default fund exposures to a qualifying CCP will be capitalized according to the risk-based method that consistently and simply estimates risk arising from such default fund.	**Leverage Ratio** A non-risk-based leverage ratio that includes off-balance sheet exposures will serve as a backstop to the risk-based capital requirement. Also helps contain system wide build-up of leverage.	**Supplemental Pillar II Requirements** Address firm-wide governance and risk management; capturing the risk of off-balance sheet exposures and securitization activities; managing risk concentrations; providing incentives for banks to better manage risk and returns over the long term; sound compensation practices; valuation practices; stress testing; accounting standards for financial instruments; corporate governance; and supervisory colleges.	**Revised Pillar III Disclosures Requirements** The requirements introduced relate to securitization exposures and sponsorship of off-balance sheet vehicles. Enhanced disclosures on the detail of the components of regulatory capital and their reconciliation to the reported accounts will be required, including a comprehensive explanation of how a bank calculates its regulatory capital ratios.	**Liquidity Coverage Ratio** The liquidity coverage ratio (LCR) will require banks to have sufficient high-quality liquid assets to withstand a 30-day stressed funding scenario that is specified by supervisors. **Net Stable Funding Ratio** The net stable funding ratio (NSFR) is a longer-term structural ratio designed to address liquidity mismatches. It covers the entire balance sheet and provides incentives for banks to use stable sources of funding. **Principles for Sound Liquidity Risk Management and Supervision** The Committee's 2008 guidance *Principles for Sound Liquidity Risk Management and Supervision* takes account of lessons learned during the crisis and is based on a fundamental review of sound practices for managing liquidity risk in banking organizations.
SIFIs	In addition to meeting the Basel III requirements, global systemically important financial institutions (SIFIs) must have higher loss absorbency capacity to reflect the greater risks that they pose to the financial system. The Committee has developed a methodology that includes both quantitative indicators and qualitative elements to identify global systemically important banks (SIBs). The additional loss absorbency requirements are to be met with a progressive Common Equity Tier 1 (CET1) capital requirement ranging from 1% to 2.5%, depending on the bank's systemic importance. For banks facing the highest SIB surcharge, an additional loss absorbency of 1% could be applied as a disincentive to increase materially their global systemic importance in the future. A consultative document was published in cooperation with the Financial Stability Board, which is coordinating the overall set of measures to reduce the moral hazard posed by global SIFIs.					**Supervisory Monitoring** The liquidity framework includes a common set of monitoring metrics to assist supervisors in identifying and analysing liquidity risk trends at both the bank and system-wide level.

Source: (BCBS, 2011)

As long as the newly agreed international standards need some time to be translated into national legislation, the Committee issued some transitional arrangements, as illustrated in table (3.9), that were recommended for national governments in 2010 to help in the implementation stages of the Basel III. Capital requirements are implemented gradually over a period of five years (2013-2017). Capital instruments that do not qualify as common equity, Tier 1, or Tier 2 capital should be phased out over a ten-year period (2013-2022). The higher minimums for common equity and Tier 1 capital increased from 2% and 4% to 4.5% and 6%, respectively, throughout the period 2013-2015. In addition to the capital conservation buffer ratio of 2.5% that will be imposed progressively throughout the period 2016-2019 (BCBS, 2015).

Table (3.9): Basel III Phase-in Arrangements

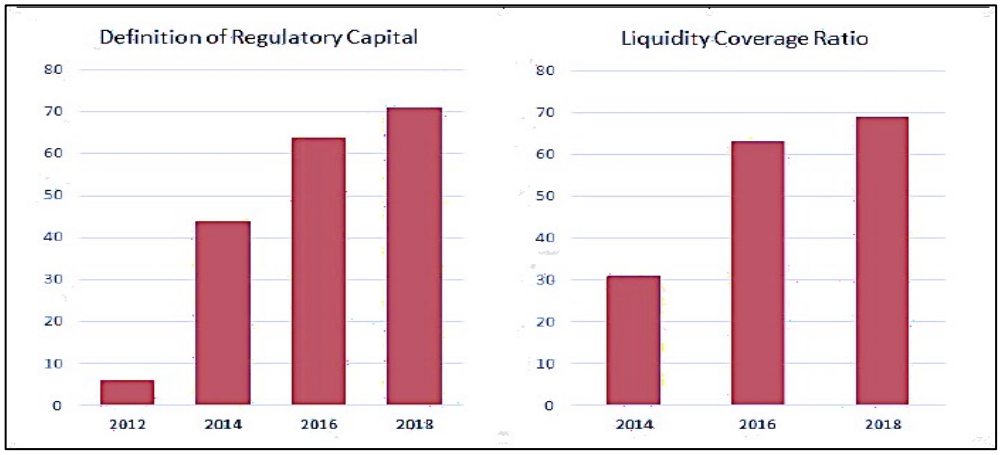
Phases		2013	2014	2015	2016	2017	2018	**2019**
Capital	Leverage Ratio	Parallel Run 1 January 2013 – 1 January 2017 Disclosure Starts 1 January 2015					Migration to Pillar 1	
	Minimum Common Equity Capital Ratio	3.5%	4%	4.5%				**4.5%**
	Capital Conservation Buffer				0.625%	1.25%	1.875%	**2.5%**
	Minimum Common Equity Plus Capital Conservation Buffer	3.5%	4%	4.5%	5.125%	5.75%	6.375%	**7%**
	Phase-in of Deductions from CET1*		20%	40%	60%	80%	100%	**100%**
	Minimum Tier 1 Capital	4.5%	5.5%	6%				**6%**
	Minimum Total Capital	8%						**8%**
	Minimum Total Capital Plus Conservation Buffer	8%			8.625%	9.25%	9.875%	**10.5%**
	Capital Instruments That No Longer Qualify as Non-core Tier 1 Capital or Tier 2 Capital	Phased out over 10-year Horizon Beginning 2013						
Liquidity	Liquidity Coverage Ratio-Minimum Requirement			60%	70%	80%	90%	**100%**
	Net Stable Funding Ratio						Introduce Minimum Standard	
* Including Amounts Exceeding the Limit for Deferred Tax Assets (DTAs), Mortgage Servicing Rights (MSRs) and Financials.								
	Transition Periods							

Source: (BCBS, 2013)

The leverage ratio will be also introduced gradually until 2017. The LCR is introduced gradually, as it began by 60% in 2015 and will continue to increase to

100% by 2019. The LCR requires banks to hold high quality liquid assets to meet short run cash requirements. While the NSFR was introduced by 2018 and will require banks to hold more stable funding sources necessary to cover longer term liquidity mismatches. Moreover, the Regulatory Consistency Assessment Programme endorsed in 2012 was intended to monitor the adoption of Basel III standards by the Basel Committee's members and to assess the completeness and consistency of the Basel III standards throughout its implementation stages (BCBS, 2015). The seventh report published by the BCBS (2016) to update the G20 leaders about the state of the Basel III implementation stated that all the member countries have successfully implemented the risk-based capital standards and LCR. Member countries has made substantial efforts in the way to implement other elements such as the leverage ratio and NSFR. While, many non-Basel Committee members have successfully implemented the core elements of Basel III. Figure (3.2) shows level of implementation of Basel III capital and liquidity standards in non-Basel committee members based on surveys of the Financial Stability Institute (FSI).

Figure (3.4): Basel III Capital and Liquidity Standards Implementation in Non-Basel Committee Member Jurisdictions



Source: (BCBS, 2016)

Only six non-Basel Committee members had adopted Basel III regulatory capital standards in 2012, this number increased to 44 by 2014. For the final implementation of LCR, 31 non-Basel committee members had reported successful implementation by 2014. What is worth mentioning here is that Egypt is also considering the new adjustments proposed by the Basel III framework according to the FSI (2015). The CBE agreed to start applying the capital conservation buffer requirement gradually starting from 2016 with a ratio of 0.625%, until reaching 2.5% in accordance with the Basel III phase-in

arrangements published by the BCBS. Table (3.10) summarizes the policy of the CBE in applying the capital conservation buffer requirement and the total regulatory capital requirements in years 2016-2019. Moreover, the CBE added a regulatory requirement for a leverage ratio of 3% starting 2018. In addition to introducing the minimum LCR requirement starting 2016 with 70% that increased gradually by 10% each year to reach 100% in 2019 which is also consistent with the Basel III phase-in arrangements suggested by the BCBS. The CBE started also applying the minimum NSFR of 100% in an early stage starting 2016 (CBE, 2017). However, until the Egyptian banking sector digests the implementation of pillar I of the Basel II framework, the full application of Basel III standards will be postponed. Additionally, the calculation of counterparty credit risk under Basel III is based on complicated stress period calculations and VaR models that are very advanced to the Egyptian banking sector in this stage. All of these advanced enhancements will be considered by the CBE in the future when internal models approaches are introduced (FSI, 2016).

Table (3.10): CBE's Requirements for Capital Conservation Buffer

	2016	2017	2018	2019
Capital Conservation Buffer	0.625%	1.25%	1.875%	2.5%
Minimum Tier 1 Capital	6%	6%	6%	6%
Minimum Tier 2 Capital	4%	4%	4%	4%
Minimum Total Capital	10%	10%	10%	10%
Minimum Total Capital Plus Conservation Buffer	10.625%	11.25%	11.875%	12.5%

Source: (CBE, 2017)

3.7 Summary

Therefore, this chapter focused on the regulatory framework of banks and the regulatory capital requirements developed by the BCBS in different Basel Accords. The chapter included an introduction on the development of Basel regulations and how the BCBS started its operations that affected the world banking by introducing Basel I. The main framework of Basel I , its implementation, the spread of capital arbitrage under Basel I framework and its effect on the world banking were also discussed. Then, introducing the comprehensive framework of Basel II represented the largest part of the chapter with details of the minimum capital requirements under Basel II presented. In

addition to details of the capital charges for each risk type under Basel II; Credit risk, operational risk, and market risk. This included different approaches for calculating capital charges for each risk type under Basel II comprising the two approaches of calculating capital charges for credit risk; the Standardized Approach and the Internal Ratings-Based Approach. As well as the three approaches used to calculate capital charges for operational risk; the Basic Indicator Approach, the Standardized Approach, and the Advanced Measurement Approach. Lastly, the two approaches proposed by Basel II to calculate capital charges for market risk were also presented; the Standardized Approach with different treatments for interest rate risk, equity position risk, foreign exchange risk, and commodities risk; in addition to the Internal Models Approach.

Furthermore, the chapter discussed the implementation of Pillar I of Basel II in Egypt following the banking reform program implemented by the CBE, with the help of the European Central Bank and other European banks. The chapter discussed how the implementation of advanced approaches of calculating capital charges for credit risk, operational risk, and market risk was postponed in Egypt. The CBE chose to postpone implementation of these approaches, as well as Pillar II and Pillar III of Basel II, until the Egyptian banking fully digests the implementation of Pillar I. The role of simplicity and communication in implementing Pillar I of Basel II in Egypt was also highlighted. Moreover, the chapter highlighted the introduction of Basel 2.5 and the amendments introduced by the Basel Committee as a result of the major lessons from the Global Financial Crisis and its effect on the world banking. Finally, the chapter provided a general background on Basel III, the new amendments included, and the plan adopted by the Basel Committee to introduce the new requirements of Basel III. In addition to highlighting how the CBE considered some of some new reforms of Basel III and started introducing it gradually. Therefore, this chapter provided a general background on bank regulatory framework to help understand different risks facing banks, as well as needed regulatory capital requirements worldwide and in Egypt. In addition to focusing on the Egyptian banking industry and the implementation of different Basel requirements, which provided a good understanding of the potential effect of regulatory requirements on bank performance worldwide and in Egypt. Studying the effect of regulatory requirements on bank performance in different countries will be further discussed in the following chapter more empirically. As well as discussing different theories on bank performance, the effect of different internal and external factors on bank

profitability, and the relationships between credit and liquidity risk in the financial literature.

Chapter.4 Literature Review

4.1 Overview

A sound and strong financial system is very important, especially in times of crises, as it enables investors with investment capabilities to have funds from savers with financial capabilities which will eventually enhance economic growth through facilitating investment opportunities. In this context, studying bank performance, with its two main dimensions; profitability and risk, is an important issue. Better understanding of bank performance, and different factors that have the greater influence on it, helps in facilitating investment opportunities through providing credit as a result of enhanced profitability, and provides regulators with more flexibility in setting required regulatory frameworks (Trujillo-Ponce, 2013). Furthermore, understanding and studying performance of banks, and the main factors that affect it, is a crucial part of understanding the decision making process of the banking system. This is significantly important to country development, as the soundness of the banking industry represents a crucial part of a country's financial system. Therefore, bankers, investors, academics, and government agencies are all stakeholders that pay a great attention to the study of bank performance (Lee, 2015).

Bearing in mind the importance of conducting research in the banking area, provides an incentive for researchers to focus on measuring the effect of different bank-specific, industry-specific, and macroeconomic factors on profitability of banks. In addition to studying bank risk as an important dimension of bank performance and interrelationships among different bank risks. Therefore, most of the previous studies highlighted the importance of studying the impact of these factors on bank profitability in many countries, and also studied different bank financial risks. However, there is a different case in Egypt, where good researches that studied bank performance are very rare. Which imposes the need for a critical review of the previous literature that studied bank profitability and its most important determinants and key financial risks. This chapter will cover the relevant literature, with a focus on the most recent literature in bank performance. In doing so, it will provide a critical review of previous studies that investigated different bank-specific and industry-specific, and macroeconomic variables that can affect bank profitability; in addition to studies that investigated bank financial risks and its key interrelationships.

Performance management is a totally different concept than performance evaluation, however they have always been mistaken as two terminologies for the same concept. In fact, both concepts are related but are not exactly equivalent. Performance management is a tool of improving the desired outcomes from business organizations, or individuals through applying a certain planned framework of strategies, goals, and some tactics required to achieve these goals. Therefore, it can be said that performance management is considered to be a systematic process for improvement. However, performance evaluation is only part of the process that is mainly concerned with measuring past performance (Armstrong, 2006). Rose and Hudgins (2013) stated that performance of financial firms has two main dimensions; profitability and risk which are considered as the main goal of any financial institution; that is to achieve the maximum shareholders' value at the lowest possible risk.

Financial ratios such as net interest margin (NIM), return on assets (ROA), and return on equity (ROE) are considered accounting-based measures for bank profitability, that are commonly used in previous literature. However, there are three sets of commonly used measures of bank profitability, accounting-based measures, market-based measures, and economic-based measures. Ommeren (2011) stated that the traditional accounting-based measures such as NIM, ROA, and ROE are measures of profitability of banks which can be obtained from publicly available data, except for some developing countries which have a low transparency level. However, some other studies used market-based measures of profitability; such as that discussed in the study conducted by Siddiqui and Shoaib (2011) where they used Tobin's Q (TQ) ratio as a measure of bank efficiency. In their study, they calculated TQ ratio by the market value to book value ratio for banks. Moreover, they followed other researches who used accounting-based measures of bank profitability and they used two accounting-based measures of bank profitability, ROA and ROE in addition to the TQ ratio as one market-based measure of bank financial performance. While Trad *et al.* (2017) used two measures of profitability indicators in their study of Islamic banks, as compared to conventional ones in 12 different countries. These measures included; ROA as measured by net returns over total assets and ROE as measured by net returns over total equity.

Pasiouras and Kosmidou (2007) discussed ROA in their study as the most commonly used measure of bank profitability in the financial literature. In the same line, Trujillo-Ponce (2013) stated that ROA and ROE are the most known measures for bank profitability in the banking literature. The author considered ROA as the single most used measure of bank profitability, that it is used to

measure operational performance and managerial efficiency. Pasiouras and Kosmidou (2007) mentioned that ROA usually measures business operational performance and efficiency by calculating how much return will be earned to each one dollar invested in assets. Similarly, Djalilov and Piesse (2016) stated that ROA measures bank management's ability to generate profits using each dollar of assets; however, it might be biased due to off-balance sheet activities. Therefore, it can be considered that the major disadvantage of ROA is the exclusion of off-balance sheet (OBS) assets from the calculated percentage. Where returns from OBS activities are included in the numerator of the ratio, and the OBS assets are not included in the denominator. It can be said that ROA has an upward bias because of excluding OBS assets in its calculation (Goddard *et al.*, 2004; and Trujillo-Ponce, 2013). The calculated ROA can include the average total assets in the denominator as suggested by Kosmidou (2008) who used the return on average assets to measure bank profitability, as the average term is used to capture the differences in assets during the fiscal year. She also used net profit after tax in the numerator of the ratio. While Trujillo-Ponce (2013) calculated ROA using the pre-tax income over average total assets. Trujillo-Ponce suggested the use of the pre-tax income in the numerator to avoid distorted conclusions related to the taxing system.

On the other hand, the European Central Bank (2010) argued that ROE is considered to be the most practiced measure of profitability. Additionally, Siddiqui and Shoaib (2011) used ROE as a measure of the firm efficiency and profit maximization. While Trujillo-Ponce (2013) stated that ROE is used to measure the return on stockholders' funds and is calculated using the pre-tax income in the numerator and the average total assets in the denominator. In spite of this, the main disadvantage of ROE is that it ignores financial leverage and also the effect of regulations on financial leverage (Dietrich and Wanzenried, 2011). Ommeren (2011) stated that the inclusion of the profit that is generated from debt financing in the numerator of the ratio with the exclusion of these sources of fund in the denominator leads to a bias in the ratio. Which is evident in case of banks that rely mainly on generating profits from its debts, these banks will report higher performance than those with less reliance on debt financing and more reliance on their own capital structure and equity finance.

Another measure of bank profitability that is used in the banking literature is the TQ. Which was originally developed by James Tobin, a Nobel prize winner and a professor at Yale University, and William Brainard in 1968. The ratio was developed based on the assumption that the firm should be worth what it takes to replace its assets. Therefore, the ratio is measured by the firm's market values

of outstanding shares to the replacement cost of its physical assets (Ali *et al.*, 2016). Morck *et al.* (1988) used TQ as a market-based indicator of the firms' performance, where they stated that the TQ measure is employed as the most common measure of a firm's market value that can be used as the basis for maximization of wealth. The higher the value of TQ results in the possibility of issuing more stocks to raise more capital and to raise value of the firms' assets. Similarly, Siddiqui and Shoaib (2011) used TQ as a measure of the market value of the firm and wealth maximization. Additionally, Ali *et al.* (2016) used TQ ratio as a measure of bank performance in their study, where they calculated it as the market value to book value of the banks included in the analysis. They used TQ to evaluate bank performance from the investors' point of view and to measure the market value of a bank's shares in relation to the replacement cost of its assets.

In addition to this, Saona (2016) discussed another measure of bank profitability which is NIM. Saona (2016) stated that the initial research that investigated factors determining bank profitability used NIM as the main measure of bank performance. Saona (2016) used an ex-post measure of NIM through calculating the interest spread or the difference between actual interest revenue and actual interest expense. The use of ex-post is different from the ex-ante measure by the loan defaults. The ex-post spread is preferred to the ex-ante as it controls for the fact that banks with high yields and risky credits are more exposed to face loan defaults. Similarly, Goddard *et al.*, (2004) indicated that NIM calculates the ratio of net interest income to total assets. According to the authors, this measure helps in overcoming the bias that might result from OBS activities by including some but not all of the returns that are generated from OBS activities. However, neglecting some returns that are generated from non-core banking activities may result in imperfect results. As these activities are considered of a major importance for banks' earnings. Therefore, this creates a serious bias to the use of NIM for measuring bank profitability that is the exclusion of income that can be generated from non-core banking activities.

Moreover, determinants of bank profitability were discussed by Djalilov and Piesse (2016) who confirmed that future financial and economic development strategies can be enhanced through the kind of research that investigates the determinants of bank profitability; that are mostly considered as bank-specific, industry-specific, and macroeconomic factors. Djalilov and Piesse (2016) stated that most of the existing literature examined both internal or microeconomic and external or macroeconomic determinants. The first group is mainly linked to internal management and strategies, while the second group is related to the

external environment, both institutional and economic environments within which banks operate. Likewise, Ommeren (2011) stated that banks' profitability can be affected by bank-specific, industry-specific and macroeconomic variables. The bank-specific variables are controllable, whereas the industry-specific and macroeconomic variables are difficult to be controlled by managers in a bank and so they are external factors. Also, Trujillo-Ponce (2013) stated that the main determinants of bank profitability can be grouped into the bank-specific factors, that are mainly related to internal management decisions, and the industry-related and macroeconomic factors that are related to external factors. Trujillo-Ponce (2013) included in the first group of internal determinants; capitalization, size, financial structure, revenue diversification, asset quality, efficiency, and asset structure. While inflation, economic growth, industry concentration, and interest rates were included in the second group.

In the same line, Kosmidou (2008) indicated that the factors affecting the performance of banks can be generally divided into internal and external. The internal ones are those subject to management decisions and policy objectives. While the external ones are those related to macroeconomic and industry conditions. Therefore, it can be concluded that the financial literature discussed internal determinants of bank profitability; bank-specific, and external determinants; industry-specific and macroeconomic. Bank-specific and industry-specific factors discussed in previous studies included variables such as; bank risks, capital adequacy, bank size, asset quality, asset structure, financial structure, funding costs, business model of a Bank in Measuring Non-Interest Income or revenue diversification, operational efficiency, bank liquidity, concentration, operating leverage, intermediation, market growth, and operating expenses management. While macroeconomic factors included variables such as; GDP, Inflation, interest rates, and money supply. Previous studies like; Bashir (2001), Pasiouras and Kosmidou (2007), Bagheri (2007), Kosmidou (2008), Athanasoglou *et al.* (2008) Dietrich and Wanzenried (2011), Ali *et al.* (2011), Trujillo-Ponce (2013), Saeed (2014), Ghodrati and Ghasemi (2014), Lee (2015), Pervan *et al.* (2015), Saona (2016), Djalilov and Piesse (2016), Trad *et al.* (2017) and Ahamed (2017) among others, explored these determinants in their models.

Moreover, bank risks are amongst the most important factors that affect bank profitability as discussed in different previous studies. Ansell and Wharton (1992) defined risk as "any unintended or unexpected outcome of a decision or a course of action", which is a very important concept in today's business environment, that can be perceived to be more changing, volatile and characterized by the existence of different complicated variables. Lawrie *et al.* (2015) argued that the

business environment surrounding the firm makes it more difficult to predict changes and risks, which puts more pressures on the regulatory framework and management functions. Therefore, regulators are always struggling to improve corporate governance in general through passing new legislations with particular focus on the management of risk in an attempt to keep tracing today's changing business environment. Moreover, Likierman (2007) argued that risk assessment is involved in most aspects of any organization's operations from the highest levels of decision making all the way to detailed operational decisions. It can be argued that greater returns can be expected from investing in some new business ventures, or in parts of the world subject to some political instability conditions, than investing in more established and stable business environments. Therefore, judgments about performance shall be incomplete in these cases, as risk rarely figures when performance is measured. Furthermore, Calandro Jr *et al.* (2008) stated that risk management's popularity has grown lately because of the recognition of how important the management of risk is and how it is strongly linked to managing performance. A key issue of managing risk is evaluation of performance in a way that considers the relative volatility in business operations, which makes risk an important dimension of performance.

Therefore, it can be argued that a primary objective of business organisations in today's fast evolving and competitive business environments is the maximization of organisational returns at a reasonable risk, or with the minimum possible risk taking. However, this task is not so easy and many risk/return models do not help much in achieving this objective (Calandro Jr *et al.*, 2008). Also, it can be claimed that systems used to manage performance at broad level have much in common with proposals for best practice risk management processes which also implies the importance of risk in managing performance (Lawrie *et al.*, 2015). Therefore, the importance of risk measurement for improving performance is very clear. As long as the need for economic development continues to increase, different organisations will be exposed to a great amount of increasing risks, which poses more challenges (Charles, 2013). Therefore, academic research should focus more on investigating different risks as one important dimension of managing performance.

Likierman (2007) described the links between performance and risk from three different perspectives; the first deals with risk in assessing the overall company performance, the second sets out internal risk management to improve performance, while the last discusses the links between risk and rewards for individuals. The first perspective's main concern is assessing the overall company performance while incorporating risk in an appropriate performance

measure. This is one way to take account of risk, such as calculating risk adjusted return on capital. While the second perspective identifies risk management as the key element in determining the management quality. This perspective argues that a good manager should be more capable of managing different risk types, e.g. vulnerabilities and opportunities in strategy and budgeting which can be identified in light of risk (e.g. Monte Carlo simulation of creating risk portfolio), incorporation of risk in setting targets and measuring performance (e.g. balanced scorecard with its incorporated risk indicators) and the identification of the probability and effect of risk in continuing operations. Lastly, the third perspective can be reflected in an approach for remunerating executive directors under which the interests of shareholders and executives have to be aligned through incentives and rewards, which should be done in a way that allows risk to be assessed, and managed. This approach reflects the relationship between risk and individual reward.

In the same line, Santomero (1997) stated that banks are In-the-risk business because they assume different types of risks while providing their vital financial services. Accordingly, bank risks are generally categorized as one of the following six categories: systematic or sometimes called market risk, counterparty risk, credit risk, plus those risks concerning liquidity, operational, and legal risks. Each type of risk has its own characteristics and methods of calculations and management according to its importance and effect on banks' performance. Santomero (1997) mentioned that the risk of changes in assets value that is linked to systematic factors is called systematic risk. This systematic risk, that is usually defined as market risk, can't be totally diversified but can be hedged. Additionally, Santomero (1997) declared that counterparty risk is another risk type that is usually the result of non-performance of trading partners, which might happen in case of the existence of some systematic factors, or political and legal constraints that lead to adverse price movements. However, diversification can be utilized for controlling non-systematic counterparty risk. Also, Santomero (1997) argued that individual operating problems are considered to be one type of risks that affect organisational performance even if it has a minor probability of occurrence. Therefore, operational risk arises mainly because of some problems concerning processing and settling trades for cash in an accurate way; in addition to risks in recordkeeping, compliance with regulations, and processing system failure.

Generally speaking, different types of risks can be grouped into operational and financial risks in the way they affect different business organizations. Operational risks are those risks related to the investment opportunities of the firm and level

of uncertainty the firm is exposed to. However, financial risks are those risks that affect the financial performance of companies, these risks are sometimes called market-wide risks (Adarkwa, 2011). Therefore, the source of risk represents the main difference between both risk types, where losses that result from financial variables are considered to be a source of financial risk, and losses that arise from operational activities are considered to be a source of operational risk. According to Badea *et al.* (2010); financial risks are comprised of credit risk, liquidity risk, and market risk (currency risk and interest rate risk). Therefore, Djalilove and Piesse (2016) concluded that two types of risks are commonly addressed as major risks affecting bank profitability in previous studies; these risks are credit and liquidity risks. The two risk types are very important to bank profitability, especially under cases of uncertainty. Hence, it can be concluded that one important factor that affects bank operations is the management of financial risks, namely credit and liquidity risks, as the main risks affecting bank performance.

Previous studies examined the relationship between liquidity and credit risks and how their interaction could affect bank stability, such as Goldstein and Pauzner (2005), Cai and Thakor (2008), Acharya *et al.* (2010), Gorton and Metrick (2012), Acharya and Viswanathan (2011), and Acharya and Mora (2015). All of these studies investigated this issue from various points of view and they derived, mostly from a theoretical perspective, conclusions showing mutual effects between credit and liquidity risks and how this interaction might affect bank stability. However, there are only isolated papers that take both risks into account when modelling bank risk. Diamond and Rajan (2005) adopted the idea that banks obtain money from the unskilled depositors which is then used for lending, while problems may arise when many economic projects that are funded with loans yield insufficient funds and the bank cannot meet depositors' demands. Consequently, this asset deterioration will lead more depositors to claim back their money; as a result, the bank will call in loans, therefore reducing the aggregate liquidity in the market. Therefore, a higher credit risk is accompanied with a higher liquidity risk through depositors' demand. The positive relationship between credit and liquidity risks have been approved by some other researches like Acharya and Viswanathan (2011), and Gorton and Metrick (2012).

Moreover, Acharya and Viswanathan (2011) further explained in their model why the building up of leverage in times of good economic conditions can lead to asset shocks and lack of liquidity in times of bad economic conditions. The higher the amount of debts in the banking sector, the higher the probability of occurrence of bank run risk, especially during crises times. This is mainly due to

the deterioration of asset prices and the increased difficulty for banks to use debts to finance assets during this time. However, Gorton and Metrick (2012) discussed the relationship between liquidity and credit risks from a different perspective. Their empirical analysis suggested that in the (2007/2008) financial crisis, a substantial increase in funding haircuts and refinancing rates in the interbank market occurred due to the perceived credit risk that was mainly represented by subprime loans. Although investors had no idea about the actual subprime risks that were facing banks, the fear for investments resulted in severe liquidity problems for banks because market for short-term funding dried up due to higher repo rates and haircuts. Their research illustrated how the perceived credit risk can lead to liquidity risk in banks as opposed to actual credit risk.

Others might argue that instability might be caused by increases in the liquidity of bank assets. This is because banks would benefit from more liquid assets in boosting the sale of assets during crises times; however, crises become less costly in this case and banks wouldn't be much keen to prevent crises from happening (Wagner, 2007). Similarly, Acharya *et al.* (2010) built their work on the empirical evidence that cash holdings of banks increased steeply during the recent financial crisis. Their model viewed liquidity holdings as an ex-ante strategic choice for active bank management, so that they could purchase assets of other banks at fire sale prices during times of economic distress. Therefore, the relationship between liquidity and credit risk is negative. Furthermore, Acharya and Naqvi (2012) explained that in times of crises households and corporate depositors perform what is called a "flight for quality". This term refers to the act of depositing assets in banks by households and corporate clients, which leave banks flushed with some cash that reduces the "quality" and also their monitoring of new and existing borrowers. Therefore, they concluded that liquidity and credit risk do not move together as banks with higher liquidity may have loan portfolios that are fully loaded with some bad loans. Therefore, it can be concluded that credit and liquidity risks have some ambiguity concerning their relationship. Therefore, the inconclusive results pose the need for more empirical investigations in different contexts to draw more practical conclusions about causal relationships and implications of the interaction between both risk types.

4.2 Relevant Theories

This section will present some of the theories related to bank performance and its main determinants. Measuring bank profitability is based on accounting-based measures in most of the previous studies, such as; ROA, ROE, and NIM.

However, some other studies used market-based measures of bank profitability such as TQ; originally developed by James Tobin and William Brainard in 1968. One important theory that can be mentioned here to explain this market-basde measure is ***the investment behaviour theory, or the general equilibrium theory, or what is sometimes called the Q theory,*** stating that if the value of TQ is equal to one, the firm is fairly valued in the stock market. Alternatively, if it is less than one, this means that the value of the firm's assets is more than the fair market value of the firm and the firm is better off selling its assets. In case the ratio is greater than one, this means that the firm is overvalued in the market and it would be a wise decision to put more investments in this firm (Ali *et al.*, 2016).

Moreover, according to Imbierowicz and Rauch (2014), explanations for banks' inherent risks and return sources can be shown through two common research perspectives; the first one is the ***Classical Financial Intermediation Theory***, that is adopted mainly by models of Bryant (1980) and Diamond and Dybvig (1983). The second one is the ***Industrial Organization Approach*** that is well known in the Monti-Klein model of banking organizations. The first perspective is the Financial Intermediation Theory that models banks as pools of liquidity providing depositors and borrowers with the cash needed, which helps to enhance economic welfare and also to internalize economic liquidity risk. While, the Industrial Organization Approach models banks as profit-maximizing price takers in the oligopolistic markets of loans and deposits. Banks will have an upward sloping demand in case of deposits, with respect to increasing interest rates, and a downward sloping demand in case of loans. On the asset side, banks can generate returns through interest from loans; while on the liabilities side, banks incur interest on deposits. These two models are used in the financial literature to refer to the existence of a relationship between liquidity and credit risk at least in theory. However, there is some ambiguity concerning the direction of the relationship. Both credit and liquidity risks would be positively correlated at least in theory. It can be found that the theoretical Financial Intermediation literature supports this hypothesis (Imbierowicz and Rauch, 2014).

Moreover, previous studies referred to other theories related to the effect of different factors on bank profitability to support their findings. Examples include Important theories that support the positive relationship between bank profitability and bank capitalization. Trujillo-Ponce (2013) and Saona (2016) referred to two theories to support the positive relationship between capitalization and profitability of banks, which are; the ***Expected Bankruptcy Cost Hypothesis and the Signalling Hypothesis***. Similarly, Saona (2016) explained

that the Signalling Hypothesis is a forward-looking hypothesis that supports the positive effect of capitalization on bank performance based on the assumption that managers will be willing to signal good future prospects and ability to generate better cash flows. Therefore, banks with good future prospects are expected to report lower debt or higher capitalization in their financial statements. Additionally, the Expected Bankruptcy Cost Hypothesis supports the same view based on the assumption that banks which expect bankruptcy costs to increase as a result of some external factors tend to increase their capitalization as a protection against default. In the same way, Trujillo-Ponce (2013) argued that there is consensus in the banking literature that the increased proportion of a bank's own funds relative to total assets, enhances the bank's solvency and enables the bank to decrease the cost of external debt in a way that offsets the high cost of equity, and enhances profitability as a result.

Berger (1995) also explained the bankruptcy cost hypothesis and the Signalling Hypothesis that support the positive impact of capitalization on profitability in details. He described them as the most plausible and interesting theories about the positive relationship between capital and earnings. First, he defined the bankruptcy cost as the probability of bank failure times the liquidation costs incurred in case of failure. The increase in the probability of bank failure increases the expected bankruptcy costs, as a result banks will be willing to increase their capital ratios to decrease their probability of failure and the expected bankruptcy costs. Berger explained that expected bankruptcy costs will increase unexpectedly when there is an increase in the probability of failure in the banking industry; therefore, capital adequacy for banks will need to be improved, and those banks that will succeed in increasing their capital adequacy will have better performance through a decreased interest rate on unsecured debts. Moreover; the alternative theory, which is the Signalling Hypothesis, refers to the situation when good future performance is expected, then bank management can signal good future expectations about better cash flows, better revenues, lower costs, or lower risk. Management might be able to signal this information through capital decisions, and it is less costly for "good" banks to signal good future performance through higher capital than "bad" banks. Therefore, a signalling equilibrium in this case means that banks with good future prospects will have higher capital.

While Saona (2016) showed that profitability increases with increases in capitalization up to a certain critical value, then its starts to deteriorate. The positive impact is supported by the Expected Bankruptcy Cost and the Signalling Hypotheses, while the negative impact is supported by the decrease in tax

subsidy on interest deductibility and by ***the Efficiency-Risk Hypothesis***. The Efficiency-risk Hypothesis supports the negative relationship between capitalization and profitability based on the ability of efficient banks to withstand financial destress in case of resorting to higher debt and lower capitalization. Therefore, the negative impact of increased capitalization will be evident in case of inefficient banks due to the choice they make to resort to more capital and lower debt to avoid higher risk that they can't handle. In this case it's expected that the risk will be lower and the return as well, indicating a negative impact on bank profitability.

Another important factor that affect bank profitability is the industry concentration, which was measured in previous literature as the assets of the five largest banks in the industry to the assets of all commercial banks, or using the HHI. However, the effect of industry concentration on bank profitability is either positive or negative in previous studies. What is interesting concerning the positive effect of concentration on bank profitability is that it was discussed in the literature in the light of two important hypotheses; ***the Structure Conduct Performance (SCP) Paradigm or the Market Power Hypothesis, and the Efficient Structure Hypothesis***. Examples of studies that considered these hypotheses include; Trujillo-Ponce (2013), Djalilov and Piersse (2016), and Saona (2016). The SCP hypothesis suggests that a more concentrated market is associated with high profitability since banks with high market power are more capable of earning higher returns. The Efficient Structure Hypothesis states that when banks are more capable of managing their costs more efficiently, higher efficiency will enable banks to increase their market share which will enhance profitability. One important macroeconomic factor that affect bank profitability is the growth of a country's money supply, which measures the growth of the amount of money in the economy of a country and is determined by central banks. One theory that is used in previous studies to support the effect on money supply on bank profitability is the ***Quantity Theory of Money***, which tates that changes in the economy's money supply affects the nominal GDP and price levels, and it is affected by behaviour of households who hold the money and banks within which the money is held. Therefore, growth of money supply is expected to have a positive impact on bank profits.

4.3 Internal Determinants

4.3.1 Credit Risk

Heffernan (1996) identified credit risk as the inability or delay in serving bank's loans which results in a decrease in assets' present value and consequently deteriorates bank solvency. In the same line, credit risk was defined by Fischer and Jordan (1996) as the potential failure of a counterparty or a borrower to satisfy bank's obligations when due. They also explained that the general objective of managing credit risk is to maximize banks' return and improve bank profitability through maintaining credit risk exposure within predetermined limits. Therefore, credit risk management of a bank's credit portfolio in addition to managing individual transactions is an essential task for banks. Also, Santomero (1997) indicated that credit risk can arise from a borrower's inability or unwillingness to perform. This may have an impact on the lender holding contract of the loan, in addition to other lenders to the creditor. Consequently, it really matters for a bank to be aware of the borrower's financial condition and value of collateral as deviations of the performance of a portfolio from expectations are considered a source of real credit risk. Additionally, Santomero explained that credit risk cannot be eliminated but can be diversified because of the existence of default risk that comes up mainly form systematic risk.

Additionally, Liuksila, (1996) mentioned that banks are usually facing a great difficulty in case of deteriorating loan quality. Thus the management of credit risk exposure effectively is a vital part of any comprehensive risk management approach, in addition to its importance to the long-term success of any bank. Liuksila (1996) also discussed the improvement of credit risk management for banks through investigating the relationship between credit risk and bank profitability to highlight different indices that should be taken into consideration while developing a comprehensive risk management approach for any bank. Therefore, a good understanding of the basic concepts of performance and risk management is required to study the effect of credit risk, as one of the most important types of financial risks, on bank profitability. Moreover, Bessis (2002) stated that credit risk can result in major problems for banks as the default of bank's major clients can result in large losses which may lead to insolvency. Giesecke (2004) also confirmed that credit risk is considered to be the most important financial risk of any bank and the success of the bank is a function of how the bank monitors and manages its credit risk than any other risk type. In

addition to the great influence of efficient and precise credit risk management on the success of any bank business compared to other types of risk. Badea *et al.* (2010) stated that financial risks are comprised of liquidity risk, credit risk, and market risk, and they also stated that credit risk is considered by many studies in the literature as the most important type of financial risks that affect bank performance. Similarly, Driga (2012) indicated that credit risk is inherent to banking operations when dealing with any of bank customers including corporate or individual customers, as banks face credit risks in trading, lending, investing or even mediating between clients and other parties. Also, it can be claimed that the main source of credit risk may arise in case of lending to borrowers based on inadequate information about their credit worthiness (Kolapo *et al.*, 2012). Therefore, Afriyie & Akotey (2017) explained that credit risk management is carefully planned to manage uncertainty through undertaking risk assessment, which is then used to develop strategies needed to manage and mitigate the assessed risk using managerial resources. Strategies of credit risk management adopted by banks may involve avoiding risks, transferring risk to other parties, and reducing or accepting some of the negative influence of risk.

Furthermore, Kosmidou (2008) illustrated that poor asset quality means higher credit risk and it may have negative effects on bank profitability resulting in low interest income and higher provisions cost. Kosmidou (2008) explained that loan loss reserves represent the stock that accumulates over time from new provisions assigned by the bank. Provisions is subtracted from net profit before provisions, extraordinary items and taxes. After deducting provisions, extraordinary items and taxes, the result is the net profit after tax which is the numerator of the profitability measure. Which means that provisions can be used to smooth out profits. Banks can use provisions to lower the profit variability by charging higher provisions while loan quality and net profit are high. This results in less provisions needed in case of deteriorating loan quality or bad economic conditions. Therefore, she measured the asset quality of banks in her study by the ratio of loan loss reserves to gross loans. The higher the proportion of the loan loss reserves the lower the quality of assets as the ratio represents the amount provided for but not charged off in the loan portfolio. Higher ratios mean lower quality and higher credit risk. Although the risk-return hypothesis might indicate positive relationship in this case; however, lower quality leads to less interest income and more provisions cost and lower profitability. This implies a negative association between this variable and bank profitability. In her results, the asset quality or the credit risk variable measured as the ratio of loan loss

reserves to gross loans proved to be significant and negatively affecting bank profitability.

Similarly, Pervan *et al.* (2015) described credit risk, as measured by the ratio of total reserves to bank's total loans, as the risk that arises from failing to pay back bank loans by its customers. The increase in such risk affects earnings negatively. Therefore, banks need to predict future credit risk levels and develop their credit policies in order to improve profitability. Pervan *et al.* (2015) proved that credit risk as measured by reserves to loans ratio has a statistically negative relationship with bank profitability, which means that the increased amounts of reserves relative to total loans means inability of bank customers to repay bank loans which deteriorates profitability. Also, Athanasoglou *et al.* (2008), and Iannotta *et al.* (2007) used the loan loss reserve to gross loans ratio to evaluate credit risk. Alternatively, Ommeren (2011) measured the asset quality of loan portfolio as a proxy for credit risk, using the ratio of Loan loss provisions to net interest revenue to calculate asset quality of loan portfolio. High rate of loan's non-repayment that takes the form of loan loss provisions is an indicator of low credit quality of loans. Over long periods of time, lower credit quality can lead to a negative influence on profitability due to higher impairment cost of loan non-repayments in case of some banks with lower quality, and the opposite holds true for banks with higher quality. Consequently, it can be concluded that lower asset quality will affect bank's performance negatively.

Furthermore, Saona (2016) measured credit risk using credit quality or the ratio of loan loss provisions to total loans, or alternatively the ratio of net loans to total loans. Saona (2016) hypothesized a positive relationship between bank credit quality and profitability indicating that banks are expected to increase their profitability through screening and monitoring their credit risk. Saona (2016) implied that the greater the share of loan loss provisions as a percentage of gross loans, the higher the margins charged to compensate for default risk and the higher the profitability. However, Saona (2016) described the positive effect of credit risk as normal in Latin American countries and similar regions, where the interest of investors is not highly protected; therefore, the increase in costs of more risks is passed on to customers as they pay higher margins for their banking services. Likewise, Trujillo-Ponce (2013) indicated that a positive impact of the quality of banks' assets on profitability is expected, that is the higher the quality of a bank's assets, the higher the profitability. The increase in low quality assets, poor credit quality, leads to an increase in the amount devoted to cover provisions for these assets, and the profitability of a bank would be lower. The results of Trujillo-Ponce (2013) confirmed this argument through the positive

significant relationship between bank profitability and asset quality measured by both non-performing loans to gross loans ratio, and the loan loss provisions to net loans ratio. This reflects that an increase in the doubtful low quality loans would lead banks to devote higher portion of their gross margins to cover credit losses which would affect profitability negatively, thus a deterioration in the loan quality would decrease profitability and vice versa.

Also, Kutsienyo (2011) conducted a study of the determinants of bank profitability in Ghana, in which the ratio of provisions for bad debts to advances was used. Kutsienyo argued that this measure is a good reflection of the credit quality and the bank loan portfolio. The higher the loan loss provisions to total loans ratio, the higher the accumulation of unpaid loans with a much higher interest as well, and the higher the credit risk; which will cause a decline in the present value of assets and will have a great effect on the solvency of a bank. In the same way, Djalilov and Piesse (2016) used the ratio of loan loss provisions to loans as a proxy for credit risk and they discussed that it indicates the loan quality for a bank, with higher ratios reflecting lower quality and hence lower profitability. Correspondingly, the results discussed by Dietrich and Wanzenried (2011) revealed a negative and significant impact of loan loss provisions to total loans during the crisis, while they reported an insignificant impact of the same variable, which is used as a proxy of credit risk, for the period before the crisis. Dietrich and Wanzenried concluded that Swiss banks preserved low level of loan loss provisions during the period before the crisis. However, this policy of keeping low levels of loan loss provisions changed dramatically in the crisis period which implied that low credit quality increases the sensitivity of banks to bad market conditions, which will result in higher default rates and vice versa.

Therefore, it can be claimed that previous studies employed different proxies of credit risk and reported varying results. According to Ben Naceur and Omran (2011); credit risk was measured by net loans to total loans. They reported credit risk to have a significant positive impact on bank performance as measured by NIM, ROA and cost efficiency. Moreover, Noman *et al.* (2015) used the credit risk variable in their study, as measured by loan loss reserve to gross loans. Noman *et al.* (2015) found that credit risk negatively affects bank profitability. Rahman *et al.* (2015) used two proxies for measuring credit risk; the ratio of non-performing loans as a percentage of total loans and loan loss provisions to total loans. While Islam and Nishiyama (2016) measured credit risk using the non-performing loans to total loans ratio. Also, Garcia and Guerreiro (2016) included credit risk in their model as measured by loan loss provisions to total loans, and they found the effect of credit risk to be negative before the crisis, which turned

to be positive in the crisis period. Another study by Ghenimi *et al.* (2017) measured credit risk using the ratio of non-performing loans to total loans. While, Bouzgarrou *et al.* (2017) also used credit risk in their models as measured by loan loss provisions to total assets. Also Trad *et al.* (2017) used two proxies in their model to measure credit risk; total equity over net loans ratio and impaired loans over gross loans ratio. Other articles of the same year by Bandt *et al.* (2017), and Bucevska and Misheva (2017) incorporated credit risk as measured by loan loss provisions to total loans. Similarly, a more recent study by Batten and Vo (2019) found credit risk to have a significant positive effect on profitability as measured by NIM, the authors measured credit risk by provisions to total loans. While, Ha (2020) measured bank credit risk using both loan loss reserve to total assets and non-performing loans to total gross loans.

4.3.2 Liquidity Risk

Oldfield and Santamero (1997) argued that liquidity risk can arise from maturity mismatches, this situation happens when liabilities have a shorter life than assets, in these cases an unexpected increase in demand for liquidity by borrowers may result in shortage of liquidity. While, Tabari *et al.* (2013) argued that liquidity risk comes up from two sources either from banks' inability to cover liabilities' decreases, or to fund assets' increases. Additionally, Saunders and Cornet (2007) explained bank liquidity risk through discussing the financial gap of banks, which is the difference between values of bank's loans and its core deposits that represent stable sources for financing loans. In case of having a positive financial gap, the amount of bank loans exceeds deposits, the bank should fill it with cash funds that can be raised through selling liquid assets or borrowing from the money market. In case of economic downturns when demands for cash are increasing in the market there will be more exposure to liquidity risk. Therefore in some studies, financial gap is an appropriate proxy for the purpose of measuring bank liquidity risk, and in some cases total assets will be included in the denominator of the financial gap variable for standardization purposes.

Additionally, one way to measure liquidity risk is through the liquidity ratio which can be employed using two methods. In the first form, liquidity is adjusted by size which can be done through the use of the cash assets to deposits ratio (Chen *et al.*, 2018), or the cash assets to total assets ratio (Barth *et al.*, 2003). In the second form, loan is adjusted by size which can be done through the use of net loans to total assets ratio (Kosmidou *et al.*, 2008). Tabari *et al. (*2013) concluded

that the first type implies less vulnerability to bankruptcy in case of high liquidity ratios that leads to high liquidity levels, while the second type implies higher liquidity risk levels in case of higher ratios. Similarly, Trujillo-Ponce (2013) explained that the ratio of loans to total assets of a bank reflects the relative proportion of loans to other assets for a bank or the bank's asset structure. The higher the ratio of loans in a bank's assets reflects lower liquidity, i.e. higher liquidity risk, that results from the lower ability of a bank to finance increases in its assets or decreases in its liabilities. Therefore, higher ratios mean higher liquidity risk, which means that a bank is expected to have higher profitability. The results of Trujillo-Ponce (2013) proved a highly significant positive relationship between the asset structure as measured by loans-to-total-assets ratio and bank profitability as measured by ROA and ROE. Likewise, Djalilov and Piesse (2016) and Lee (2015) used the ratio of loans to total assets as a measure of liquidity risk to reflect the liquidity holdings of a banks that is used as a measure of management's ability to manage assets. Also, Ahamed (2017) discussed the asset composition variable and accounted for it using the ratio of loans to total assets. However, Ahamed argued that the higher the amount of loans, the more aggressive the bank should be towards profitability to pay off interest; however, the increase in loans means more risk-bearing activities which will affect the non-interest activities and lower profitability.

Even though, Kutsienyo (2011) suggested that the ability to fulfil short-term obligations once they are due is a measure of bank's liquidity, which can be measured by the ratio of total loans to customer deposits. Banks without sufficient liquidity to meet demands would face a higher probability for bankruptcy, which implies the importance of liquidity for bank performance. In the same line, Ariffin (2012) stated that the management of liquidity is very important for banks, as liquidity is important to banks' ongoing viability which indicates that managing liquidity efficiently will enhance bank's solvency. Similarly, Bourke (1989) found a positive relationship between profitability and liquidity ratios. On the other hand, liquidity and profitability were reported to have an inverse relationship by Molyneux & Thornton (1992). In the same line, Kosmidou (2008) measured liquidity management by the ratio of loans relative to customer and short-term funding. The higher the ratio, the lower the bank liquidity which does not provide enough protection against insolvency problems. However, more liquid assets held by banks might indicate lower rates of return and as a result lower profitability. Therefore, Kosmidou (2008) argued that higher liquidity might mean lower profitability, and the liquidity management ratio is

expected to affect bank's profitability negatively, as higher ratios means lower liquidity and higher profitability.

Both positive and negative effects of liquidity were discussed in previous studies. Kosmidou (2008) found a negative and statistically significant relationship of the liquidity ratio with profitability when considering internal factors only in the model, which reflects a positive relationship between liquidity risk and profitability. Noman *et al.* (2015) measured liquidity risk by the ratio of loans to total assets ratio. Similarly, liquidity was measured by customer loans to total assets in the study of Rachdi (2013) and Rahman *et al.* (2015); that reported the positive impact of liquidity risk measure on bank profitability. While Knezevic and Dobromirov (2016), and Hasanov *et al.* (2018) used loans to deposits ratio as a measure of liquidity, and the ratio had a negative effect on bank profitability. However, Islam and Nishiyama (2016) included liquidity risk in their model as measured by liquid asset to total assets and short-term funding ratio, and its effect on bank profitability was proved to be negative. Correspondingly; Ghenimi *et al.* (2017), and Trad *et al.* (2017) measured liquidity by the ratio of liquid assets to total assets. Additionally, Trad *et al.* (2017) used one more measure for liquidity which is liquid assets over deposits and short-term financing ratio. Finally, Ha (2020) found the liquidity ratio as measured by the current assets to total assets ratio to positively affect bank profitability.

4.3.3 Capital Adequacy

Indeed, banks always have some worries concerning the increase in capital ratios due to the inherent risk of capital and the higher expected return, as the cost of equity is considered to be the most expensive liability item for banks, in terms of expected return. Therefore, it is argued that the higher the equity requirements, the higher the cost of funding (Trujillo-Ponce, 2013). Ahamed (2017) described bank capital adequacy or capitalization as one of the most important factors affecting bank profitability, which is defined by Kosmidou (2008) as the ratio of bank's equity to bank's total assets that measures the sufficiency of the bank's equity to absorb any potential shocks. Likewise, Pervan *et al.* (2015) stated that bank capitalization denotes the bank's own ability to cover obligations in due time. Thus, Strengthening capital of banks has become a major requirement after the 2007/2008 Global Financial Crisis, especially after failure of many large financial institutions. Therefore, the need for Basel III regulations was evident to enhance the regulatory capital framework through increased regulatory capital requirements, as well as an increase in the quality

of capital through requiring more common equity and a minimum leverage ratio (de Bandt *et al.*, 2017). Similarly, Lee (2015) stated that the relationship between capital adequacy and bank profitability is of great importance for regulatory authorities responsible for controlling bank capital adequacy. Additionally, this relationship is important to maintain profitability of the banking sector of a country. Moreover, according to Saona (2016); capital adequacy measure is used as a reciprocal measure of leverage, while the regulatory capital is determined by the regulatory systems (e.g. Basel Regulations) and represents the amount of capital needed to cover risk-weighted assets. Saona (2016) calculated capital adequacy as the book value of equity capital over total assets, as well as using another measure of capital ratio calculated as the book value of equity capital over total assets lagged one period. This Was done to correct for the contemporaneous effect of profits on equity that might exist if profit is not paid out. In addition to the use of the quadratic term of the capital ratio to test for the non-linear relationship between bank profitability and capital ratio.

Nevertheless, the effect of capitalization as measured by the ratio of equity to total assets is not decisive in previous studies. Djalilov and Pierrse (2016) stated that some studies supported the positive impact of capitalization powered by the view that higher capital ratio lowers the cost of unsecured debt, and also banks can send good signals about its future through better capitalization. On the other hand, some other studies supported the negative impact as they based their arguments on the high cost of equity as a source of fund relative to other sources. Also, Lee (2015) argued that bank capitalization would increase or decrease profitability, the negative effect might be the result of the moral hazard in case of low capital ratio or high debt ratio that encourages managers to take higher risks and if they succeeded, profits will increase and a negative relationship between capitalization and profitability exists. A different perspective on this is that well-capitalized banks attract investors who require lower returns because of the low bankruptcy probability, this would result in lower cost of capital and hence a higher profitability, and in this case a positive relationship exists between capitalization and bank profitability. Similarly, Pervan *et al.* (2015) supported both the positive and negative impact of capitalization on profitability. They argued that the higher the capitalization ratio, the lower the risk, which is associated with lower earnings. On the other hand, higher capitalization ratios means lower need for external funding to finance the banking operations, this results in lower interest expenses and improved profitability. Furthermore, Saona (2016) suggested that there is an optimal level of capital that should be held by banks, especially in an environment characterized by economic and financial instability.

Furthermore, Ahamed (2017) supported the positive relationship between capitalization and profitability. Ahamed argued that a positive relationship between capitalization and profitability reflects more ability of pursuing business opportunities and handling unexpected losses with better flexibility as better capitalized banks are expected to be more profitable and capable of absorbing shocks and have lower insolvency risk. Additionally, the higher the capital the more the supervision of shareholders on management which mitigates risk taking. In the same way, Kosmidou (2008) stated that bank capitalization variable is expected to affect profitability positively, as the increase in bank's equity means less need for external funding and normally higher profitability; in addition to the lower risk of going bankrupt faced by banks in case of well capitalization which means lower cost of funding. In the same line; Ben Naceur and Omran (2011) used capitalization as one of the internal determinants of bank profitability, as measured by equity to total assets and they found that the effect of capitalization on bank performance, as measured by NIM, ROA and cost efficiency, is positive. A more recent study by Hasanov *et al.* (2018) also measured capital as the ratio of equity to total assets, which was proved to positively affect bank profitability of Azerbaijani banks as measured by ROA.

Similarly, Ommeren (2011) suggested that a higher capital ratio might mean better profitability because weaker banks do not have the ability to hold the same amount of equity without further deteriorating earnings. Also a higher capital ratios might lower the costs of financial distress, as banks will have more ability to absorb potential losses and shortfalls. Moreover, Pasiouras and Kosmidou (2007) found that the capitalization ratio affects bank profitability positively. They also supported their results by arguing that banks reduced bankruptcy costs and had less need for external funding which means that those well-capitalized banks faced lower funding costs. In the same line, Boudriga *et al.* (2009) illustrated that higher capital adequacy ratio would lead to less credit exposure or lower credit risk which will enhance profitability. The positive effect of capitalization was also evident in the study of Lee (2015); who found that banks with better capital ratios relate high asset size, better operating leverage, and better loan ratio to higher profitability more significantly than other banks with lower capital ratios. The results indicated that banks with higher capital ratios can translate this into better management of bank profitability. According to Lee (2015); this might be due to the lower cost of capital, lower financial distress and bankruptcy costs. Correspondingly, the results of Trujillo-Ponce (2013) showed that the effect of the capitalization variable, as measured by equity to assets ratio, on bank profitability, as measured by ROA, is positive and highly significant.

Some other studies supported the perspective of a negative effect of capitalization on bank profitability. The study of Saona (2016) suggested that a negative relationship between capital adequacy and profitability is also expected, as the low capital or high leverage leads to a decrease in the agency cost of outside equity and provides an incentive for managers to act in the best interest of the shareholders which increases the firm value. Additionally, high capital ratios don't encourage mangers to use debt financing for more business opportunities and the firm value decreases. Moreover, the negative effect of capitalization on bank performance can be explained through the increase in the cost of equity and the decrease in the interest deductibility for debt provided by the tax subsidy as a result of increases in bank's capitalization. Additionally, well-capitalized banks, with management operating with overcautious policies, might not be able to benefit from some business opportunities and experience lower profits as a result. Similarly, Chirwa (2003) showed a negative relationship between capital adequacy and profitability. Also, Dietrich and Wanzenried (2011) showed insignificant impact of capitalization on bank profitability during the period before the financial crisis, while capitalization was proved to affect profitability in a significant and negative way during the crisis. They explained their results through pointing out that banks with higher safety conditions obtained additional deposits that could not be used in lending due to decreased demand during the crisis period.

In the same line, Ha (2020) measured capital using the equity to total assets ratio, as well as the natural logarithm of total assets. The study found the effect of bank capital on profitability is negative when measuring profitability by both ROA and ROE. The author argued that this result is due to the fact that better capitalized Vietnamese banks will not receive tax advantages and will have to pay more opportunity cost for holding more cash, which will decrease profitability. While, the results of Trujillo-Ponce (2013), and Ghodrati and Ghasemi (2014) showed that the effect of the capitalization on profitability is positive when measured by ROA, which turned to be negative when measured by ROE. Also, Batten and Vo (2019) found a positive effect of capital adequacy as measured by equity to total assets on bank profitability of Vietnamese banks measured by NIM and return on average assets; however, the effect was proved to be negative in case of measuring profitability by the return on average equity. Trujillo-Ponce (2013) interpreted the negative effect on ROE as the result of breaking down ROE into its two components ratio; ROA and equity multiplier (total assets/ equity). Therefore, the decrease in ROE in case of increasing a bank's capitalization can be seen as the result of the decreased leverage or

indebtedness of the bank rather that the result of the decrease in wealth creation from invested capital.

Additionally, de Bandt *et al.* (2017) highlighted that the implementation of different stages of Basel regulations, Basel I, Basel II, Basel II.5, and Basel III has differed greatly in the calculation of capital requirements. The differences are mainly concerning the way of calculating risk-weighted assets as a main component in the calculation of regulatory capital. In Basel I, uniform weights were the main tool that were applied to broad asset classes. In Basel II hereafter, a great change has been provided through proposing the use of credit ratings to monitor the quality of borrowers in the standardized approach. Additionally, banks were allowed the chance to calculate their risk-weighted assets through the internal-ratings-based and the advanced approaches. One point to mention here is that de Bandt *et al.* (2017) argued that the causality between capital and performance is valid only in case of voluntary capital, with no evidence proving the same relationship in case of regulatory capital. Therefore, the authors concluded that regulations have been neutral to bank profitability based on the reported figures. Furthermore, Ayadi *et al.* (2016) investigated the effect of adopting regulatory standards and Basel core principles for effective banking supervision on bank efficiency using a sample of 1146 international banks that are publicly listed in more than 75 countries and by adopting Simar and Wilson double bootstrapping approach. The authors used the World Bank Basel Core Principles for Effective Bank Supervision (BCP) assessments conducted from 1999 to 2014. The findings indicated compliance with the Basel Core Principles (BCP) or even with any of its individual chapters do not have any effect on bank efficiency which supports the argument that regulatory constraints might prevent banks from efficiently allocating their resources. What is more, the results highlighted that compliance in emerging countries negatively impacts efficiency concerning specific chapters related to the effectiveness of current supervisory authorities. Additionally, According to Tran *et al.* (2016) capitalization as measured by equity to total assets ratio represents a more conservative measure when compared to Basel regulatory capital measures, especially during crises times as banks tend to have sufficient regulatory capital on average but lower ratios of capital when calculated as equity to total assets ratio.

4.3.4 Diversification

Diversification is another important internal factor that affects bank profitability. Trujillo-Ponce (2013) argued that the effect of diversification is not clear due to

the possible effect of economies of scope that might lead to increased costs. However, the possibility of enhancing profitability also exists, through raising income from different non-interest activities as an alternative to interest income, especially during times of declining interest rates. Therefore, Trujillo-Ponce (2013) used the ratio of non-interest income to total operating revenues to measure revenue diversification. The higher the ratio of non-interest income to total revenues, the higher the income generated from fees and commissions which is not generated mainly from core banking activities. Similarly, Saona (2016) measured revenue diversification using flow variables (non-interest income to total operating income ratio). Saona (2016) found a negative impact of the revenue diversification variable, which implies that non-interest income activities impacted profitability negatively. While Ommeren (2011) used non-interest income to gross revenues as the main proxy for measuring the income share of non-core banking activities or revenue diversification. However, Rachdi (2013), Rahman *et al.* (2015), and Islam and Nishiyama (2016) measured revenue diversification by the ratio non-interest income to total assets. Ahamed (2017) used two proxies for the income diversification variable of Indian banks; one is the HHI, and the other one is the non-interest income to net operating income. Ahamed (2017) revealed that more non-interest activities affect bank profits and risk-adjusted profits positively. The author argued that these results were valid irrespective of ownership group, with the exception of the effect of income diversification on the risk-adjusted profits of public sector and private domestic banks, that was proved to have no effect. This exception revealed the importance of income diversification for foreign banks that benefited more from income diversification with the existence of advanced methods and managerial skills. Therefore, the overall results of this study indicated that as banks move towards more non-interest income, both profits and risk adjusted profits are improved.

4.3.5 Operational Efficiency

Furthermore, previous studies discussed operational efficiency or expenses management as another factor that affects bank profitability. This variable is commonly measured using the cost-to-income ratio to assess variability of banks' costs. Therefore, the effect of this variable is expected to be negative on bank's profitability as more efficient banks are expected to operate at lower costs (Kosmidou, 2008). Pasiouras and Kosmidou (2007), Athanasoglou *et al.* (2008), Kosmidou (2008), Ali *et al.* (2011), Dietrich and Wanzenried (2011), and Trujillo-Ponce (2013) stated that more efficiency leads to more profitable banks, which

means that poor expenses management leads to lower profitability. Additionally, Trujillo-Ponce (2013) explained that the technological advancements have enabled banks to perform more efficiently and to have lower expenses at given levels of output. From this we can infer that; the more efficient the bank, the lower the operating expenses, and the higher the profitability. Consequently, the study of Trujillo-Ponce (2013) proved that the efficiency variable had a significant and positive effect on bank profitability, that is to say a decrease in the cost-to-income ratio leads to improvements in bank profitability. Moreover, Trujillo-Ponce (2013) argued that the improvements in profitability might be attributed to a high degree of improvement in management skills (X-efficiency). Other studies that used the same measure of operational efficiency and concluded the same negative effect of the ratio of cost-to-income on profitability include; Noman *et al.* (2015), Knezevic and Dobromirov (2016), Garcia and Guerreiro (2016), Rachdi (2013), Noman *et al.* (2015), Rahman *et al.* (2015), Garcia and Guerreiro (2016), and Neves *et al.* (2020).Alternatively, Pervan *et al.* (2015) used the ratio of operating expenses to bank's total assets as a proxy for operating expenses management. They indicated that lower operating expenses means better management practices and higher operational efficiency which will improve bank's profitability and vice versa. Therefore, they reported that the operating expenses management of a bank has a statistically negative relationship with profitability, indicating that better management result in efficiency of operations, reducing operating costs, and improving profitability as a result.

4.3.6 Size

Another very important factor that was reported to have a significant effect on bank profitability in most of the previous studies is bank size. An initial study by Boyd and Runkle (1993) suggested that reduction in the cost of gathering information and processing can be one advantage of economies of scale which will have a significant positive effect on profitability. While, Siddiqui and Shoaib (2011) found that size of Pakistani banks is a significant factor in measuring bank profitability. Also, Djalilov and Piesse (2016) stated that size is another important determinant of bank profitability signalling the existence of economies or diseconomies of scale. The authors measured size using the logarithm of total assets, as different sizes are expected to affect bank profitability. Examples of other studies that utilized this measure include; Athanasoglou *et al.* (2008), Dietrich and Wanzenried (2011), Ommeren (2011), Ben Naceur and Omran (2011), Trujillo-Ponce (2013), Ghodrati and Ghasemi (2014, Lee (2015), Noman *et al.* (2015), Pervan *et al.* (2015), Rahman *et al.* (2015), Islam and Nishiyama

(2016), Knezevic and Dobromirov (2016), Saona (2016), Bandt *et al.* (2017), Bouzgarrou *et al.* (2017), Trad *et al.* (2017), Ahamed (2017), Hasanov *et al.* (2018), and Batten and Vo (2019). Trujillo-Ponce (2013) argued that the squared logarithm of total assets can be used to measure the size variable instead of using the logarithm of total assets. The use of the squared logarithm of total assets controls for the potential effect of the non-linear relationship between profitability and size.

Smirlock (1985) and Akhavein *et al.* (1997) reported a significant and positive effect of bank size on profitability. Similarly, Kosmidou (2008) concluded that the effect of bank size on profitability was positive but significant only in case of considering internal and external factors in the model. While in the study of Rachdi (2013), and Saeed (2014); bank size was measured by total assets, and was found to positively affect bank profitability. Also, Noman *et al.* (2015), Pervan *et al.* (2015), Saona (2016), Trad *et al.* (2017), and Hasanov *et al.* (2018) found that bank size had a positive impact on profitability indicating the existence of economies of scale. Saona (2016) concluded that the greater the bank's operations; the higher the risk taken, and the greater the required return that eventually improves bank profitability. Also, Pervan *et al.* (2015) stated that bank size is expected to have a positive impact on bank profitability. Larger banks may utilize economies of scale to obtain cost advantage over their small competitors. Larger banks may develop their systems and utilize more advanced technologies which will improve their operational efficiency. Additionally, larger firms might be able to hire more qualified staff which will enhance their performance and affect profitability. Profitability might also be enhanced through better marketing campaigns of larger banks and better reputation. However, extremely large banks can be affected negatively by its size.

Therefore, Ahamed (2017) concluded that larger banks may have good opportunities to grow and generate more profits; however, banks might also suffer from diseconomies of scale due to complicated administrative procedures and agency costs. As a result, the effect of size on bank profitability is still inconclusive in the literature. Correspondingly, Lee (2015) considered that the size of bank's assets is expected to affect profitability both positively and negatively. Economies of scale in case of large sizes result in lower operating costs and hence higher profitability. On the other hand, large sizes are associated with more diversification which lowers risk, and lower risks might lead to lower profitability. Therefore, both negative and positive effects exist concerning bank size and the final effect depends on which effect is greater. In the same line, Kosmdiou (2008) used the bank's total assets as a proxy for bank

size, and she also argued that some studies found economies of scale for large banks and some found diseconomies of scale for large banks or economies of scale for small banks. In the same line, Dietrich and Wanzenried (2011) and Ommeren (2011) argued that the sign of the coefficient of the measure of bank size is considered to be unexpected, maintaining the reasoning that synergies and economies of scale are effective up to a particular level, then diseconomies of scale appear due to the increased complexities of financial institutions with very large sizes.

Likewise, Turjillo-Ponce (2013) stated that bank size may have a positive impact on bank profitability due to the effect of economies of scale up to a certain size, and then the impact turns to be negative due to diseconomies of scale. Furthermore, the possible effect of economies of scope might lead to increased costs associated with bureaucratic and other costs, while more specialized banks can reduce their cost of lending. On the other hand, the “too-big-to-fail” assumption gives banks an advantage of the image of big size that can be utilized to decrease their cost of funding. Nonetheless, the results of Trujillo-Ponce (2013) didn’t support the significant effect of size on bank profitability in Spain. Therefore, the author inferred that the trend of growing through mergers and acquisitions was mainly intended to enhance solvency not supporting profitability of banks in Spain. Likewise, Ghodrati and Ghasemi (2014) reported the positive impact of bank size on bank profitability when measured by ROA; however, the effect turned to be negative in the ROE model. On the other hand, Knezevic and Dobromirov (2016), and Batten and Vo (2019) found that bank size affected profitability negatively. In the same line; Neves *et al.* (2020) found that bank size, as measured by the logarithm of total number of employees affects bank profitability negatively for their sample of 94 European banks for the period 2011-2016 using the GMM estimation.

4.3.7 Financial Structure

According to Ommeren (2011), funding structure of a bank is another important internal factor for determining bank profitability, as external funding resources are considered to be among the main determinant of the liability structure of a bank. Trujillo-Ponce (2013), and Bandt *et al.* (2017) measured the financial structure variable using the ratio of total deposits over total debt. Trujillo-Ponce (2013) stated that many European banks have utilized medium and long-term wholesale financial resources as an alternative to customer deposits, to finance credit growth, but this didn’t replace the role of customer deposits as a cheap

source of finance compared to other sources. Therefore, more reliance on customer deposits relative to other financial resources is expected to enhance profitability. This implies a direct relationship between the share of customer deposits in bank liabilities and profitability. On the other hand, there is an argument that there might be a negative relationship between the growth in customer deposits of a bank and profitability. This could be the result of what is called a “deposit war”; where banks adopt an aggressive policy through increasing interest rates to attract customer deposits. This trend is enhanced when there is some difficulties in accessing sufficient international funding resources. The results of Trujillo-Ponce (2013) showed that the financial structure variable had a positive effect on bank profitability as measured by ROA and ROE. The author argued that resorting to other sources of finance by Spanish banks represented a source of flexibility, compensating for the increased cost of finance in case of deposit wars. Therefore, deposit wars wouldn’t hurt bank profitability in case of the existence of other sources of finance that provide an alternative source of income to offset the short-term increase in the financial costs of maintaining deposits. Furthermore, Saeed (2014) and Saona (2016) measured the financial structure of a bank using the ratio of total customer deposits to total assets, which proved to have a significant positive impact on bank profitability. Saona (2016) stated that deposits constitute a cheap source of financing for banks specially in low competitive markets such as those of Latin America, which implies a positive impact of the growth of deposits on bank profitability. On the other hand, a very recent study by Ha (2020) reported that the ratio of deposits to total assets, as a proxy for bank financial structure, negatively affects bank profitability. This result was explained by the pressure created for banks to use deposits effectively when the deposit ratio increases; however, a rapid increase in the ratio increases interest paid and affects profitability negatively.

4.4 External Determinants

4.4.1 Industry-Specific Factors

The external determinants of bank profitability were tested for their effect on bank profitability in so many studies such as; the study of Kosmidou (2008). The industry-specific factors are major determinants of bank profitability; therefore, Kosmidou (2008) investigated bank profitability and its relationship with banking industry development and the stock market. Three main variables were used; the

variable of the overall development of the banking industry measured by the assets of the deposit money banks to GDP, in addition to the variable that measures the complementarity or substitutability between stock market and the banking sector financing, measured as the stock market capitalization to assets of the deposit money banks, and finally the industry concentration measured as the assets of the five largest banks in the industry to the assets of all commercial banks. Kosmidou (2008) concluded that the development of the banking industry and the stock market capitalization variables are expected to impact profitability negatively. Correspondingly, Ben Naceur and Omran (2011) included two financial development variables; stock market capitalization divided by GDP and credit to private sector divided by GDP. However, the authors couldn't conclude any significant impact of financial development indicators on bank performance.

Industry concentration is another industry-specific determinant of bank profitability that is widely used in previous literature. Ben Naceur and Omran (2011) measured bank concentration through the fraction of the assets held by the three largest banks in the industry. Knezevic and Dobromirov (2016) measured concentration by the assets of the five largest banks to the assets of all banks in the industry. Saona (2016) also employed the industry concentration variable, which was measured as the fraction of the assets held by the largest three banks to assets of all commercial banks in the industry or alternatively using Lerner index. Whereas, Trujillo-Ponce (2013) and Ommeren (2011) used the HHI to measure industry concentration. This index is calculated by summing the squared total assets of banks as a measure of their market shares in percentage, which reflects entry of new or smaller banks and the existence of single large bank. If the index exceeds 1800 (Or 0.18 in case of using units instead of percentages), it is said to be a highly concentrated market, and if the index doesn't exceed 1000, it is said to be low concentrated market. Furthermore, Pervan *et al.* (2015), and Djalilov and Piesse (2016) discussed the effect of sector concentration on profitability, where they stated that it is not determined in the banking literature as some studies concluded a positive effect and others concluded a negative effect. Goddard *et al.* (2007) argued that larger banks may operate more efficiently and yield high monopoly profits in case of the existence of high market power which will result in non-competitive pricing. Therefore, in a more concentrated market there could be more efficient and profitable banks. Similarly, concentration was found by Trujillo-Ponce (2013), Pervan *et al.* (2015), Knezevic and Dobromirov (2016), and Saona (2016) to affect profitability significantly and in a positive way, which is supported by the SCP paradigm. However, a more recent study by Batten and Vo (2019) reported

cconcentration, as measured by the HHI, to have a negative impact on bank profitability as measured by the NIM.

4.4.2 Macroeconomic Factors

Macroeconomic factors have a determinant role in bank profitability models, and are proved to affect bank profitability significantly. Different previous studies discussed factors like; economic growth, inflation, money supply growth, interest rates, tax rates and exchange rates. An important study by Dietrich and Wanzenried (2011); included some macroeconomic factors that affect bank profitability that are considered external and difficult to be controlled by bank management. In their study, they measured the business cycle using GDP growth, while the effective tax rate was used to measure differences among countries' tax systems. Additionally, Djalilov and Piesse (2016) considered that GDP and inflation are amongst the most commonly defined macroeconomic determinants of bank profitability. They stated that these variables are common among previous studies, however, the direction of the relationships are not consistent and many differences across countries appear to affect the direction of these relationships. Moreover, there are many macroeconomic factors discussed in the literature and tested for their effects on bank profitability.

Athanasoglou *et al.* (2008), Ali *et al.*, (2011), Ommeren (2011), Dietrich and Wanzenried (2011), Pervan *et al.* (2015), Djalilov and Piesse (2016), and Saona (2016) argued that the business cycle, with both its up and downswings, affects the demand for borrowings and hence is one of the major determinants of bank profitability. Moreover, Kosmidou (2008) confirmed that the growth of GDP is one of the most important macroeconomic factors that is used to measure the economic activity and the macroeconomic conditions of a country which play an important role in the supply and demand for loans and deposits. Therefore, Ommeren (2011) controlled for the effect of real GDP growth because of the existence of great differences in business cycles among European countries. Similarly, Trujillo-Ponce (2013) reported that good economic conditions enhance bank profitability, and bad economic conditions affect profitability negatively. This is because good economic conditions enhance solvency and increase demand for loans by both firms and households. On the other hand, it can also be argued that bad economic conditions worsen the quality of loan portfolio and results in high credit losses and larger amount of loan provisions. The results of Trujillo-Ponce (2013) reflected a positive effect of GDP growth on bank profitability,

which was explained through the economic cycle and its effect on credit demand by firms and households as discussed.

In same line, Djalilov and Piesse (2016) concluded that GDP growth is said to have a positive impact on bank profitability through the increase in demand on credit during growth time, on the other hand decreasing GDP growth worsens the credit quality of banks and impact profitability negatively. Therefore, they reported a positive impact of GDP growth on bank profitability, as better growth enhances credit demand, and therefore affects bank profitability positively. Likewise, Kosmidou (2008) stated that the argument stating the association between economic growth and financial sector performance is further supported by the positive and significant relationship of the growth of GDP and bank profitability in her model. Similarly, Ali *et al.* (2011), Rachdi (2013), Pervan *et al.* (2015), and Ha (2020) discussed in their results that GDP growth has a positive and statistically significant relationship with bank profitability. Their results supported the same argument stating that economic growth indicates an increase in demand for deposits by households and firms which improve the profitability of banks. However, Trad *et al.* (2017) concluded that GDP had a positive and significant relationship with ROA and significant negative relationship with ROE. While Saeed (2014), Islam and Nishiyama (2016), Garcia and Guerreiro (2016), Saona (2016), and Garcia and Trindade (2019) showed GDP growth rate to have a negative relationship with profitability. Saona (2016) argued that this might be the result of banks adjusting their margins down in periods of high economic growth as these good conditions support the competition in the market and hence putting a downward pressure on abnormal profits by banks. While Ben Naceur and Omran (2011), and Batten and Vo (2019) failed to find a consistent effect of GDP on profitability.

Furthermore, Athanasoglou *et al.* (2008) explored the relationship between the business cycle and bank profitability. They argued that bank profitability could be procyclical as the increased risk during periods of bad economic conditions may limit lending, as well as the effect on the increased amounts of provisions due to the deterioration in loan quality, in addition to the effect of the business cycle on capital. Therefore, they stated that in case of not including a business cycle variable in profitability models, other bank-specific variables could partly reflect the effect of business cycle on profitability. They argued that the measures utilized in literature to measure the economic activity in profitability models are not always appropriate; therefore, they used different measures of business cycle including; real GDP deviations from its segmented trend, from the trend calculated using the Hodrick-Prescott (HP) filter, and the Greek output gap

OECD index. They mentioned that a positive output gap is evident when the real GDP exceeds its trend, and it's expected to affect profitability positively, while the opposite holds true. The results of Athanasoglou *et al.* (2008) confirmed the positive effect of business cycle on bank profitability.

Staikouras and Wood (2011) and Kosmidou (2008) stated that the inflation rate is another important macroeconomic determinant of bank profitability which affects profitability both directly and indirectly and the effect depends on the anticipation of inflation. In case of anticipating inflation, banks adjust their interest rates which results in increasing revenues faster than costs and affects profitability positively. However, in case of not anticipating inflation, adjustment of the interest rates will not be done appropriately, which will cause costs to increase faster than revenues and the effect will be negative. In the same line, Djalilov and Piesse (2016) confirmed the same idea through discussing the impact of inflation on bank profitability in the light of anticipation of inflation rate movements. They also explained that interest rate adjustments is done in a way that offset the increase in costs in case of anticipating inflation, which affects bank profitability positively. Alternatively, they stated that the increase in costs might be difficult to be covered by adjustments in interest rates and hence affect profitability of banks negatively if inflation is not anticipated. Therefore, they adopted the same argument that the effect of inflation is dependent upon its anticipation and the speed of adjustment of interest rates to offset increases in bank costs due to higher inflation levels.

Trad *et al.* (2017) found that inflation had positive and significant relationship with ROA and significant negative relationship with ROE. While Nishiyama (2016), Saona (2016), and Batten and Vo (2019) found a positive effect of inflation on bank profitability. Also, Trujillo-Ponce (2013) argued that there is a direct association between inflation and bank profitability based on the assumption that the inflation is fully anticipated. The results of Trujillo-Ponce (2013) proved a positive effect of inflation on profitability as measured by ROA, which was considered as an evidence that inflation is predictable by managers and interest rates are adjusted accordingly. Alternatively, Saeed (2014) and Hasanov *et al.* (2018) found inflation to have a statistically significant but negative effect on bank profitability. Similarly, Kosmidou (2008) found that inflation has a negative and significant effect on bank profitability, which indicates that inflation was not anticipated in her model. Moreover, Ben Naceur and Omran (2011) found inflation to be the only variable among the macroeconomic and financial development variables in their study that had a significant effect on bank performance as measured by NIM, its effect was proved to be negative.

Likewise, the results of Pervan *et al.* (2015) reported a negative effect of inflation rate on bank profitability through the effect on customers' liquidity positions, in addition to the effect of not anticipating changes in inflation rates. The authors discussed that increases in inflation might affect the repayment rates of banks' loans through affecting customers' liquidity positions, which indicates a negative effect of inflation on bank profitability. They explained their findings of statistically significant and negative relationship of inflation with bank profitability through the argument that higher inflation impacts the liquidity of households and firms which affects their ability to repay loan obligations to banks and affects bank profitability negatively. In addition to the effect of anticipating inflation rate, they argued that the inflation rate in the Croatian banking industry is not fully anticipated. Therefore, the adjustment of interest rates is not done perfectly as a result of the poor anticipation rate of inflation in the Croatian banking industry.

Another macroeconomic variable considered in previous studies for its effect on bank profitability is the interest rate. It can be argued that decreases in interest rates can affect bank margins and profitability negatively due to the inability of setting appropriate prices. Therefore, a direct relationship between interest rates and bank profitability exists (Trujillo-Ponce, 2013). However, the results of Trujillo-Ponce (2013) showed an unexpected negative association between interest rates and bank profitability which was explained by incurring a high interest rate risk by Spanish banks through holding a higher proportion of fixed rate assets relative to fixed rate liabilities, which was accompanied with a difficulty to pass changes in interest rates on to customers. Similarly, Islam and Nishiyama (2016) included in their model interest rate among the macroeconomic variables that affect bank profitability, and it was proved to be negative. Additionally, the growth of money supply is considered by Kosmidou (2008) as another macroeconomic determinant of bank profitability. The supply of money measures the quantity of money available in the economy and it is determined by the policy of the central bank. The growth of money supply is expected to have a positive effect on profitability; however, Kosmidou (2008) found that growth of the money supply has no significant impact on bank profitability in her study. While Ha (2020) found that the growth of money supply affected ROA and ROE positively, and the effect turned to be negative on NIM. The negative impact on NIM is explained by the effect of the growth of money supply on increasing loans, leading to an increase in the cost of loans and lower NIM.

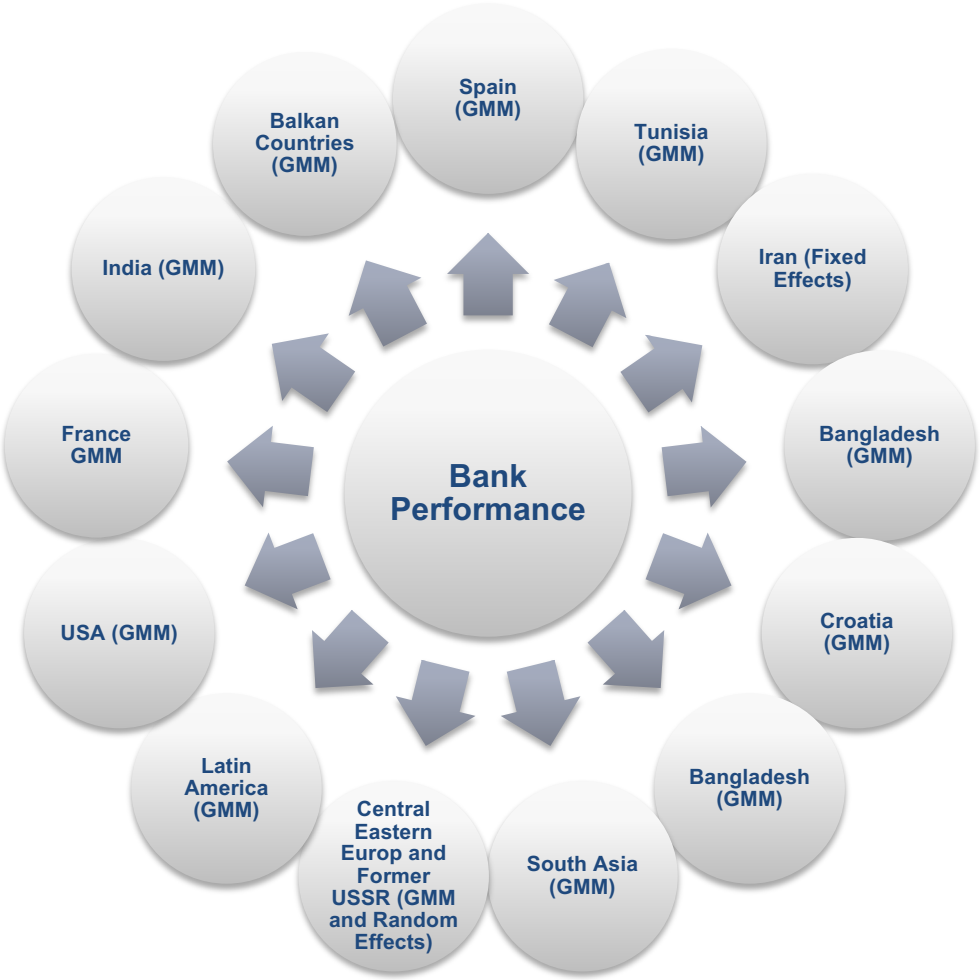
4.5 The Literature Gap

A good contribution to knowledge would be based on the identification of relevant gaps in the literature; therefore, the previous section provided a background of some relevant studies in the area of bank performance. A review of the relevant literature in the area of bank performance indicated that many researchers investigated bank profitability determinants and used samples from different banking sectors around the world. Review of relevant literature presented in the current chapter presented and compared the work of these previous studies from different countries including; South Asian countries, Central Eastern Europe, Latin America, USA, India, France, UK, Bangladesh, Croatia, Iran, Tunisia, Turkey, Spain, and others; as illustrated in the following figure (4.1). The figure presents a summary of the most recent studies that applied different bank performance models in different parts of the world. The figure summarizes the context of applying the model and the estimation method used for some of the most recent studies discussed in this chapter. However, from reviewing relevant literature; it can be noticed that very few studies investigating bank performance in Egypt are there, which proves the need for more empirical research in the area of bank performance in Egypt to study intra- and extra-bank profitability determinants of Banks operating in Egypt and interrelationships among different risks. Moreover, the dynamic nature of bank profitability models has always been the main focus of most of previous studies. It can be noticed that profit persistence and different endogeneity problems have been accounted for, in most if not all of the recent studies in the area of bank performance, through the use of the GMM estimation. While the main study that accounted for the dynamic nature of bank profitability models using the GMM approach for Egypt is the research of Ben Naceur and Omran (2011), who discussed factors affecting bank profitability in Egypt among other ten countries. This study was more than 8 years ago, which means that a lot of changes to the Egyptian economy and the Egyptian banking sector have occurred, especially with the changing global and local environments in all aspects including; political, economic, and regulatory aspects.

Therefore, testing the effect of the Global Financial Crisis and the Arab Spring on Egyptian economy and the banking sector is considered another important issue that is not addressed on that level in recent studies. While some reports by the Egyptian Ministry of Finance and the IMF have discussed the resilience of the Egyptian banking sector to different economic and political shocks, due to different reasons discussed in earlier chapters. However, studying the impact of

those events in an empirical way and using the most recent data would help greatly in this respect. This further highlights the need for more studies on bank performance in terms of both profitability and risk for the Egyptian banking sector that takes into consideration the effect of the serious changes that occurred in Egypt and affected the banking industry, which made Egypt a very special context to study in this area. Moreover, it can be found that the CBE focused on implementing new regulatory reforms to the Egyptian banking industry with the major one occurred in 2012/2013 fiscal year; by requiring all banks to apply the first pillar of Basel II. These major regulatory changes imposed the need for testing the impact of the new regulatory ratios on bank profitability, which might motivate or demotivate further application of different Basel-related regulations. Finally, the inconclusive results that have been provided in the banking literature concerning the causal relationship between credit risk and liquidity risk, provides an additional gap that can be filled by estimating the causal relationship between these two important financial risks, since financial risk is a crucial dimension of bank performance.

Figure (4.1): Context and Estimation Methods of Recent Studies on Bank Performance



4.6 Potential Contribution

It can be noted that previous studies utilized dynamic modelling techniques in investigating different bank profitability models, which have been applied in different countries around the world to measure different interrelationships that might affect bank performance, which is further summarized in table (4.1) presented at the end of this chapter. Therefore, estimating a dynamic model using the GMM approach to investigate different interrelationships that might affect bank performance in Egypt would represent an important contribution, especially after the major changes to the Egyptian economy as a whole after the 2007/2008 Global Financial Crisis and the Arab Spring, and also the major changes to the banking sector after applying the first Pillar of Basel II Accord since 2013. Moreover, a recent report by the International Monetary Fund, IMF (2017), mentioned that the Egyptian banking sector has been resilient to different shocks including the Crisis and the Arab Spring due to the strict policies of the Central Bank on one hand. On the other hand, the Egyptian banking sector is not considered fully integrated in the world financial system which gives some protection against global and regional shocks. Therefore, testing the effect of the 2007/2008 Global Financial Crisis and the Arab Spring on the Egyptian banking industry would represent another contribution that is worth investigating. Both events represented major serious shocks during the recent history of the Egyptian economy as a whole. Furthermore, having the most recent data on regulatory capital ratios applied through the first pillar of Basel II in Egypt represents another contribution to knowledge, as Egypt is considered to be one of the late adopters of Basel II regulations only since 2012/2013. Therefore, testing the effect of applying Basel regulations consistently with more recent data would be beneficial to determine the appropriateness and possible benefits of the new regulations for the Egyptian banking sector. In addition to investigating the causal relationships between the two main financial risks that affect bank performance ;credit and liquidity risks. Which will help in enriching the financial literature with some empirical conclusive results on the relationships between those two important risks.

Therefore, this thesis focuses on investigating the main internal and external determinants of bank profitability using a sample of the listed banks in Egypt. This is done using the Fixed Effects estimation, as well as the GMM to account for the dynamic nature of bank profitability models. Moreover, the Global Financial Crisis as well as the Arab Spring are tested for their effects on bank profitability in Egypt. Additionally, the thesis tries to have a supporting role to the

efforts of the CBE in investigating the effects of the new regulations by focusing on testing the effect of regulatory capital on bank profitability of the listed banks in Egypt using very recent data after the application of the new regulations in 2013. Furthermore, very few studies were conducted recently to investigate the causal relationship between bank credit and liquidity risks, such as the study of Imbierowicz and Rauch (2014), and Ghenimi *et al.* (2017), but with no meaningful causality reported between both risks. Therefore, the current research has another significant contribution through investigating the causal relationship between credit risk and liquidity risk in an empirical way and highlighting the direction of the causal relationship between both risk types for the sample banks in Egypt.

4.7 Development of Research Hypotheses

The main contribution of this study is based on investigating different interrelationships affecting bank performance with its two main dimensions; profitability and risk. This would help in investigating the main bank-specific and macroeconomic determinants of bank profitability in Egypt; in addition to testing the effect of the Arab Spring and the Global Financial Crisis on bank profitability in Egypt. In doing so, different previous studies have been reviewed to determine the most relevant bank profitability determinants and their expected effects. Therefore, the effect of capital adequacy as measured by the equity to total assets, as will as the regulatory capital ratio, will be tested for its effect on bank profitability as measured by ROA and ROE. The review of previous literature highlighted that the effect of capital adequacy could be either positive or negative. Moreover, the effect of size as measured by the natural logarithm of total assets is tested, which is also undetermined in literature and could be either positive or negative. Also, the share of non-interest income in bank's total revenues is tested in this thesis, which is also undetermined in previous studies. Other variables that will also be tested for their effect on bank profitability of the sample banks, with possible positive or negative effects, include; liquidity risk as measured by total loans over total assets or over total customer deposits, inflation rate as measured by the percentage change in consumer prices, and interest rate as measured by the overnight deposit rate. All of the previously mentioned variables will be part of hypotheses testing for both the expected positive or negative effect of each variable on bank profitability.

Other research hypotheses are developed to test the positive effect of the financial structure variable, economic growth, and money supply growth

variables. Financial structure is measured by total customer deposits over total liabilities; while economic growth is measured by real GDP growth, as well as the deviation of real GDP from its trend calculated using the Hodrick-Prescott (HP) filter. Whereas the hypotheses developed to test the negative effect of other factors include; testing the negative effect of both operational efficiency, as measured by the cost-to-income ratio, and credit risk as measured by loan loss reserves over total loans. Moreover, the thesis takes into account the effects of the Global financial Crisis and the Arab Spring on bank profitability of the sample banks to find out whether those serious shocks had a negative influence on bank profitability. Finally, the last two research hypotheses are intended to test the causal relationships between credit risk and liquidity risk, and whether credit risk granger causes liquidity risk, or liquidity risk granger causes credit risk. This should help to uncover the ambiguity of the causal relationship between the two variables in previous literature. A summary of the research hypotheses to be tested in the analysis section is provided in the following table (4.1), which is developed based on the review of previous studies in the light of the main focus of the current thesis, as previously discussed.

Table (4.1): Research Hypotheses

H_{1a}: *Capital adequacy has a positive significant impact on profitability of banks in Egypt.*
H_{1b}: *Capital adequacy has a negative significant impact on profitability of banks in Egypt.*
H_{2a}: *Bank size has a positive significant impact on profitability of banks in Egypt.*
H_{2b}: *Bank size has a negative significant impact on profitability of banks in Egypt.*
H_{3a}: *Revenue Diversification has a positive significant impact on profitability of banks in Egypt.*
H_{3b}: *Revenue Diversification has a negative significant impact on profitability of banks in Egypt.*
H_4: *Operational efficiency has a negative significant impact on profitability of banks in Egypt.*
H_5: *Credit risk has a negative significant impact on profitability of banks in Egypt.*
H_{6a}: *Liquidity Risk has a positive significant impact on profitability of banks in Egypt.*
H_{6b}: *Liquidity Risk has a negative significant impact on profitability of banks in Egypt.*
H_7: *Financial structure has a positive significant impact on profitability of banks in Egypt.*
H_8: *Economic growth has a positive significant impact on profitability of banks in Egypt.*
H_{9a}: *Inflation rate has a positive significant impact on profitability of banks in Egypt.*
H_{9b}: *Inflation rate has a negative significant impact on profitability of banks in Egypt.*
H_{10a}: *Interest rate has a positive significant impact on profitability of banks in Egypt.*
H_{10b}: *Interest rate has a negative significant impact on profitability of banks in Egypt.*
H_{11}: *Money supply growth has a positive significant impact on profitability of banks in Egypt.*
H_{12}: *The Global Financial Crisis had a significant negative impact on profitability of banks in Egypt.*
H_{13}: *The Arab Spring had a significant negative impact on profitability of banks in Egypt.*
H_{14}: *Credit risk of banks in Egypt Granger causes liquidity risk.*
H_{15}: *Liquidity risk of banks in Egypt Granger causes credit risk.*

4.8 Summary

All of the preceding sections discussed important terminologies in the literature of bank performance and compared the points of view of different previous studies. In addition to presenting the results of these studies to allow for a better comparison of their contributions. The focus was on providing a general background in the area of bank performance, and to provide a closer look on the most important areas discussed in literature; profitability measures, intra- and extra-bank profitability determinants, financial risks, capitalization…etc. The chapter started with an overview of the area of bank performance through presenting some key points discussed in the financial literature concerning bank profitability and its different measures, as well as bank risk and its different types. Then, the chapter presented the relevant theories that are vital in understanding some key relationships of bank performance. The chapter also described the key bank profitability determinants discussed in previous studies through two main sections. The first one discussed, in details, the internal determinants of bank profitability; as well as their main measures and the results obtained in key previous studies. The second section focused on external determinants and how they were discussed in different studies of bank performance. Based on this review of relevant literature, a gap was identified in the following section; describing the potential that exists to fill in this gap through the current thesis. Also, the last two sections of this chapter described how the gap can be filled and the expected contribution of the thesis in pursuing the main objectives. Additionally, the research hypotheses that will be tested in the analysis section are also discussed. However, a more practical way to present a comparison of previous studies is to summarize their main contributions in a tabular form. This allows a clearer view of different models and the used variables and measures; in addition to illustrating how previous studies constructed their models. Therefore, the following table summarizes some of the most recent academic articles that were previously discussed in this chapter. Table (4.2) is intended to provide an informative summary that will help explore the discussion provided in the current chapter; in addition to providing a summary of the base that will be needed in the following chapter. The next chapter will build on the base extracted from reviewing relevant previous studies to discuss the data and methodology and data of the thesis. All discussions of estimation methods, variables, and different relationships in the next chapter will be based on this chapter.

Table (4.2): Summary of Recent Studies on Bank Performance

No.	Author(s)	Year	Description	Variables	Findings
1	Antonio Trujillo-Ponce	2013	Investigating the main profitability determinants for Spanish banks during the 1999-2009 period using the System GMM technique. In addition to investigating qualitative differences among commercial and savings banks in Spain.	Two main proxies of bank profitability were used to measure the dependent variable, ROA and ROE. While the independent variables included; asset structure, loan portfolio quality, capital adequacy, capital structure, efficiency, size, revenue diversification, industry concentration, economic growth, inflation, and a dummy variables to account for bank type was also included to differentiate between commercial banks, savings banks and credit cooperatives, and to account for time effects.	The findings supported a positive impact of capital ratio, loans to total assets ratio, customer deposits, bank efficiency, and a negative impact of the ratio of doubtful assets. The author found no effect of economies or diseconomies of scale or scope on bank profitability.
2	Houssem Rachdi	2013	Investigating bank-specific, industry-specific and macroeconomic determinants of bank profitability before and during the 2007/2008 Global Financial Crisis, using a sample of 10 Tunisian banks for the period (2000-2010) through estimating a system GMM model.	ROA, ROE and NIM were used as proxies for the main dependent variable of bank profitability. While the independent variables included; capitalization, size, liquidity, operational efficiency, off-balance sheet activities, deposits' growth, concentration, inflation, and GDP.	The results showed that capitalization, liquidity, size, operational efficiency, bank growth, inflation, and GDP growth are the main determinants of bank profitability in the before-crisis period. While, operational efficiency, bank growth, inflation, and GDP growth were significant in the during-crisis period. Therefore, the author concluded that the Tunisian banking system was not highly integrated in the worldwide banking system, and that the effect of the 2007/2008 Global Financial Crisis was minor.
3	Naser Ail Yadollahzadeh Tabari, Mohammad Ahmadi, and Ma'someh Emami	2013	Investigating the main bank-specific and macroeconomic factors affecting bank profitability in Iran for the period 2003-2010. Using a sample of 15 Iranian banks and the fixed effects estimation.	Bank profitability was measured using ROA and ROE as two proxies for the dependent variable. While independent variables included; bank size, liquidity risk, credit risk, capitalization, GDP, and inflation.	The main findings reported positive relationships between bank profitability and bank size, bank assets, GDP, and inflation. While credit risk and liquidity risk were found to affect bank profitability negatively.

No.	Author(s)	Year	Description	Variables	Findings
4	Björn Imbierowicz and Christian Rauch	2014	Investigating the causal relationship between two causes of bank's probability of default; credit risk and liquidity risk. The authors used a sample of almost all American commercial banks for the period 1998-2010. Additionally, they investigated the individual and joint effect of both risks on probability of default of the sample banks. The authors used a variety of econometric approaches in their analyses including simultaneous equations modelling via 3SLS, PVAR model and multivariate logistic regression models.	The main variables analysed included; the liquidity risk variable measured by the ratio of short-term obligations to short-term assets including off-balance sheet items. Also, the credit risk variable was measured by the ratio of net loan losses in a period to allowances for these loan losses that were recorded in the previous period, as a proxy for the unexpected loan default ratio of a bank. As well as using indicator variables for bank default as dependent variables in the multivariate logistic regression models. While controlling for bank characteristics, macroeconomic influences, monetary policy, and the overall risk of the banking sector.	The authors reported no meaningful reciprocal relationship between the two types of bank financial risks; credit and liquidity risk. However, it was proved that each risk type has a separate effect on bank's probability of default. The result of their interaction might increase or decrease the probability of default, which depends mainly on the overall level of bank risk.
5	Hassan Ghodrati and Mohammad Ghasemi	2014	Studying the factors determining bank profitability in Iran using as a sample of 18 Iranian banks for the period 2002-2011.	The main dependent variable is bank profitability as measured by ROA and ROE. The independent variables included; capital adequacy, size, total liabilities to assets ratio, and deposits to assets ratio.	The results indicated positive relationships between ROA and bank size, capital adequacy, the total liabilities to assets ratio, and the total deposits to assets ratio. While the ROE model reported a negative relationship between ROE and both capital adequacy and bank size, and positive effects of both the ratio of deposits to total assets, and the ratio of liabilities to total assets on ROE.
6	Muhammad Sajid Saeed	2014	Investigating the main bank-specific and macroeconomic determinants of bank profitability in UK. The author used a sample of 73 commercial banks operating in UK with fully available data for the period (2006-2012) using the fixed effects model.	The author measured the dependent variable using both ROA and ROE, also the independent variables included internal factors such as; bank size, capitalization, loans, customer deposits, and liquidity. In addition to external factors such as; interest rate, GDP, and inflation.	All of the internal factors tested for their effect on bank profitability were proved to have a positive relationship with both ROA and ROE. However, external factors affected bank profitability both positively and negatively, as interest rate had a positive effect on bank profitability; while, GDP and inflation reported negative effects on bank profitability.

No.	Author(s)	Year	Description	Variables	Findings
7	Abu Hanifa Md. Noman, Mustafa Manir Chowdhury, Najneen Jahan Chowdhury, Mohammad Jonaed Kabir, and Sajeda Pervin	2015	Investigating the main determinants of bank profitability in Bangladesh including; bank-specific, industry-specific, and macroeconomic variables. The authors used both the fixed effects and the system GMM estimation methods in analysing a sample of 299 observations for 35 banks collected for the period 2003-2013.	Three main measures of profitability were used; return on average assets, return on average equity, and NIM. While independent factors tested for their effect on profitability included; liquidity, credit risk, capitalization, size, and cost efficiency as intra-bank variables. While, extra-bank variables included; inflation, growth of GDP, stock market turnover and real interest rate. Also, a dummy variable for bank type was included in the analysis.	The authors found that some factors affected bank profitability in Bangladesh positively including; liquidity, size, capital adequacy, stock market turnover, and inflation. While, other factors had a negative effect on profitability including; operational efficiency, credit risk, real interest rate, and GDP growth. The authors also concluded that the return on average assets is the most preferable measure of bank profitability. They also concluded that public banks in Bangladesh were less profitable compared to private commercial banks and development banks.
8	Maja Pervan, Iva Pelivan and Josip Arnerić	2015	Estimating a dynamic panel model using GMM estimation to identify the main bank-specific, industry-specific, and macroeconomic determinants of bank profitability for 46 Croatian banks. In addition to identifying profit persistence in the Croatian banking industry using the Markov Chain stochastic process for the period (2002-2010)	The main dependent variable is bank profitability measured by ROA. The independent variables included bank-specific variables such as; size, market share, solvency risk, credit risk, intermediation, and operating expenses management. While, the industry-specific determinants included; industry concentration and market growth, that were used to capture the characteristics of the industry in which banks operate. Finally, the macroeconomic group included; GDP growth and inflation.	All variables are proved to be significant with the exception of market share variable. Statistically significant variables which had positive impact on bank profitability included; size, solvency, intermediation, concentration, GDP growth, and market growth. While significant variables with negative impact included; credit risk, operating expenses management, and inflation. Additionally, evidence for profit persistence in the Croatian banking industry was barely sufficient.
9	Mohammad Morshedur Rahman, Md. Kowsar Hamid and Md. Abdul Mannan Khan	2015	Investigating the main profitability determinants of 25 Bangladeshi banks for the period 2006-2013. The authors used the system GMM technique to deal with potential endogeneity.	The dependent variable measured bank profitability using ROA, ROE, and NIM over total assets. The explanatory variables included; capitalization, ownership structure, credit risk, cost efficiency, non-interest income, bank size, liquidity risk, and off-balance sheet activities. In addition to GDP growth and inflation as macroeconomic determinants of profitability.	The main results indicated the positive effect of liquidity risk and capitalization variables, while operational efficiency and off-balance sheet activities had a negative impact on bank profitability. However, all other variables had different effects on different measures of bank profitability.

No.	Author(s)	Year	Description	Variables	Findings
10	Seok Weon Lee	2015	Investigating the effect of better capital ratios on factors determining profitability of Korean banks during the 2000-2008 period through comparing two bank groups; high capital ratio banks and low capital ratio banks.	The dependent variable was measured using ROA, ROE, and NIM. Independent variables included; capitalization and size; while inflation, as measured by CPI, was controlled in this model. In addition to adding a dummy variable that took the value of 1 for regional banks and 0 for local banks.	The findings indicated that banks with better capital ratios relate high asset size, better operating leverage, and better loan ratio; to higher profitability more significantly than other banks with lower capital ratios.
11	Md. Shahidul Islam and Shin-Ichi Nishiyama	2016	Investigating the bank-specific, industry-specific, and macroeconomic factors affecting bank profitability in four South Asian countries. The authors collected the data of 259 commercial banks for the period 1997-2012 which was then used for estimating a dynamic model using the GMM technique.	The dependent variable was measured using ROA and ROE, while the independent variables included; capitalization, size, credit risk, liquidity, cost of fund, productivity, recurring earning power, growth of deposits, funding gap, interest income to total loans ratio, off-balance sheet income ratio, concentration, term structure of interest rate, inflation, and economic growth.	The main results highlighted low levels of profit persistence during the sample period and a late hit of the Global Financial Crisis. The inflation variable, capitalization, and recurring earning power were proved to impact bank profitability positively. While; productivity, liquidity, funding gap, cost of fund, term structure of interest rate and, economic growth were proved to affect bank profitability negatively. The authors also concluded a low efficiency of manpower in South Asian banks through the negative impact of the productivity ratio on bank profitability.
12	Ana Knezevic and Dusan Dobromirov	2016	Investigating bank-specific, market-specific, and macroeconomic factors affecting profitability of banks in Serbia for the period 2004-2011. The authors used the fixed effects estimation method and considered the effect of the Global Financial Crisis in their analysis. They also managed to compare performance of banks in Serbia to banks in the EU, in addition to comparing the performance of foreign and domestic banks in Serbia.	The main dependent variable is the return on average assets. While, the independent variables comprised; bank size, capitalization, operational efficiency, and liquidity; which were used as bank-specific factors. Moreover, market-specific factors included; concentration, bank assets to GDP, market capitalization to bank assets, and market capitalization to GDP. Finally, the macroeconomic factors included; inflation and GDP. In addition to including a dummy variable for the crisis period.	The authors concluded that size, operational efficiency, liquidity, and all market-specific factors had significant effect on bank profitability in Serbia; however, macroeconomic factors did not have any effect. Also, the effect of the crisis is different for domestic and foreign banks, as it affected domestic banks negatively; however, it affected foreign banks positively. Also, the comparison with banks in the EU countries showed that banks in Serbia were different in two variables; capitalization and liquidity.

No.	Author(s)	Year	Description	Variables	Findings
13	Khurshid Djalilov and Jenifer Piesse	2016	Investigating bank profitability determinants in two groups of countries; early transition countries of the Central Eastern Europe (CEE) and the Baltic states, and late transition countries of the former USSR. The authors used a very rich dataset covering the period 2000-2013 to represent the stages before, during, and after the 2007/2008 Global Financial Crisis. They also studied the environmental factors through examining country-specific conditions for the considered groups of countries. They used both static and dynamic econometric approaches (GMM and random effects estimation methods).	The dependent variable is measured using ROA. The independent variables included; credit risk, capital adequacy, efficiency, size, industry concentration, economic growth, inflation, in addition to national environmental factors such as; government spending, and fiscal and monetary freedom.	The authors found profit persistence in both groups, and differences of bank determinants across country groups. More competition is found in the early transition countries, and a positive effect of credit risk on bank profitability. However, negative impact of credit risk, government spending, and monetary freedom were found in the late transition countries. While, better capitalization was found to positively impact banks in early transition countries.
14	Maria Teresa Medeiros Garcia and João Pedro Silva Martins Guerreiro	2016	Investigating the profitability determinants of Portuguese banks for a sample of 27 banks covering the period 2002-2011. The authors used unbalanced dataset and applied the fixed effects estimation method. Additionally, they considered the effect of the 2007/2008 Global Financial Crisis.	The dependent variable was measured using return on average assets, return on average equity and NIM. However, the independent variables included; capitalization, operational efficiency, credit risk, annual growth of deposits, difference between bank and market growth of total loans, interest income share, funding costs, effective tax rate, real GDP growth, term structure of interest rate, and annual growth of household disposable income.	The results supported the positive impact of the variable measuring the difference between market and bank growth of loans, and the variable measuring the yearly growth of household disposable income. While, operational efficiency and GDP growth were proved to affect profitability negatively. Moreover, the results showed that the term structure of interest rate, capitalization, credit risk, and the growth of deposits variables had significant effects on bank profitability in Portugal, but with varying signs for different sub-periods.

No.	Author(s)	Year	Description	Variables	Findings
15	Paolo Saona	2016	Investigating the main variables affecting bank profitability in Latin America for a sample of banks in seven Latin American countries, using the system GMM approach for the period 1995-2012.	Bank profitability is the main dependent variable measured by NIM. While, the independent variables included; capital adequacy, functional diversification, bank loans, bank deposits, bank size, credit risk, industry concentration, financial development, legal enforcement and regulatory system, inflation, economic growth, reserve requirements, and economic crises.	The main findings included; a negative U-shaped relationship between profitability and capital ratios, a positive impact of assets diversification on profitability, a negative impact of revenue diversification on profitability, a negative impact of regulatory improvements on profitability, and a positive impact of industry concentration on profitability.
16	Vuong Thao Tran, Chien-Ting Lin, and Hoa Nguyen	2016	Investigating different dynamic interrelationships between bank liquidity creation, regulatory capital and profitability for US banks; and how these interrelationships differ across different crises periods, different sizes, regulatory capital measurements, and levels of regulatory capital. The authors estimated a VAR model using the system GMM technique with of unbalanced data of all US banks for the period 1996-2013.	The study investigated the interrelationships among three main variables which included; liquidity creation, regulatory capital, and profitability; while the control variables included; bank variables (risk, size, productivity growth, and operating management), market variables (market concentration and stock market volatility), in addition to the macroeconomic variables (real GDP growth and business cycle indicators).	The main findings of this study highlighted the existence of a bidirectional positive relationship between liquidity creation and capital adequacy, which was mainly driven by small banks and during non-crisis periods. Additionally, the authors concluded a negative effect of liquidity on bank profitability; and a non-linear relationship between capital adequacy and bank profitability, as the relationship is positive for banks with low capitalization, and negative for banks with high capitalization.
17	Ameni Ghenimi, Hasna Chaibi, and Mohamed Ali Brahim Omri	2017	Investigating the relationship between credit risk and liquidity risk and how their interaction affected bank stability in the MENA region. The sample comprises 49 banks operating in different countries in the MENA region for the period 2006-2013. The authors applied simultaneous equations modelling via 2SLS, PVAR model, in addition to applying the GMM technique to measure the effect of credit and liquidity risks on bank stability in a separate regression.	The main variables of credit risk, liquidity risk, and bank stability Z-score; were used as dependent variables in different estimated models. Additionally, the analyses included control variables such as; ROA, ROE, NIM, capitalization, size, efficiency, crisis, liquidity gaps, asset growth, income diversification, GDP growth, and inflation.	The authors highlighted that credit risk and liquidity risk do not have economically meaningful reciprocal relationship. However, both risks affected bank stability, both individually and jointly, through their interaction.

No.	Author(s)	Year	Description	Variables	Findings
18	Houssam Bouzgarroua, Sameh Jouidaa, and Waël Louhichib	2017	Investigating bank profitability of 170 French banks through comparing the main internal and external determinants of profitability between two groups; foreign and domestic banks for the period 2000-2012. Additionally, the authors tested for profit persistence before and during the Global Financial Crisis; therefore, they adopted the system GMM estimation to account for the potential bias.	ROA, ROE and NIM were used to measure bank profitability as the main dependent variable. Independent and control variables included; capitalization, liquidity, credit risk, off-balance sheet activities, overhead to total assets ratio, bank size, GDP, inflation, dummy variable for the financial crisis, and another dummy for foreign and domestic banks.	The findings indicated that foreign banks' profitability is far better than profitability of domestic banks in France, especially during the period of the Global Financial Crisis, which was more evident for foreign banks from advanced economies. Additionally, the study highlighted that the lagged profitability had a negative impact on domestic banks' profitability during the financial crisis; however, the impact was positive for foreign banks.
19	M. Mostak Ahamed	2017	Investigating how income diversification towards more non-interest income affected banks' profits and risk-adjusted profits in 107 commercial banks in India for the period 1998-2014. In addition to conducting a comparison between different ownership groups and different asset quality groups of banks using the system GMM.	The dependent variable is bank profitability as measured by ROA or risk-adjusted ROA, while ROE and risk-adjusted ROE were used in the robustness check. Furthermore, the independent variables included; income diversification, and non-interest income to net operating income, as proxies of non-interest income activities. Also, a set of bank-specific control variables included; bank size, credit risk, capitalization, assets composition, and growth of total assets. In addition to including year dummies to account for business cycle effects.	The main results indicated that the higher the non-interest income share, the higher the bank's profits and risk-adjusted profits, especially when banks are involved in more trading activities. Furthermore, the author found that foreign private banks are more capable of generating more profits compared to domestic private and public banks. The results also showed that low-asset- quality banks are more sensitive to income diversification.

No.	Author(s)	Year	Description	Variables	Findings
20	Naama Trad, Mohamed Ali Trabelsi and Jean Francois Goux	2017	A sample of 78 Islamic banks in 12 countries was used to test some bank-specific, and macroeconomic variables for their effect on soundness of Islamic banks, as explained by bank profitability for the period 2004-2013. The authors employed the system GMM approach to account for possible endogeneity problems.	The dependent variables included profitability as measured by ROA and ROE, and risk measured through insolvency risk and credit risk. The independent variables included intra-bank variables comprising; bank size, capitalization , asset quality, and liquidity. While the extra-bank variables included; real GDP, inflation, and the official exchange rate.	The main findings indicated that bank size and capital are the main drivers for profitability of Islamic banks, which helped in reducing bank's credit risk as well. While, the liquidity and asset quality variables resulted in inconclusive results. Moreover, macroeconomic variables, with the exception of inflation, helped to improve Islamic banks' profitability; however, credit risk remained unfavourable. The main conclusion of the study is that Islamic banks don't differ from conventional banks in terms of bank profitability and risk features.
21	Olivier de Bandt, Boubacar Camaraa, Alexis Maitreb, Pierre Pessarossia	2017	The authors used a panel dataset of 25 French banks to investigate different relationships between actual capital, regulatory capital, and bank performance for the period (2007-2014), using the system GMM estimation.	The main model of the study employed bank profitability, as denoted by ROA, as the dependent variable. While, the independent variables were the regulatory capital and voluntary capital. In addition to controlling bank size, loan share, deposits share, asset diversification, credit risk, and the output gap as a measure of macroeconomic shocks in France.	The estimation results confirmed that voluntary capital had a positive effect on bank profitability, while regulatory capital proved to be insignificantly affecting bank profitability. Therefore, increases in regulatory capital requirements have been proved not to be detrimental to banks in France.
22	Vesna Bucevska and Branka Hadzi Misheva	2017	Investigating the relevance of the SCP and the Efficiency hypotheses in explaining bank performance in six Balkan countries for the period 2005-2009, using unbalanced panel dataset for a sample of 127 banks. The authors estimated a GMM dynamic model to check for profit persistence in the selected sample.	The main dependent variable is proxied by ROA and ROE as measures of bank profitability. Independent and control variables included; concentration, market share, efficiency, credit risk, size, capitalization, ownership, banking sector reform index, inflation, and GDP growth.	The results suggested that profit tended to persist over the sample period. Also, Efficiency hypothesis was supported as the efficiency variable affected bank profitability significantly and in a positive way. While, the concentration variable did not have an impact on bank profitability. Additionally, all of the control variables were proved to have an impact on bank profitability with the exception of size, inflation, and economic growth.

No.	Author(s)	Year	Description	Variables	Findings
23	Fakhri J. Hasanov, Nigar Bayramli, and Nayef Al-Musehel	2018	Investigating the bank-specific and macroeconomic determinants of bank profitability in Azerbaijan using a dynamic panel model under the GMM estimation. The study used the quarterly data of 22 Azerbaijani banks over the period Q12012-Q12017.	The main depended variable was ROA used to measure bank profitability. Independent variables included Capital measured by the equity to total assets, size measured by natural logarithm of total assets, the ratio of total loans to deposits and short-term funding as a measure of liquidity risk, the ratio of loans to total assets, the ratio of deposits to total assets, as well as a number of measures for economic cycle, inflation, change in oil prices, and change in exchange rate.	The study concluded a positive significant effect of capital, size, loans, expected inflation, and economic cycle on profitability. While the negative effects of liquidity risk, deposits, exchange rate devaluation were evident in the model. Moreover, the study concluded a moderate persistence of profit in the Azerbaijani banking.
24	Jonathan Batten & Xuan Vinh Vo	2019	The study used the panel date of 35 Vietnamise banks over the period 2006-2014 to investigate the effect of different internal and external factors on bank profitability, as measured by NIM, return on average assets, and return on average equity. Employing both the Fixed Effects as well as the GMM estimation methods.	The main dependent variable is measured using the NIM, return on average assets, as well as return on average equity. However, determinants of bank profitability included; size as measured by the logarithm of total assets, capital adequacy measured by the equity to assets ratio, provisions to total loans as a measure of credit risk, operating expenses to total assets ratio, while the log of profit per employee ratio is used to measure productivity, market structure as measured by the HHI, in addition to inflation and GDP growth.	The authors found a negative effect of bank size on profitability. Capital were found to affect profitability positively in case of NIM and return on average assets. While the effect turned to be negative in case of measuring profitability using return on average equity. Credit risk had a significant positive effect on profitability as measured by NIM. While Operating expenses ratio affected banks negatively in case of return on average assets, and positively in case of NIM. Moreover, productivity affected banks positively in all models. Concentration variable affected NIM negatively, and inflation affected NIM positively. However, the study couldn't report a consistent effect on GDP on profitability.

No.	Author(s)	Year	Description	Variables	Findings
25	Maria Teresa Medeiros Garcia and Maria José Trindade	2019	Using balanced dataset of 17 banks operating in Angola for the (2010-2016) period; the authors investigated 4 bank-specific factors and 7 macroeconomic factors that affect bank profitability using the fixed effects estimator, to provide new insights into the determinants of bank profitability of the sample banks.	Bank profitability was measured by return on average assets and return on average equity. Bank-specific factors included; equity to assets ratio, cost-to-income ratio, a dummy variable for foreign versus domestic banks, deposits to total assets ratio. While macroeconomic variables included; real GDP growth, effective tax rate, term structure of interest rate, assets of all banks in the economy to real GDP ratio, price of crude oil at the end of each year, exchange rate, inflation rate, and corruption index.	Only two bank specific variables showed statistical significance; ownership and capitalization variables. However, capitalization proved to affect only return on average equity negatively. Real GDP proved to affect profitability as measured by return on average equity negatively. While the effective tax rate had a negative impact on the two measures of profitability. Finally, exchange rate, inflation rate, and corruption index proved to affect profitability as measured by return on average assets positively.
26	Charles Nyoka	2019	Testing the positive effect of bank capital on bank profitability using the GMM and Panel Two Stage Least Squares (2SLS) techniques using panel dataset for a sample of 13 banks operating in South Africa for the period (2006-2013).	The main dependent variable was measured using ROA and ROE. The main independent variable is measured using the capital to assets ratio. While control variables included; size measured as the square of the natural logarithm of total assets, ration of operating expenses to total assets, credit risk as measured by loan loss provisions to total loans, market concentration (HHI), inflation, and annual growth of GDP.	The results reported a positive significant effect of capital ratio on profitability in all models, which was used to draw some implication to help financial institutions, investors, and policymakers in their decision making processes. However, the study reported varying results of the control variables across different models using different statistical techniques.
27	Van Dung Ha	2020	Investigating the effect of bank capital on profitability and risk for a sample of 35 Vietnamese banks for the period 2008-2017 using two-step system GMM. The study employed bank profitability and bank risk as the main dependent variables, bank capital as the main independent variable, and controlled for other bank-specific and macroeconomic factors of bank profitability.	Bank profitability is measured by ROA, ROE, and NIM. Whereas bank risk is measured using two proxies; loan loss reserve to total assets and non-performing loans to total gross loans. Bank capital is measured by equity ratio; equity to total assets and equity level; natural logarithm of equity. Control variables include; loans to total assets ratio, deposits to total assets ratio, liquidity as measured by current assets to total assets ratio, money supply growth as measured by M2, in addition to inflation and GDP growth.	Bank capital was found to negatively affect profitability when measured by ROA and ROE. Bank capital affected risk negatively when measured by the ratio of loan loss reserve to total loans, whereas the effect turned to be positive when measuring risk by the ratio of non-performing loans to total gross loans. The deposit ratio proved to affect bank profitability and bank risk negatively. While, the liquidity ratio affected bank profitability positively, and had a negative effect on bank risk. Inflation was found to affect profitability negatively. GDP was found to affect profitability positively and risk

No.	Author(s)	Year	Description	Variables	Findings
					negatively. Finally, the effect of money supply growth was positive in case of ROA and ROE, and negative in case of NIM.
28	Myra V. De Leon	2020	Investigating the effect of credit risk and macroeconomic factors on bank profitability of 20 Asian banks from Indonesia, Malaysia, Thailand and Philippines using unbalanced dataset for the period 2012-2017 under the fixed effects and the random effects estimation methods.	The main dependent variable is bank profitability as measured by ROA and ROE. Independent variables include credit risk measured by the ratio of loan loss reserves to total loans, in addition to using GDP growth and inflation rate as two macroeconomic variables to test their effects on profitability.	The study found that profitability, as measured by ROA and ROE, is negatively affected by credit risk and GDP growth, and positively affected by the inflation rate. The study recommended the need to strengthen banks' credit policies to evaluate credit worthiness.
29	Binh Thi Thanh DAO and Dung Phuong NGUYEN	2020	Studying the main bank-specific, industry-specific, and macroeconomic determinants of bank profitability, using panel data for a sample of 27 Asian banks in three countries; 10 from Vietnam, 8 from Malaysia, and 9 from Thailand for the period 2012-2016.	Bank profitability is measured by ROA, ROE, and TQ. Bank-specific factors include; capital adequacy ratio, non-performing loans ratio as a measure of credit risk, bank size, operational efficiency as measured by the cost-to-income ratio, and liquidity ratio. While, the industry-specific factors include concentration as measured by the HHI. Finally, GDP growth and inflation are the two macroeconomic factors used in the study.	A negative effect of bank size on bank profitability was found on models of Vietnam and Malaysia. Also a negative effect on profitability was the overall conclusion of the study for capital adequacy variable. Additionally, a positive effect of credit risk was recorded, and a negative effect of operational efficiency on bank profitability.
30	Maria Elisabete Duarte Neves , Maria Do Castelo Gouveia, and Catarina Alexandra Neves Proença	2020	Using an unbalanced dataset for the period 2011-2016 to investigate factors determining bank profitability of 94 banks from 19 Eurozone countries, using the GMM estimation method. In addition to using value-based data envelopment analysis (DEA) methodology to determine efficient banks.	The main dependent variable is the return on average assets. While independent variables include; assets composition as measured by the ratio of loans to total assets, capitalization as measured by equity to total assets, size measured by the logarithm of total employees, and operational efficiency as measured by the cost-to-income ratio.	The study found a negative effect of operation efficiency and size on bank profitability. Moreover, the authors concluded that bank-specific characteristics determine efficiency; however the effect differs, taking into consideration macroeconomic factors.

Chapter.5 Methodology and Data

5.1 Research Strategy

The research philosophy chosen by researchers include implications on the way they view the world and their understanding of the relationship between the knowledge and the processes of developing knowledge. The views of researchers on what is important and what is useful in their research differ by their attitude towards the world and how they believe knowledge is being developed. According to Saunders *et al.* (2012); one way of thinking about a research philosophy is the researcher's epistemological position, which describes what is considered important in a certain field of study; resources or feelings. The 'resources' researches will be much keen on the collection of data for analysis of facts, a situation in which the researcher believes that there is less room for bias or subjectivity, as the main dependence is on facts and objects that are separate from researchers' own existence. This type of researchers who prefer to deal with objects and facts that they consider more objective; are said to take a positivist position. This is the point of view adopted here, where observations lead to collection of quantitative panel data that is used to test research hypotheses based on existing facts and theories (Saunders *et al.*, 2012).

Therefore, the deductive research approach is more suitable here based on a positivist position to test the research hypotheses developed based on review of previous studies and relevant theories of bank performance, and this is all based on facts rather than impressions. The value-free way of conducting research is also reflected here in the independence of the researcher from any influence that can be done to the data or facts used. However, it can always be claimed that there is some sort of influence by the researcher who adopts positivism, in the choice of methods, data, objectives…etc. The deductive research approach is being utilized here to develop hypotheses to be tested by a structured research methodology. Which is done by going through many stages in the research process including; observation, investigating theories related to bank performance as discussed in the previous chapter, predicting outcomes, developing hypotheses, setting a plan to test hypotheses, collecting and

processing data, and finally verifying findings and making conclusions or returning to the prediction sage (Saunders *et al.*, 2012).

Therefore, the main research problem is being investigated to answer the main research questions, through testing the developed research hypotheses. This is done to study the effects of the main bank-specific and macroeconomic factors on performance of banks in Egypt by replicating the empirical evidences in other countries, and by taking into consideration the effects of serious political and economic shocks during the sample period; in addition to investigating the causal relationship between credit and liquidity risks. Which makes the deductive research approach the appropriate one to adopt in the research process to meet the study's main objectives of exploring different interrelationships that would affect bank performance in Egypt. The panel data modelling is to be applied for a sample of eleven banks that are listed on the Egyptian Stock Exchange. Necessary data was gathered from the audited financial statements of each bank in the sample, in addition to other macroeconomic data that was gathered from Euromonitor International and Trading Economics databases. As well as additional data gathered from Reuters databases to run additional analysis using capital regulatory ratios for the sample banks. The data gathered is used to run multiple regression analyses and test different relationships between the dependent and the independent variables to be able to test the main research hypotheses and answer the research questions. It is worth mentioning here that data analysis was done using Stata 14 software package.

5.2 Data Collection

The data collection process has gone through several stages to conclude the best possible source that provides the largest set of consistent data for the Egyptian banking sector. A check of the websites of banks operating in Egypt was conducted, and it has been found that there is no consistent reporting of financial data online, especially historical data. Most banks report the most recent reports, with the exception of 2 or 3 banks that provide full set of historical data. Moreover, by checking the Bankscope database, it has been found that it contains historical data for 38 banks in Egypt. However, the available data is not consistently reported for all banks, e.g. annual data is provided consistently for recent years only starting from 2011 to 2015, while interim data (quarterly reports) is not provided for all banks consistently (e.g. 2014 Q1 and Q2 is

available for most banks, while Q3 is not available, and some quarters are not available for all banks).

Also by checking Thomson Reuters databases, it has been found that data is not provided consistently for all banks (e.g. values to calculate gross loans for some banks have many missing numbers; 3 quarters are missing from the balance sheet of El Baraka bank for the period (2005-2015); one quarter is missing from the balance sheet of Credit Agricole bank for the same period; four quarters from the balance sheet of Faisal bank; twelve quarters for Gulf Bank with full two consecutive years missing; five quarters from the balance sheet of the National Bank of Kuwait Egypt; one quarter for QNB; three for SAIB; and two quarters for the balance sheet of UNB-Egypt). All regulatory requirements related to Basel II (e.g. Tier 1 Capital, Tier 2 Capital, and Risk-Weighted Assets) are reported consistently through Reuters, starting from 2014, with some missing values. No reporting for regulatory requirements of Basel III (e.g. leverage ratio and net stable funding ratio; following the application of some regulatory requirements related to Basel III gradually starting 2016, as discussed in chapter 3). Moreover, investigating the best source that provides data for banks in Egypt revealed that the Central Bank of Egypt (CBE) does not provide any financial data for banks registered in Egypt. While, the Egyptian Stock Exchange provides financial data for the listed banks only. The Egyptian Stock Exchange provides the financial data for all the listed companies only through a specialized company for information dissemination called “Egypt for Information Dissemination (EGID)”. Therefore, the EGID concluded that they can provide data for eleven banks that are consistently listed on the Egyptian Stock Exchange and that reported a full set of quarterly reports for the period 2005-2015. Additionally, they stated that the period 2005-2015 is the best to provide a full set of data for the eleven listed banks, with minor exceptions. This period represents a suitable sample period, as it covers the period of the Global Financial Crisis, the Arab Spring, and the major regulatory reforms made to the Egyptian banking industry.

Therefore, the population includes all the thirty-eight registered banks that are currently operating in Egypt after excluding the two banks that have recently got an approval for ceasing their operations in Egypt; Bank of Nova Scotia, and the National Bank of Oman. However, a full set of quarterly reports has been obtained though the EGID for the sample of eleven banks listed on the Egyptian Stock Exchange for the period (2005-2015). The sample banks are listed in Table (5.1) with their most recent share prices. Additionally, an additional dataset was obtained from Reuters databases for the same eleven banks for the period (2014

quarter 1 to 2016 quarter 2) which was used to conduct an additional analysis to investigate the impact of regulatory capital on bank profitability in Egypt. The additional dataset was collected because data on regulatory capital ratios is only available for the sample banks on a consistent basis starting 2014 as discussed earlier, and this data is provided regularly through Reuters. Moreover, the macroeconomic data was checked from different sources such as; the International Monetary Fund databases; the World bank; the CBE; the Ministry of Planning, Monitoring, and Administrative Reform of Egypt; the Central Agency for Public Mobilization and Statistics of Egypt (CAPMAS Egypt); Euromonitor; and Tradingeconomics databases. A full set of macroeconomic data has been obtained from the Euromonitor and Tradingeconomics databases that provided the best source for the macroeconomic data of Egypt for the sample period on a quarterly basis.

Table (5.1): Sample Banks and the most recent share prices

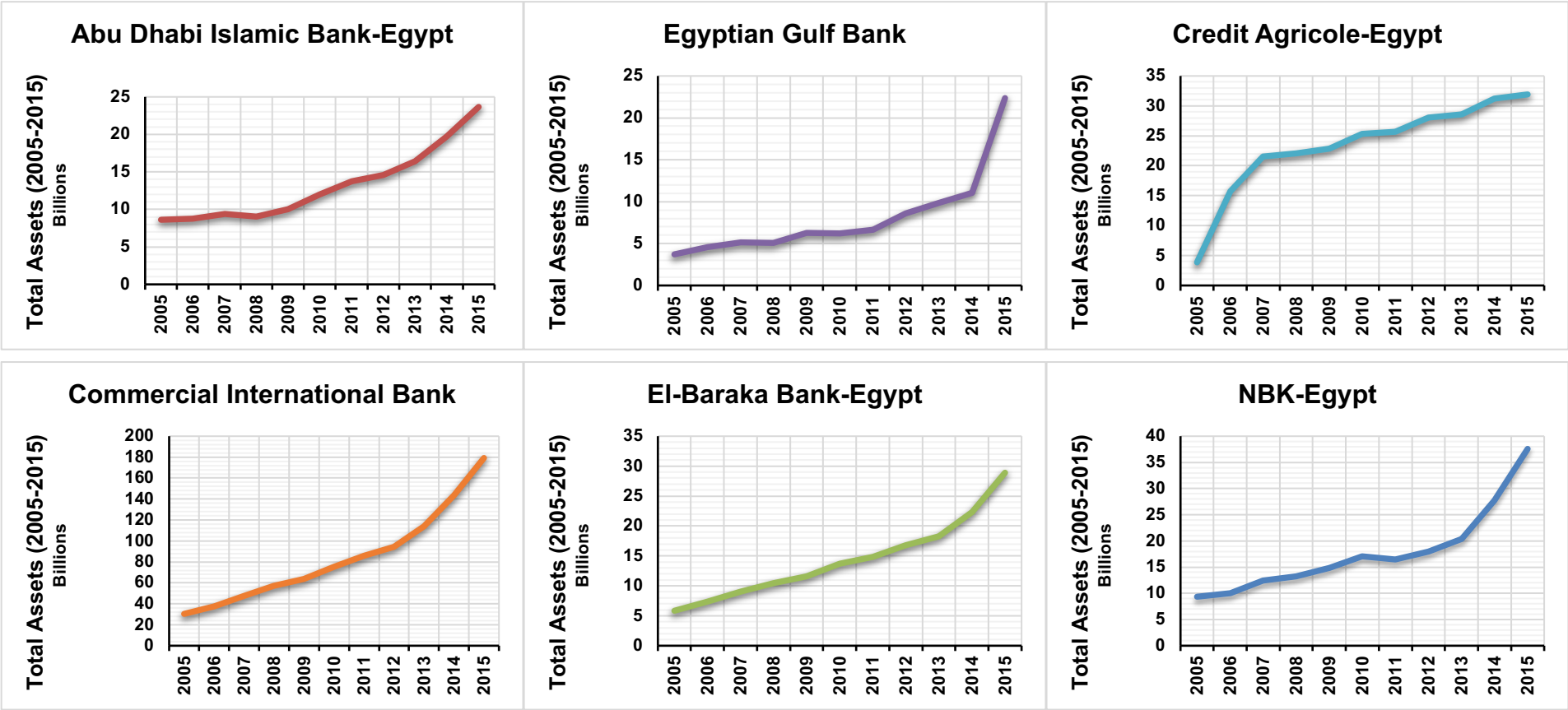
#	Bank Name	Share Price
1	Commercial International Bank (Egypt)	77.00
2	Qatar Natinal Bank Al Ahli (QNB Al Ahli)	56.67
3	Faisal Islamic Bank of Egypt	20.82
4	Société Arabe Internationale de Banque-SAIB	194.59
5	The National Bank of Kuwait- Egypt (NBK-Egypt)	39.80
6	Credit Agricole Egypt	44.99
7	Al Baraka Bank Egypt	17.74
8	Abu Dhabi Islamic Bank	17.48
9	Egyptian Gulf Bank	16.98
10	Suez Canal Bank	15.50
11	Union National Bank - Egypt (UNB-Egypt)	8.71

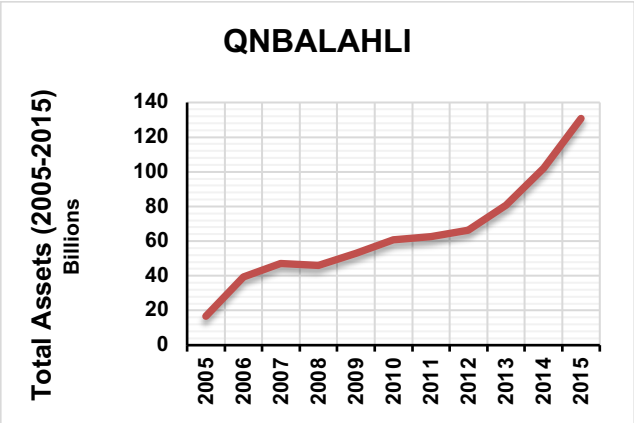
5.3 Comparing Sample Banks

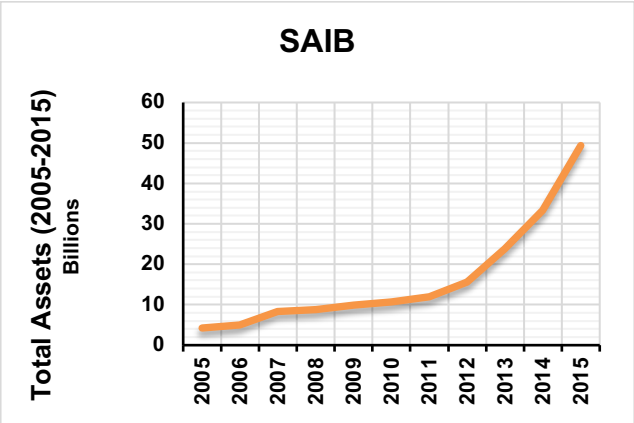
The eleven listed banks that are used in the sample of the current research shows a great growth in terms of the size of their total assets throughout the sample period. This can be shown through the following figure, which presents the line of total assets for each bank separately and how the values grew from the first quarter 2005 until the last quarter of 2015. The first look on the next two pages shows that the CIB is the largest bank with the highest rate of growth of total assets that grew from less than 30 billion EGP to more than 170 billion throughout the sample period. This bank provides the highest potential for growth among the sample banks as it continues growing with even a higher growth rate

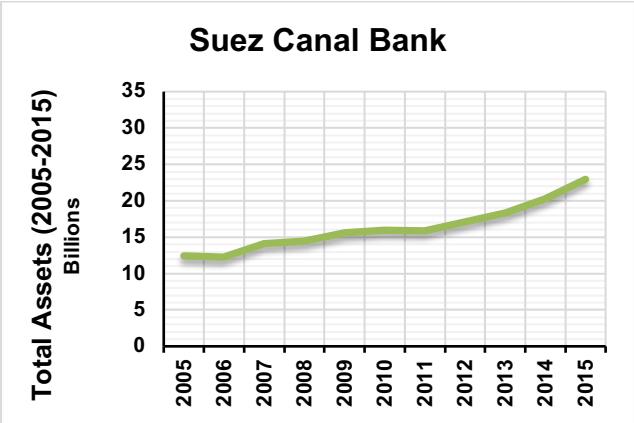
as indicated by the total assets growth. Also QNBALAHLI bank shows a fast growth rate of total assets as can be noticed from the line. The bank grew from less than 20 billion of total assets to more than 130 billion throughout the sample period. However, all sample banks showed a good growth rates throughout the sample period in terms of total assets especially for the largest two banks as explained. In addition to a higher growth rate in the last few years of the sample period for Egyptian Gulf bank, El-Baraka Bank-Egypt, NBK-Egypt, SAIB and UNB-Egypt.

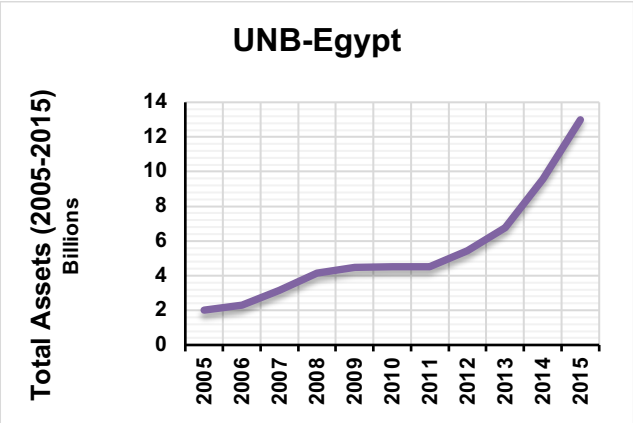
Figure (5.1): Total Assets for the Sample Banks in EGP (2005Q1-2015Q4)







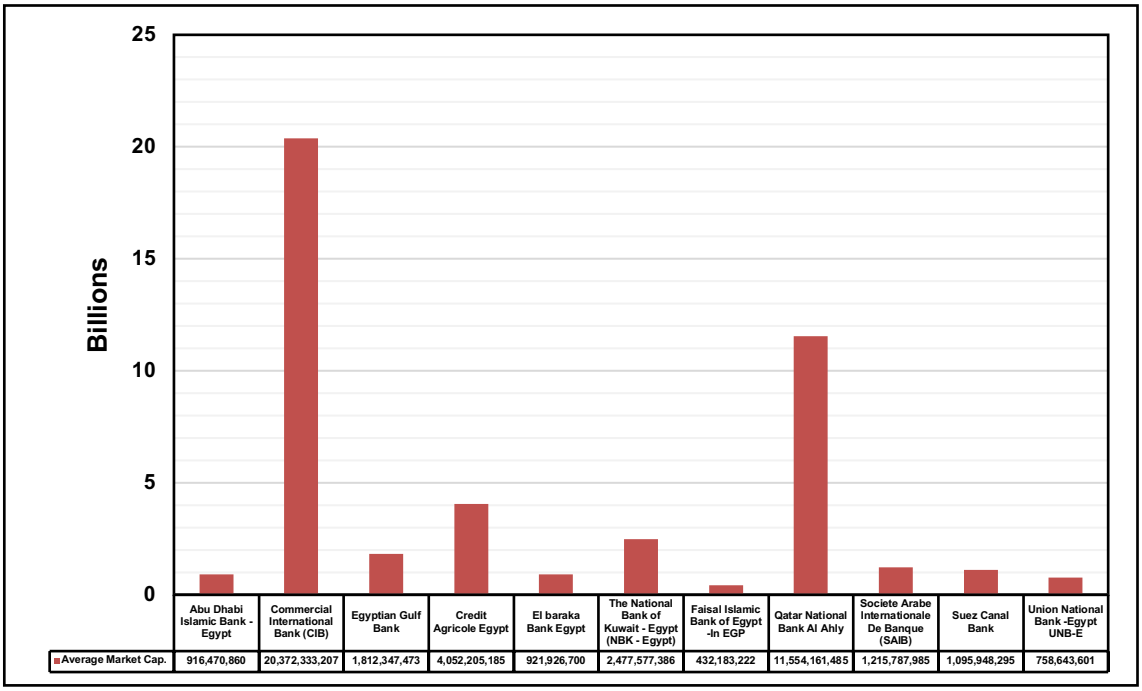




Source: (Banks' Financial Reports)

The eleven banks used in the sample of the current research are all listed consistently on the Egyptian Stock Exchange for the whole sample period. Therefore, the market capitalization of the sample banks, or the market values of their outstanding shares as evaluated by respective share prices, are used to compare the eleven banks through graphing the average market capitalization for the eleven banks for the sample period that started on the first quarter 2005 until the fourth quarter of 2015, as illustrated in the following figure. Rose and Hudgins (2013) stated that one of the most important values that any firm aims to maximize is the stock value which should be given priority over anything else. This is important to give the firm the needed market strength to attract investors and keep current ones, so that the firm can raise more capital for their future growth. Therefore, it can be noticed from the following figure that two banks dominate all other banks in terms of their market values which are; CIB and QNBALAHLI with an average market capitalization values of more than 20 billion EGP and 11 billion EGP, respectively. The large capitalization value of these two banks reflect that they are the major players in the stock market compared to other banks and that they might have a higher growth potential that attract more investors, especially with large sizes and higher growth rate of their total assets, as discussed earlier. Moreover, Credit Agricole and NBK-Egypt banks have medium values for their market capitalization, which are considered the next two banks in the stock market compared to other banks, while the other five banks have small values for their market capitalization compared to the largest four CIB, QNBALAHLI, Credit Agricole and NBK-Egypt.

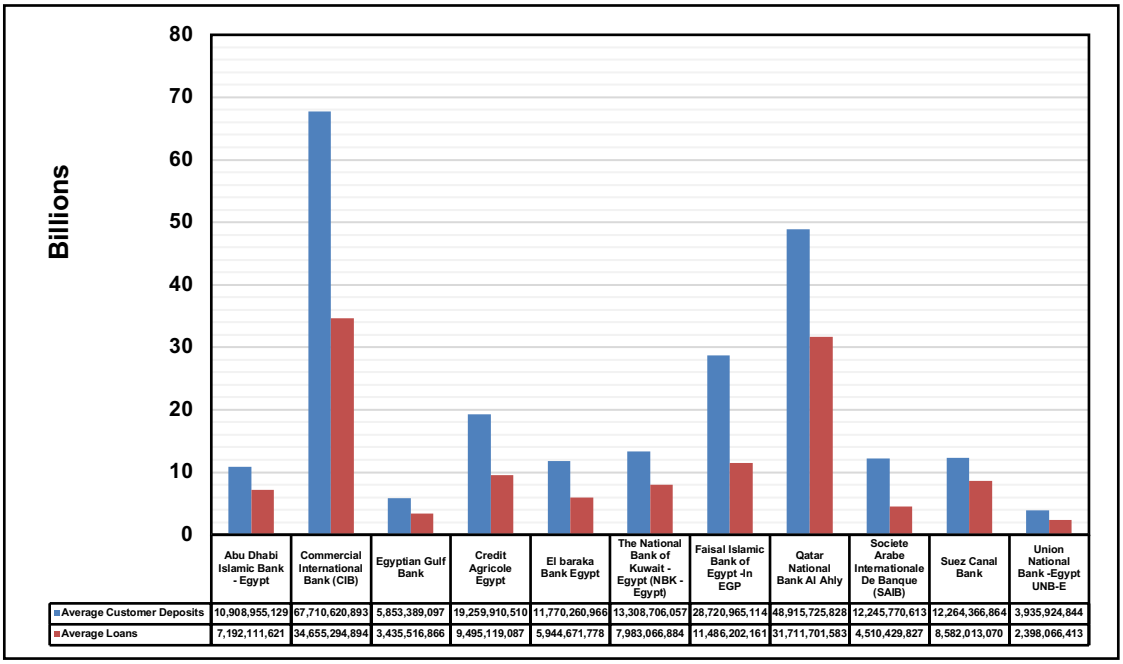
Figure (5.2): Average Market Capitalization for the Sample Banks



Source: (Banks' Financial Reports)

Moreover, a comparison of the average customer deposits and loans over the period 2005-2015, based on the quarterly dataset for the eleven banks included in the sample, revealed that the CIB has the highest figures in both deposits and loans reflecting the size of the bank's operations and its large customer base that comprises 11,461 institutional customers contributing more than 80% of the bank's loans and one million retail customers who contribute more than 75% of the bank's deposits. QNBAlAHLI follows CIB in the average deposits and loans figures over the 2005-2015 period. While the UNB-Egypt comes at the bottom of the list with around 4 billion EGP of customer deposits and 2.4 billion EGP of loans. Additionally, Figure (5.4) presents the average net income for the eleven banks in which we can notice that CIB, QNBALAHLI, and Credit Agricole banks have the highest average net income for the period 2005-2015 based on the quarterly financial reports. This confirms what is illustrated in the previous figures. However, Abu Dhabi Islamic bank and Suez Canal bank showed a negative average net income as can be noted from the figure. Both banks reported negative net incomes in the early years of the sample period, especially before acquisition of the National Bank for Development by Abu Dhabi Islamic bank.

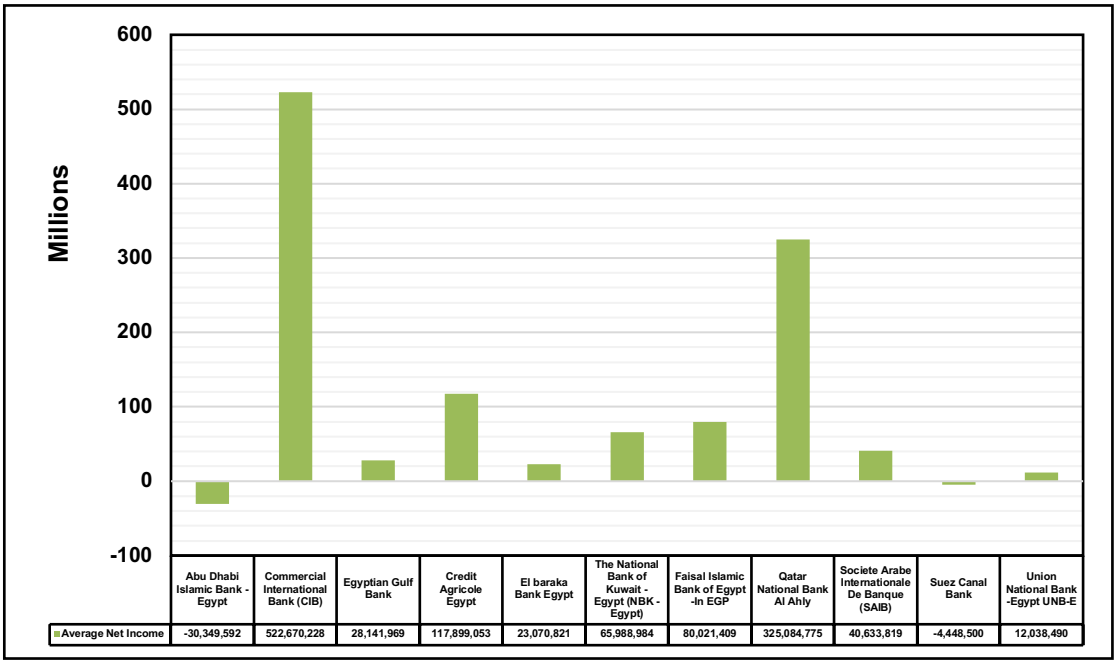
Figure (5.3): Average Deposits and Loans of Sample Banks



	Abu Dhabi Islamic Bank - Egypt	Commercial International Bank (CIB)	Egyptian Gulf Bank	Credit Agricole Egypt	El baraka Bank Egypt	The National Bank of Kuwait - Egypt (NBK - Egypt)	Faisal Islamic Bank of Egypt -In EGP	Qatar National Bank Al Ahly	Societe Arabe Internationale De Banque (SAIB)	Suez Canal Bank	Union National Bank -Egypt UNB-E
Average Customer Deposits	10,908,955,129	67,710,620,893	5,853,389,097	19,259,910,510	11,770,260,966	13,308,706,057	28,720,965,114	48,915,725,828	12,245,770,613	12,264,366,864	3,935,924,844
Average Loans	7,192,111,621	34,655,294,894	3,435,516,866	9,495,119,087	5,944,671,778	7,983,066,884	11,486,202,161	31,711,701,583	4,510,429,827	8,582,013,070	2,398,066,413

Source: (Banks' Financial Reports)

Figure (5.4): Average Net Income of Sample Banks



	Abu Dhabi Islamic Bank - Egypt	Commercial International Bank (CIB)	Egyptian Gulf Bank	Credit Agricole Egypt	El baraka Bank Egypt	The National Bank of Kuwait - Egypt (NBK - Egypt)	Faisal Islamic Bank of Egypt -In EGP	Qatar National Bank Al Ahly	Societe Arabe Internationale De Banque (SAIB)	Suez Canal Bank	Union National Bank -Egypt UNB-E
Average Net Income	-30,349,592	522,670,228	28,141,969	117,899,053	23,070,821	65,988,984	80,021,409	325,084,775	40,633,819	-4,448,500	12,038,490

Source: (Banks' Financial Reports)

5.4 Regression Models Specifications

Panel data sets, like the one used in the current research, are sometimes favoured when compared to time series and cross sectional data. This is mainly due to the fact that panel data models pool observations on both levels; time and cross-sectional. Brooks (2008) mentioned that one of the main advantages of using panel models is that it can deal with some complexities that are difficult to be addressed using other models. The general Panel regression model would be represented by:

$$\mathbf{Y}_{it} = \boldsymbol{\alpha} + \boldsymbol{\beta} \boldsymbol{X}_{it} + \boldsymbol{\varepsilon}_{it} \tag{5.1}$$

Where the cross-section dimension is represented by subscript *i* and the time-series dimension is represented by subscript *t*. Variable y_{it} is the dependent variable, and the intercept term is represented by α. While x_{it} represent the independent variable, β is a k×1 vector of parameters for the independent variables, t = 1, . . . , T ; i = 1, . . . , N, and ε_{it} is the disturbance term with v_i the unobservable bank-specific effect and μ_{it} the idiosyncratic error.

5.4.1 Estimation Methods

- **Bank Profitability Models**

The use of fixed effects estimation method is important for models with individual-specific characteristics that are not changing overtime whether they are measured or not. When the researcher is not interested in measuring time-invariant characteristics, controlling these characteristics makes the fixed effects less vulnerable to the omitted variable bias through controlling the stable characteristics, even if they are not measured in the model. However, the fixed effects estimator does not control for the omitted time-variant variables and it does not also control for the time-varying effects of the time-invariant variables. Therefore, the use of the within-individual differences in the fixed effects method disregards differences between individuals which adds inefficiency to the fixed effects estimation as compared to the random effects if there is a great variation between individuals with little variation over time for each individual. Therefore, in the random effects estimator the effect of the time-invariant variables can be estimated rather than just controlled for, especially if there are no omitted variables. This means that the choice between random and fixed effects involves

a trade-off between bias and efficiency, as the fixed effects model will be less vulnerable to the omitted variable bias; however, it would be less efficient with larger standard errors in some cases. Wooldridge (2013) stated that the Hausman test can be used to formally determine which is more consistent for the tested model; the fixed effects or the random effects estimator. The Hausman test compares coefficient vectors of each estimator, the point estimates of the estimators shouldn't differ greatly if they are both consistent. However, the point estimates of the inconsistent estimator is expected to differ from the consistent one. The null hypothesis tested in the Hausman test assumes that the fixed effects estimator is always consistent but inefficient, while the random effects is both consistent and relatively efficient. Therefore, rejection of the null hypothesis indicates that the random effects is not preferable and the fixed effects estimator is more appropriate for the model.

However, estimating bank profitability models using the common panel estimation methods might suffer from endogeneity problems. Examples of these problems might be the existence of profit persistence. Also another problem might be the reverse causality, e.g. the relationship between size and profitability might go in the opposite direction. It can be argued that banks with high profitability have the ability to increase their equity through retained earnings and through having the ability to better market themselves and therefore, banks get larger with better profitability. Moreover, this might impact their operational efficiency through increasing their personnel expenses, such as consultation fees; therefore, causality between size and profitability might have the opposite direction. Also the unobservable bank heterogeneity exists in profitability models, such as the differences in corporate governance between banks which might affect profitability. Therefore, the Generalized Method of Moments (GMM) is used to account for this kind of problems in bank profitability models. The GMM uses the lagged values of the dependent variable in level and in differences as instruments; in addition to the lagged values of other independent variables that might suffer from endogeneity problems. Additionally, the GMM controls for the bank unobservable heterogeneity that affect profitability (Djalilov and Piesse, 2016). Moreover, Windmeijer (2005) mentioned that in small samples; the estimated asymptotic standard errors of the two-step GMM are downward biased in comparison to those of the one-step GMM estimators that uses weight metrices to correct for the bias through being independent from the estimated parameters. The author recommended paying special attention to this bias of the GMM estimators in small samples, even when using the corrected variance estimates. Therefore, it has been found that the one-step system GMM estimator

is the estimator that results in well-behaved validation tests and fits the relatively small sample used in the analysis of the thesis

Furthermore, Bandt *et al.* (2017) stated that endogeneity of capital level in profitability models is one aspect that should be taken into consideration. Performance is expected to affect the optimal capital level for a bank in two ways; over the short-run, efficient banks may be more willing and capable to build-up capital. While over the long-run profitable banks might be less willing to build-up more capital as they know they have future income that can be used if needed. These two effects work in opposite directions and depending on the magnitude of each one the bias included in the model might be upward or downward. Therefore, Bandt *et al.* used the system GMM proposed by (Blundell and Bond, 1998) in addition to the fixed effects and the pooled OLS estimates, to account for this serial endogeneity and allows accounting for individual heterogeneity between banks, which was done in Stata using the xtabond2 command developed by David Roodman. The system GMM method uses the first differences to instrument levels, and uses levels to instrument first differences. The use of lags in level and first difference of capital ratio alleviates the effect of endogeneity bias, as lagged capital is not expected to be determined by current profitability levels. Additionally, the authors argued that reporting the results of the pooled OLS, fixed effects, and system GMM gives the reader more information about the size and direction of bias between models. As the pooled OLS does not take the individual heterogeneity into consideration; while the fixed effects method tends to be biased in case of using the autoregressive term, as the fixed effects autoregressive model tends to suffer from the Nickell bias. Therefore, the system GMM is the most preferable model.

In the same line, Ahamed (2017) used the two-step system GMM estimator suggested by Arellano and Bover (1995), and Blundell and Bond (1998), in which a system of equations is simultaneously estimated using both levels and first-differences. The system GMM allows the use of a lagged dependent variable to exploit the dynamic nature of the data and test the effect of past values on future values of the dependent variable. Additionally, as long as the regressors might not be strictly exogenous, the system GMM is used to control for the endogeneity problem of the independent variables, and use the lagged levels and lagged differences of the independent variables as instruments. Likewise, Trujillo-Ponce (2013) discussed that Arellano and Bover (1995) and Blundell and Bond (1998) developed the system GMM as an alternative to the difference GMM developed by Arellano and Bond (1991). Trujillo-Ponce (2013) stated that the system GMM

can be used to address issues related to the dynamic panel modelling in bank profitability models. These issues include endogeneity of some variables due to the existence of reverse causality. In addition to the problem of unobservable heterogeneity or the effect of omitting variables that might affect bank profitability. Unobservable heterogeneity might lead to biased coefficients due to the existence of correlations between the error term and some explanatory variables coefficients. Therefore, following Pervan *et al.* (2015) and Tujillo-Ponce (2013), the basic equation for this dynamic model would be;

$$\boldsymbol{Y_{it} = \alpha + \delta Y_{it-1} + \sum_{b=1}^{B} \beta_b X_{it}^b + \sum_{m=1}^{M} \beta_m X_{it}^m + \varepsilon_{it} \qquad \varepsilon_{it} = \nu_i + u_{it}} \tag{5.2}$$

Where; subscript *i* indicates banks and *t* indicates time, while Y_{it} is the profitability of bank i at time t, with $i = 1, \dots, N$, $t = 1, \dots, T$, while α is the constant term, δ is the speed of adjustment to equilibrium, Y_{it-1} is the one-period lagged profitability. The value of δ denotes the speed by which the profit persistence returns to equilibrium if the value is between 0 and 1. Values close to zero denotes a speedy adjustment to equilibrium, thus indicating a competitive market. On the other hand, if the values of δ is closer to 1, this indicates a slow adjustment to the equilibrium, and as a result a less competitive market. X_{it}^b are the bank-specific explanatory variables, X_{it}^m are the macroeconomic explanatory variables, ε_{it} is the disturbance term with ν_i the unobservable bank-specific effect, and u_{it} the idiosyncratic error.

Similarly, Saona (2016) used the GMM to address problems associated with the estimated model, such as unobservable heterogeneity and endogeneity. The author described unobservable heterogeneity as the special characteristics of each bank, such as managerial style and attitude toward risk, that don't change over time and is difficult to be measured. Therefore, this unobservable heterogeneity becomes a part of the random component of the estimated model. Additionally, the inclusion of the lagged dependent variable in the model and possibility for reverse causality represent sources for endogeneity in such dynamic models, similar to that estimated by Saona (2016). Therefore, the author used the system GMM to address these problems, as it provided the most efficient and consistent estimations. Likewise, Pervan *et al.* (2015) argued that the dynamic nature of the relationships involved in the bank profitability models has to be accounted for using the GMM. As long as the model is formulated by introducing dynamic specification or a lagged dependent variable as an explanatory variable, the GMM estimation, proposed by Arellano and Bond (1991), should be used. This is because other estimation methods become

biased in case of dynamic models such as; OLS, the fixed effects and the random effects.

Pervan *et al.* (2015), who used the first-differenced GMM in their estimation, stated that the optimal number of instrumental variables should be chosen, as the introduction of additional instrumental variables make the estimation one-sided. Similarly, Saona (2016) stated that the choice of instruments is an important decision in handling endogeneity. Therefore, Hansen's test for over-identifying restrictions should be used in the GMM models to check if the instruments are exogenous. However, Pervan *et al.* (2015) confirmed that the validity of the GMM dynamic model should be tested using the Sargan test of over-identifying restrictions to test the endogenous instrumental variables. This is a test of the null hypothesis that there is no correlation between the instrumental variables and the residuals. The p-value should exceed 0.05 in order not to reject the null hypothesis, which proves that the partiality of estimators does not increase significantly, all conditions for the moments are met, and there is no evidence of over-identifying restrictions.

Additionally, Pervan *et al.* (2015) stated that the "m1 m2 Arellano-Bond test" for testing the first-order and second-order autocorrelation between the first residual differences should be conducted. If the p-value for the first-order autocorrelation test is statistically insignificant, it means failing to reject he null hypothesis that states the absence of first-order autocorrelation between first residual differences. For the second-order autocorrelation test, the same applies for the null hypothesis. Therefore, not rejecting the null hypotheses of both tests indicates that the independence of residual differences is proved. Saona (2016) argued that the first order autocorrelation AR(1) that tests the null hypothesis of no first-order autocorrelation should be performed. However, $\Delta\varepsilon_{it=}\varepsilon_{it} - \varepsilon_{it-1}$ might be correlated with $\Delta\varepsilon_{it-1=}\varepsilon_{it-1} - \varepsilon_{it-2}$, as both have the same term ε_{it-1}. Therefore, rejecting the null hypothesis of the AR(1) represents no problem, and performing the test for the second-order autocorrelation is needed AR(2). If the test doesn't reject the null of no second-order autocorrelation, then the moment conditions are valid.

- **Panel Granger Causality Model**

Time-series vector auto-regression (VAR) models were developed in the literature as an alternative modelling procedure to multivariate simultaneous equation models (Sims, 1980). The introduction of VAR in panel data settings

was initiated in 1988 by (Holtz-Eakin *et al.*, 1988), and it has been used recently in multiple applications in the literature. Following (Granger, 1969) who developed the pioneer concept of Granger causality to test causality between two variables; a panel vector auto-regression (PVAR) model is applied in the current research. This is done through fitting a multivariate panel regression for each dependent variable on one hand, and its own lags and lags of all other dependent variables on the other hand, and by using the GMM estimation. The PVAR model combines the panel data approach with its main characteristics of unobservable individual heterogeneity with the traditional VAR approach that is different in which it treats all the variables in the system as endogenous variables. The use of GMM in panel data estimations helps in reducing the inherent bias as it controls for some problems such as endogeneity in explanatory variables, unobservable problems related to entity-specific and time-specific effects and problems of including lagged dependent variables as regressors, as discussed earlier. A time-stationary VAR representation for two variables that is adapted to a panel data context can be specified as follows;

$$Y_{it} = \alpha_0 + \sum_{j=1}^{J} \alpha_j Y_{it-j} + \sum_{j=1}^{J} \delta_j X_{it-j} + f_{yi} + u_{it} \tag{5.3}$$

$$X_{it} = \beta_0 + \sum_{j=1}^{J} \beta_j Y_{it-j} + \sum_{j=1}^{J} \gamma_j X_{it-j} + f_{xi} + v_{it} \tag{5.4}$$

Where *i* = 1,….., N refers to cross-sectional panel members (banks), *t* = 1,….., T refers to the period, α_0, β_0 refer to the intercepts, j = 1,….., J refers to lags considered, u_{it}, v_{it} refer to error terms, and f_{xi}, f_{yi} refer to the individual fixed effects for the panel member i.

However, before testing the Granger causality between credit risk and liquidity risk in the current study, tests for panel unit root or stationarity of the variables are performed. Recent tests were developed by; Maddala and Wu (1999), Choi (2001), Hadri (2000), Levin, Lin and Chu (LLC) (2002), and Im, Pesaran and Shin (IPS) (2003). The use of these tests in literature indicates that tests based on individual time series are less powerful than panel unit root tests. While the most popular unit root tests in the literature are; the Augmented Dickey-Fuller Fisher test and the Im-Pesaran-Shin (IPS) test which can deal with the balanced as well as the unbalanced series. Both tests employ the Augmented Dickey Fuller (ADF)

principle; however, the IPS is considered to be more general as it allows for more heterogeneity. Therefore, developers of this test referred to its high power compared to other tests, which makes it commonly called Heterogeneous Panel Unit Root Test. Moreover, when the lag length is chosen in ADF tests, it is important to permit some heterogeneity; therefore, this test specifies a separate ADF regression for each cross section which can be shown by the following equation;

$$\Delta y_{i,t} = \alpha_i + \beta_i y_{i,t-1} + \sum_{j=1}^{p_i} \rho_{i,j} \, \Delta y_{i,t-j} + \varepsilon_{i,t} \qquad (5.5)$$

Where $y_{i,t}$ is the series for panel member *i* over period *t*, p_i is the lag order, and the error term $\varepsilon_{i,t}$. Therefore, the null hypothesis to be tested is;

$$H_0 : \beta_i = 0, \ \forall i$$

Against the alternative hypothesis of;

$$H_1 : \begin{cases} \beta_i = 0 & \text{for some } i\text{'s.} \\ \beta_i \prec 0 & \text{for at least one } i. \end{cases}$$

The null hypothesis states that each cross-section in the panel has a unit root, while the alternative hypothesis states that there is one cross-section at least in the panel that is stationary. IPS test is used as a panel unit root test to check for stationarity of data used in this research in addition to a confirmation by using Fisher-type based on Phillips-Perron tests. Both tests have the null hypothesis that there is a unit root.

Then, a PVAR model estimation is conducted using a package of Stata programs that were applied for the first time by Love and Zicchino (2006), while the Stata package used was originally developed by one of the authors (Inessa Love). The package provides the full procedures of PVAR model selection, estimation, and inference under a GMM framework, where the forward orthogonal deviation or Helmert transformation proposed by Arellano and Bover (1995) is used to remove the panel fixed effects. In this case, lagged regressors can be employed as instruments and the coefficients can easily be estimated through the system GMM, because Helmert transformation maintains the orthogonality among lagged regressors and transformed variables. Love and Zicchino (2006) has

been cited in many research papers that estimated PVAR models using the same program package, some of them were published in “The American Economic Review” such as (Head *et al.*, 2014). Other papers include (Mora and Logan, 2012), (Carpenter and Demiralp, 2012) and (Neumann *et al.*, 2010). The PVAR analysis is predicted based on choosing the optimal lag length for PVAR specification as well as moment condition. A consistent moment and model selection criteria (MMSC) for GMM estimations were proposed by Andrews and Lu (2001). They also used the test proposed by Hansen (1982) which is the J-statistic of over-identifying restrictions. However, the use of the MMSC are equivalent to the maximum likelihood-based selection criteria that are commonly used such as; the Akaike information criteria (AIC) (Akaike, 1969), the Hannan-Quinn information criteria (HQIC) (Hannan and Quinn, 1979), and the Bayesian information criteria (BIC) (Schwarz, 1978; Rissanen, 1978; Akaike, 1977).

Granger (1969) concluded that there is a Granger causality from X to Y if prediction of Y, given its past values, can be improved using past values of X. The previously specified model in equation (5.3) concludes that if not all δ_j are equal to zero then X Granger causes Y. With respect to the model specified in equation (5.4), if not all β_j are equal to zero, then Y Granger causes X. Therefore, a Granger causality Wald test can be performed for each equation of the PVAR model and the following joint hypotheses can be tested together;

$\delta_j = 0 \quad for\ j = 1,\ldots\ldots,J$, and $\beta_j = 0 \quad for\ j = 1,\ldots\ldots,J$

Finally, validity of the choice of instruments is to be tested to ensure correct specification of the model. Over-identifying restrictions test using Hansen's J statistic can be used to test for validity of instrumental variables that are applied in the GMM estimation. The null hypothesis indicates the validity of the instruments used; therefore, an insignificant test statistic is an indication of the validity of the instruments used, which means that the instruments are uncorrelated with the residuals and the model is correctly specified.

5.5 Description of Variables

Based on the research questions, a set of bank-specific and macroeconomic variables are to be empirically examined to see the relative effect of each of these variables on the dependent variables employed to measure bank profitability in

different models. Developing the main research hypotheses will be undertaken to break down the main research questions. Therefore, details of measurement of all dependent and independent variables are discussed in this chapter, in addition to the main research hypotheses. The main focus of this thesis is to analyse the most commonly discussed factors that affect bank profitability in the literature which include; capitalization, credit risk, liquidity risk, revenue diversification, operational efficiency, size, financial structure, economic growth, inflation, interest rate, and money supply growth. Detailed description of each of these variables and the research hypotheses are discussed in the following pages. Moreover, a more detailed discussion of profitability ratios in the light of the DuPont analysis is warranted before presenting measurements of each variable. This is necessary to highlight the importance and linkages between the two main measures of bank profitability used in the analysis section; ROA and ROE, and to confirm their usefulness as the most commonly used measures for bank profitability.

5.5.1 Profitability Ratios Breakdown Analysis

Rose and Hudgins (2013) mentioned that any firm tries to maximize the value for their shareholders while bearing the minimum acceptable level of risk. Therefore, the two main dimensions of evaluating any firm's performance are profitability and risk. Better management of these two important dimensions represents the ultimate goal of any firm, especially financial firms. However, measuring firm profitability is not an easy task and there are different ways to do so. Rose and Hudgins (2013) stated that the most commonly used measures of bank profitability are; ROA, ROE, NIM, net noninterest margin, net operating margin and earnings per share of stock. Whereas the NIM, net noninterest margin, and net operating margin are considered to be not only profitability measures but also efficiency measures. While, ROA is intended to indicate the managerial efficiency in generating dollar amounts for each investment in assets. Alternatively, ROE represents the return that shareholders receive for each one dollar of their investment.

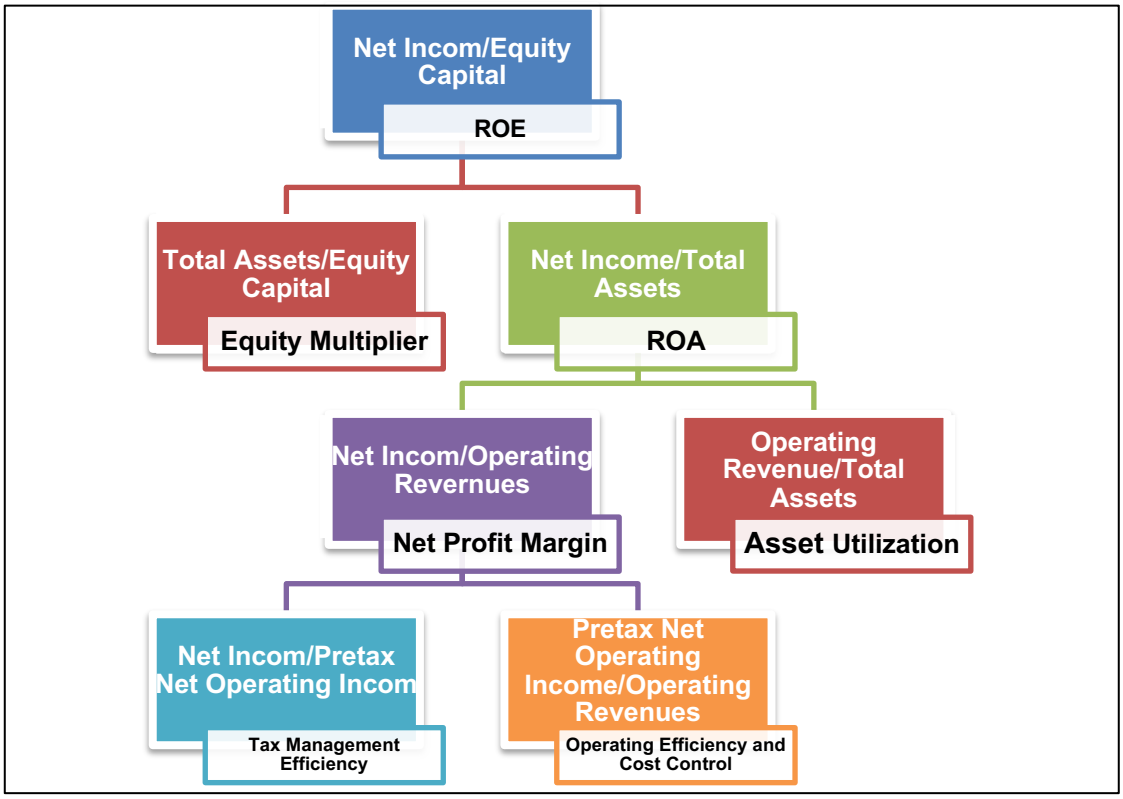
Indeed, Rose and Hudgins (2013) discussed ROA and ROE as the most important measures for profitability of banks that are widely used. Also, linking those ratios together in profitability analysis is important as they both share common factors such as net income, which can provide further implications in case of breaking down both ratios into their components. To begin, ROE is the

product of ROA and equity multiplier which reflects the sensitivity of values of ROE to the use of leverage indicated by the equity multiplier. In other words, even with low values of ROA a bank can still achiever high ROE with using more debt financing than equity or with higher leverage (debt relative to equity) and higher equity multiplier. This relationship is an example of a trade-off between return and risk, where managers have to make a decision as to whether or not to bear more risk through more debt financing to elevate the return on owners' capital. Therefore, the earnings efficiency as indicated by ROA will pose a balancing decision for managers, as in case of a declining ROA managers might choose to increase risk through higher leverage to achieve a desired return for shareholders. Therefore, the equity multiplier is the key player in this risk-return trade-off, as higher multiplier means higher leverage and higher return for shareholders as discussed. However, higher leverage means more use of debt relative to equity which implies more failure risk for banks as equity must absorb losses on assets.

Additionally, the division of ROA into net profit margin and asset utilization means that ROE is the product of three ratios in this case; net profit margin, asset utilization, and equity multiplier. This extended equation presents a new opportunity for managers of banks to find out more ways to increase the return to shareholder by means of better management of expenses and maximization of revenues through improving net profit margin on one hand, and by employing better allocation of assets to loans and investments with higher yields and incurring lower risk to enhance asset utilization on the other hand. Furthermore, better management of expenses and maximization of revenues can have the effect of enhancing net profit margin to a level that more than offset the decreases in equity multiplier that might result from attracting more equity capital. In this case bank management will manage to enhance ROE without incurring more risk of increasing leverage, especially if regulatory authorities encourage the use of lower leverage to finance banks' assets. Thus it can be seen that breaking down ROA and ROE into their respective components have the previously discussed implications in addition to many other implications that can be found by going deeper in the analysis. The DuPont analysis is important in case of financial institutions and can give managers many alerts and different ways for better management of bank operations. Careful management of financial leverage, careful management of operating leverage, better control of operating expenses and sales revenues, efficient management of asset utilization and, risk control are all examples of many factors that can be enhanced by bank management through utilizing deeper ratio analysis as discussed earlier.

Figure (5.5) reflects the main elements that determine ROE for financial firms as discussed by Rose and Hudgins (2013).

Figure (5.5): Elements Determining ROE in Financial Firms



Source: Rose and Hudgins (2013)

5.5.2 Research Variables

- **ROA**

ROA is considered to be the single most commonly used measure of bank profitability in many of the previously mentioned studies. ROA is used as a measure of operational performance and managerial efficiency (Pasiouras and Kosmidou, 2007 and Trujillo-Ponce, 2013). Therefore, ROA is used as the main measure of bank profitability in Egypt for this thesis following (Pasiouras and Kosmidou, 2007; Kosmidou, 2008; Ben Naceur and Omran, 2011; Trujillo-Ponce, 2013; Ghodrati and Ghasemi, 2014; Saeed, 2014; Lee, 2015; Pervan *et al.*, 2015; Rahman *et al.*, 2015; Djalilov and Piesse, 2016; Islam and Nishiyama, 2016; Ahamed, 2017; Bouzgarrou et al., 2017; Bucevska and Misheva, 2017 and Trad et al., 2017).

ROA = Net Income before Tax / Total Assets

- **ROE**

Return on equity is considered to be the most practiced measure of profitability for a firm. ROE is used to measure the return on stockholders investments in the bank. Therefore, the values of this variable depends on the bank's equity multiplier and the amount of debt used to finance assets as discussed earlier in relation to ROA. This variable is used as another measure for bank profitability following (Siddiqui and Shoaib, 2011; Trujillo-Ponce, 2013; Ghodrati and Ghasemi, 2014; Saeed, 2014; Lee, 2015; Rahman *et al.*, 2015; Islam and Nishiyama, 2016; Ahamed, 2017; Bouzgarrou et al., 2017; Bucevska and Misheva, 2017 and Trad *et al.*, 2017).

ROE = Net Income before Tax / Total Equity

- **Capital Adequacy**

This variable is employed to measure the bank capital structure or the percentage of total assets that is financed through equity. Therefore, this ratio is used as an indicator of the sufficiency of bank's equity to absorb losses from assets and prevent failure. Bank's capitalization is measured in the current research mainly through the ratio of equity to total assets; however, the regulatory capital ratio, that is utilized in accordance with applying Basel II in Egypt, is used in a different model using the second dataset collected from Reuters for a recent period, as will be discussed in the analysis chapter. Many studies investigated the effect of capitalization on bank profitability as measured by equity to total assets; in spite of this, the effect of capital ratio on bank profitability is undetermined in the literature. The current study followed the work of previous studies who examined capitalization as one of the main determinants of bank profitability (e.g. Chirwa, 2003; Kosmidou, 2008; Ben Naceur and Omran, 2011; Dietrich and Wanzenried, 2011; Rachdi, 2013; Trujillo-Ponce, 2013; Saeed, 2014; Lee, 2015; Noman *et al.*, 2015; Pervan *et al.*, 2015; Rahman *et al.*, 2015; Garcia and Guerreiro, 2016; Islam and Nishiyama, 2016; Knezevic and Dobromirov, 2016; Ahamed, 2017; Bouzgarrou et al., 2017; Bucevska and Misheva, 2017 and Trad *et al.*, 2017). While regulatory capital is measured using the ratio of capital to risk weighted assets as specified by the BSCB, based on the regulatory risk weights and capital requirements for credit risk, operational risk, and market risk.

Capital Adequacy Ratio = Total Equity / Total Assets

Regulatory Capital Ratio (Basel Ratio) = Capital / Risk-Weighted Assets

- **Bank Size**

Bank size is another factor that will be investigated for its effect on bank profitability through the main indicator of bank assets; following previous literature. The direction of the relationship between bank size and profitability is either positive or negative. On one hand, economies of scale cause large banks to earn higher efficiency and lower costs which enhance profitability. On the other hand, large sizes means more diversification and lower risk which might affect profitability; in addition to system complexity that might also affect profitability of large banks. Therefore, the impact of bank size on bank profitability is considered to be undetermined in the literature, as it differs from one study to the other. Some studies found economies of scale for large banks and others found diseconomies of scale for large banks. Different arguments are presented in the literature chapter and will be compared to the results in the analysis chapter. Bank size will be measured by the natural logarithm of total assets following (Athanasoglou *et al.*, 2008; Ben Naceur and Omran, 2011; Dietrich and Wanzenried, 2011; Ommeren, 2011; Rachdi, 2013; Trujillo-Ponce, 2013; Saeed, 2014; Lee, 2015; Noman *et al.*, 2015; Rahman *et al.*, 2015; Djalilov and Piesse, 2016; Islam and Nishiyama, 2016; Knezevic and Dobromirov, 2016; Saona, 2016; Ahamed, 2017; Bouzgarrou et al., 2017; Bucevska and Misheva, 2017 and Trad *et al.*, 2017).

Bank Size = Natural Logarithm of Total Assets

- **Revenue Diversification**

Efficient management of non-interest income sources might help increase bank's earnings from non-core banking activities, as alternative sources to the interest-income activities especially during times of declining interest rates. However, the final impact of diversification on bank profitability is not conclusive in previous literature. On one hand, diversifying income sources might help management to increase their earnings by boosting their non-interest income. However, the economies of scope might lead to increased costs for the bank and lower profitability on the other hand, as argued by Trujillo-Ponce (2013). The impact of

revenues diversification will be investigated using the measure of non-interest income to total revenues following (Ommeren, 2011; and Trujillo-Ponce, 2013).

Revenue Diversification = Non-interest Income / Total Revenues

- **Operational Efficiency**

Operational efficiency is another measure that affects bank profitability, that is usually calculated through the cost-to-income ratio to measure the variability of a bank's costs. Previous studies that used this measure include (Pasiouras and Kosmidou, 2007; Athanasoglou *et al.*, 2008; Kosmidou, 2008; Ali *et al.*, 2011; Dietrich and Wanzenried, 2011; Ommeren, 2011; Rachdi, 2013; Trujillo-Ponce, 2013; Noman *et al.*, 2015; Rahman *et al.*, 2015; Garcia and Guerreiro, 2016 and Knezevic and Dobromirov, 2016;). It can be argued that more efficienct banks can operate at lower costs which enhances profitability. Therefore, the effect of this variable is expected to be negative, as higher ratios means lower efficiency and lower profitability.

Operational Efficiency = Total Costs / Net Income

- **Credit Risk**

Credit risk can be measured by a bank's asset quality or credit quality which is measured by dividing loan loss reserves over total loans. According to Kosmidou (2008); this ratio shows how much of the total loans of a bank are provided for but not charged off. The higher the ratio the lower the asset quality and the higher the credit risk incurred by the bank. Higher ratios mean that bank customers are unable to pay back for loans which increases credit risk, lowers interest income, and deteriorates profitability. Studies that used this indicator of credit risk include (Iannotta *et al.*, 2007; Athanasoglou *et al.*, 2008; Kosmidou, 2008; Noman *et al.*, 2015; Pervan *et al.*, 2015; Garcia and Guerreiro, 2016, Trad *et al.*, 2017, and Ha 2020). It's worth mentioning here that there are other measures of credit risk used in previous studies; examples include studies that used loan loss provisions to total loans to measure credit risk such as; Kutsienyo (2011), Dietrich and Wanzenried (2011), Saona (2016), Djalilov and Piesse (2016), Guerreiro (2016), Bouzgarrou *et al.* (2017), Bandt *et al.* (2017), and Bucevska and Misheva (2017). Other studies used non-performing loans to total loans ratio such as; Islam and Nishiyama (2016), Ghenimi *et al.* (2017). While, there are some studies that used both non-performing loans to gross loans and loan loss provisions to total loans

including; Trujillo-Ponce (2013) and Rahman *et al.* (2015). Moreover, Ha (2020) measured credit risk using both loan loss reserves to total assets and non-performing loans to total gross loans. However, the transparency level of the Egyptian banking industry is very low and it has been found that there is lack of historical data for many variables including loan loss provisions and non-performing loans; therefore, data for these variable couldn't be collected. Moreover, Kosmidou (2008) highlighted the importance and relevance of using loan loss reserves to total loans, which is the measure used in the thesis, for measuring credit risk. Kosmidou (2008) discussed that loan loss provisions represent the accumulated balance of provisions that is formed over time to account for the portion of loans that is provided for but not charged off, which is the best measure of the extent to which banks can cover its own loan losses, and it means that the higher the ratio, the lower the credit risk. Whereas, loan loss provisions can be used by banks to smooth out profits during periods of good loan quality and high profits, which indicates that the cumulative balance of loan loss reserves will be a better indicator.

Credit Risk = Loan Loss Reserves / Total Loans

- **Liquidity Risk**

Liquidity risk is measured following (Kosmidou *et al.*, 2008; Rachdi, 2013; Trujillo-Ponce, 2013; Saeed, 2014; Lee, 2015; Noman *et al.*, 2015; Rahman *et al.*, 2015; Djalilov and Piesse, 2016; and Ahamed, 2017) using the assets structure ratio which measures how much of a bank's assets are tied up in loans. Higher ratio reflects lower liquidity and higher liquidity risk which is expected to affect bank profitability either positively or negatively as argued in different previous studies discussed in the literature. Liquidity risk can also be measured by the liquidity management ratio or the ratio of total bank loans to total customer deposits. This ratio measures the amount of loans a bank holds relative to funding from customer deposits, which means that the higher the ratio the lower the bank's liquidity and the higher the risk. According to Ariffin (2012), management of liquidity is one of the priorities for banks, because good management of bank's liquidity reduces the likelihood of insolvency. Higher ratio means higher liquidity risk; however, the effect on bank profitability is undetermined in the literature also, as some studies suggested a positive impact of liquidity enhanced by better bank's ability to manage solvency. While other studies indicated that higher liquidity risk means higher amounts of loans which enhances interest income and results in better profitability.

Some other studies used more liquid assets in the ratio of measuring bank liquidity as a percentage of total assets or customer deposits and short term funding to indicate less vulnerability to bankruptcy in case of high liquidity ratios, these studies include; Islam and Nishiyama (2016), Ghenimi *et al.* (2017), Trad *et al.* (2017), and Ha (2020). However, detailed data for more liquid assets are not separately identifiable for the sample banks; e.g. some assets accounts are combined in one account making it difficult to identify separate categories of assets, and cash amounts held by banks and amounts due from other central banks that are combined in one account. Therefore, the ratios of measuring liquidity are calculated in this thesis using total loans as a percentage of assets or customer deposits. Moreover, previous literature viewed liquidity risk as the result of two main sources; either the inability to cover decreases in liabilities or the inability to fund increases in assets. Therefore, the amount of assets tied-up in loans is considered a better reflection of the asset structure of a bank and the ability to maintain more liquid positions. Moreover, Ahamed (2017) argued that the increase in amounts of loans means high risk-bearing activities with higher interest and higher profitability. On the other hand, increased loans means lower income from non-interest activities, which might have a negative influence on profitability. Therefore, the direction of the effect of the increased amounts of loans on bank profitability will be dependent on which effect is greater, which explains the need to use loans in the liquidity raios.

Liquidity Risk 1 = Total Loans / Total Assets

Liquidity Risk 2= Total Loans / Total Customer Deposits

- **Financial Structure**

The share of customer deposits in bank's liabilities is an important determinant of bank profitability, as it measures the liability structure of the bank and how the bank relies on financing from customer deposits relative to other finance sources. The relationship is expected to be positive, since customer deposits are considered cheaper source of finance for banks. Therefore, the bank's financial structure will be measured using the ratio of customer deposits to total bank's liabilities following (Ommeren, 2011, Trujillo-Ponce, 2013, and Bandt *et al.*, 2017). A direct relationship is expected between the share of customers' deposits in bank liabilities and profitability.

Financial Structure = Total Customer Deposits / Total Liabilities

- **Arab Spring and Global Financial Crisis**

This thesis focuses on testign the effect of some serious shocks on peroformance of the sample banks through the effect on the overall political and economic envrironments of Egypt. These serious events inlcude the Arab Spring and the Global Financial Crisis. Therefore, instead of including a full set of time effects for the whole sample period to account for time-variant effects in the analysis; dummy variables are included to test the sepecific effects of the periods of the Arab Spring and the Global Financial Crisis. This is done to focus only on testing the effects of these specific periods with their coefficients and know how they affected the sample banks. Therefore, the Arab Spring is accounted for in the analysis using "dummy 1" variable, that represents the (2011-2013) period that witnessed the political unrest in the Arab world including Egypt. Moreover, the Global Financial Crisis is accounted for using "dummy 2" variable, which represents the (2007-2009) period that witnessed the effects of the Crisis, those events are expected to have a negarive effect on profitability of the sample banks.

- **Economic Growth**

It Is considered to be one of the most important macroeconomic indicators, and is commonly calculated in the literature through the percentage change in GDP or GDP per capita, as an indicator of the macroeconomic condition and business cycle. This variable affects the overall supply and demand of loans and deposits for banks. Good economic conditions support the financial conditions of bank customers and increase demand for loans by both firms and individuals. On the other hand, bad economic conditions deteriorate the credit quality and affect bank profitability negatively by increasing credit losses. Therefore, GDP growth is expected to affect bank's profitability positively, as better macroeconomic conditions help banks to operate more efficiently. The fmeasure of GDP growth for a country's economic growth will be used following (Athanasoglou *et al.*, 2008, Kosmidou, 2008; Ali *et al.*, 2011; Ommeren, 2011; Dietrich and Wanzenried, 2011; Rachdi, 2013; Trujillo-Ponce, 2013; Saeed, 2014; Pervan *et al.*, 2015; Rahman *et al.*, 2015; Djalilov and Piesse, 2016; Islam and Nishiyama, 2016; Garcia and Guerreiro, 2016; Saona, 2016; Tran *et al.* 2016; Bouzgarrou et al., 2017; Bucevska and Misheva, 2017 and Trad *et al.*, 2017). While the secodn measured that is used in the thesis follows the work of Athanasoglou *et al.* (2008).

Economic Growth = % change in GDP

Economic Growth = Deviations of real GDP from its trend calculated using the Hodrick-Prescott (HP) filter

- **Inflation**

Inflation rate is another important measure of the macroeconomic conditions, which will be measured by the inflation index or the percentage change in consumer prices. Inflation has an undetermined effect on bank profitability based on the level of its anticipation. In case of anticipating changes in inflation rate, banks can adjust interest rates in a way that makes changes in revenues large enough to more than offset changes in costs and affect profitability positively. However, if changes in inflation rate are not anticipated, adjustments in interest rates might not be enough to offset changes in costs, in a way that affects bank profitability negatively. Previous studies who investigated the effect of this variable on bank profitability include (Staikouras and Wood, 2011; Kosmidou, 2008; Rachdi, 2013; Trujillo-Ponce, 2013; Saeed, 2014; Noman *et al.*, 2015; Pervan *et al.*, 2015; Rahman *et al.*, 2015; Djalilov and Piesse, 2016; Islam and Nishiyama, 2016; Bouzgarrou et al., 2017; Bucevska and Misheva, 2017 and Trad *et al.*, 2017).

Inflation = Consumer Prices (% change) "CPI"

- **Interest Rate**

The effect of changes in interest rates on bank profitability would be tested following (Pasiouras and Kosmidou, 2007; Trujillo-Ponce, 2013; Saeed, 2014; and Md. Noman *et al.*, 2015). Reductions in interest rate might put pressures on bank management to change prices which will affect profitability negatively. This means that in case of increasing interest rates, the adjustments of interest rates causes revenues to grow which will affect bank profitability positively, which implies a direct relationship between interest rates and profitability. A different perspective on this would be present when changes in interest rates are difficult to be passed on to customers, this would mean that the relationship between interest rates and bank profitability will be negative as discussed by Trujillo-Ponce (2013). This means that increases in interest rates will cause profitability to decrease and decreases in interest rates would lead to an increase in bank profitability caused by the existence of a time lag to pass the changes in interest

rates on to customers, especially when holding a higher proportion of fixed rate assets relative to fixed rate liabilities. The CBE, as the official body responsible for all interest rate decisions in Egypt, uses the overnight deposit rate as the official interest rate of the country (Trading Economics, 2017). Annual and quarterly data are normally averages of monthly figures for short and long term interest rates. However, annual and quarterly data usually refer to the figure for the final month of the period for 'overnight' rates (OECDSTATS, 2017). Therefore, this measure is reported as the interest rate of the last month of each quarter from Trading Economics monthly interest rate data.

Interest Rate = The Overnight Deposit Rate

- **Money Supply Growth**

Another variable suggested by Kosmidou (2008) as one macroeconomic measure that has an effect on the nominal GDP and prices of a country is the growth of money supply. Money held by all non-bank money holders at a certain point in time is called the country's money supply, and the change in this variable is dependent upon the behaviour of the money holders as well as banks within which money is held. Therefore, Kosmdiou expected a positive effect of the money supply growth on bank profitability. Measuring money supply can be done using different indices; however, one important measure of money supply used by economists who try to quantify the money circulated in the economy of a country is M1. Additionally, this measure is used as the most liquid measure of money supply, as it includes cash and other liquid assets that can be easily converted into cash. Therefore, this measure is reported to represent the amount of money supply of Egypt from the Euromonitor International Databases as reported by the CBE (Euromonitor International, 2017).

Money Supply Growth = Growth of M1

Based on the previously described variables the research questions of the thesis can be modelled in the following diagram (Figure 5.6); that illustrates different variables and the interrelationships among them. Later, the analysis chapter will deal with investigating the modelled relationships to test the effect of different internal factors and external factors on bank profitability, while also considering the impact of major serious shocks during the sample period on bank profitability such as the 2007/2008 Global Financial Crisis and the Arab Spring. In addition to testing the causality between the two risk types; credit risk and liquidity risk.

Additionally, the following table (5.2) provides a summary of the previously discussed variables that will be used in the analysis sections. In addition to the expected effect of each of the explanatory variables on bank profitability and different data sources utilized to gather the whole datasets used in the analysis.

Figure (5.6): Dependent and Independent Variables

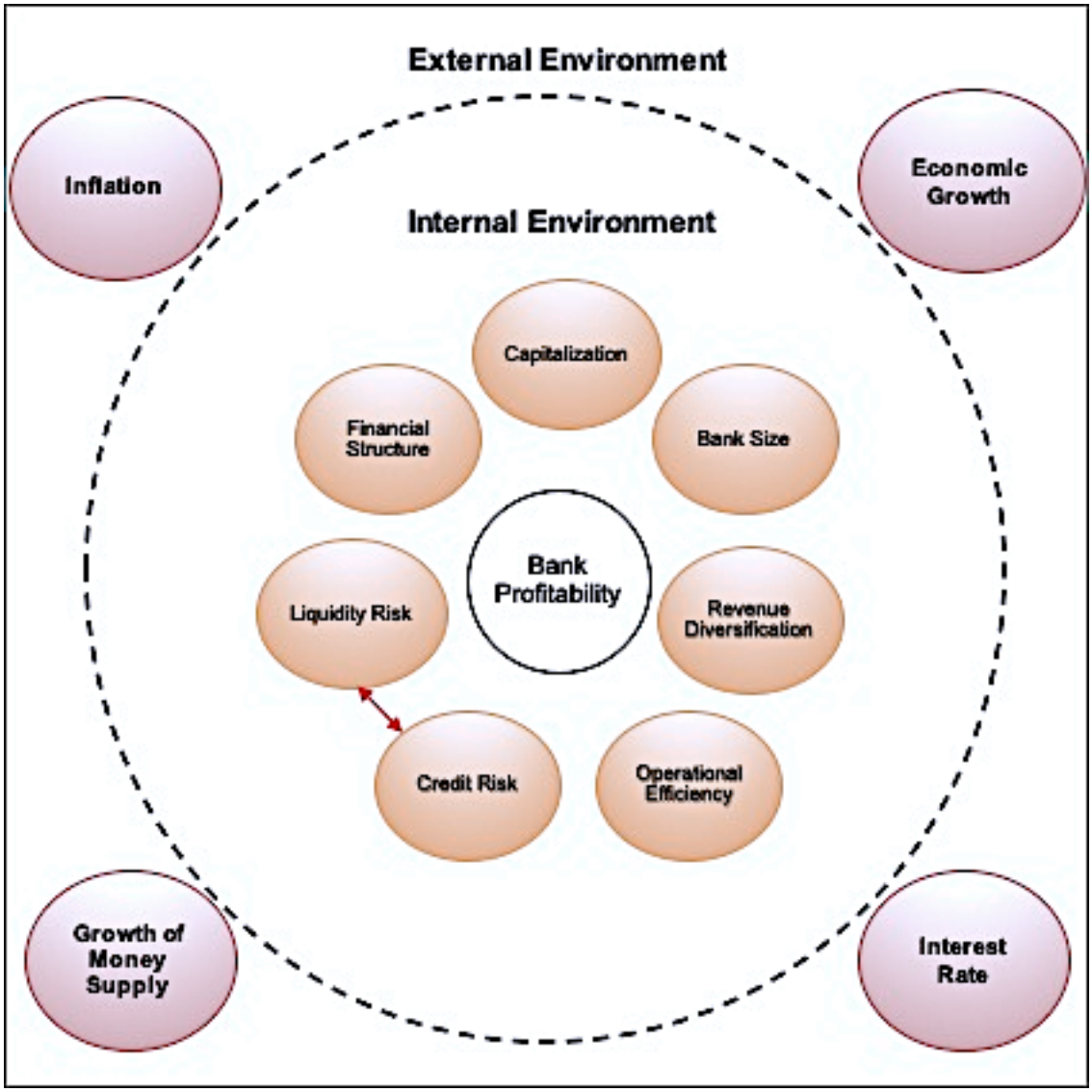


Table (5.2): Variable Description, Expected Effects and Data Sources

Class	Variable Name	Description	Expected Effect	Data Source
Dependent	Return on Asset (ROA)	Net Income before Tax/Total Assets		Banks' Annual Reports and Reuters Databases
	Return on Equity (ROE)	Net Income before Tax/Total Equity		
Independent	Capital Adequacy	Total Equity/Total Assets	+/-	
	Regulatory Capital (Basel Ratio)	Capital / Risk-Weighted Assets	+/-	
	Bank Size	Natural Logarithm of Total Assets	+/-	
	Revenue Diversification	Non-interest Income/Total Revenues	+/-	
	Operational Efficiency	Total Costs/Net Income	-	
	Credit Risk	Loan Loss Reserves/Total Loans	-	
	Liquidity Risk	Total Loans/Total Assets	+/-	
		Total Loans/Total Customer Deposits		
	Financial Structure	Total Customer Deposits/Total Liabilities	+	
	Dummy 1	Periods of the Arab Spring (2011-2013)	-	
	Dummy 2	Periods of the Global Financial Crisis (2007-2009.	-	
	Economic Growth	% change in GDP	+	Euromonitor International
		Deviations of real GDP from its trend calculated using the HP filter	+	Euromonitor International
	Inflation	Consumer Prices (% change) "CPI"	+/-	Euromonitor International
	Interest Rate	The Overnight Deposit Rate	+/-	Trading Economics
	Money Supply Growth	Growth of M1	+	Euromonitor International

5.6 Summary

The preceding chapter included the literature review on bank performance and how different factors, including different financial risks, affect bank profitability,. Additionally, different previous studies that investigated the interrelationship among different risk types, more specifically credit and liquidity risks have been discussed. Review of relevant literature indicated the need for more research efforts in this area, as discussed in the preceding chapter, especially in Egypt as the main research context with some exceptional circumstances making it a unique research context to study in the field of bank performance. Then, this chapter built on the background presented in the previous chapter to describe the methodology and data that will be used in the thesis to achieve the main research objectives. The chapter highlighted the research strategy adopted; as well as the process of data collection and how it went through different stages to select and collect the most relevant data used to run the analysis and test the research hypotheses. Moreover, the chapter compared the sample banks in terms of some important parameters to provide the reader with more insights about the sample used. Also, regression models specifications, description of the main estimation methods used for bank profitability and panel Granger causality models are provided. Finally, the chapter described the research variables used in the thesis and their different proxies that will be used in the next chapter.

The next chapter will include the practical implementation of the previously discussed estimation methods and their respective validation tests to model the variables discussed in this chapter which will help to answer the main research questions. The next chapter will be concerned with testing the existence of any relationship between bank profitability and the internal factors; capitalization, bank size, revenue diversification, operational efficiency, credit risk, liquidity risk and financial structure; as well as the external factors; economic growth, inflation, interest rate, and money supply growth. As well as testing the effect of the regulatory capital on bank profitability in Egypt after the recent application of Basel II requirements in Egypt, which will make use of a more recent database collected from Reuters as discussed earlier. In addition to testing for any causal relationships between credit and liquidity risks for the sample banks. In doing so, the methodological background provided in the current chapter will the be used as the main reference to the empirical analysis conducted in the next chapter using relevant methods and variables.

Chapter.6 Analysis and Results

After reviewing relevant literature and empirical studies that provided a good background which helped in understanding the main research questions in the light of the highlighted research gap, the statistical analyses and the needed statistical tests will be presented in this chapter to test the developed research hypotheses and compare the findings to those mentioned in similar studies in the literature. Different statistical analyses will be presented to test the main research hypotheses through the use of the following statistical tools; firstly, calculating descriptive statistics of all the variables over the sample period. Then, correlation analyses between dependent and independent variables would be conducted. Lastly, employing multiple regression modelling using different estimation methods to test the assumptions of the regression models and test the research hypotheses in the main models developed in this thesis.

6.1 Data Presentation

The existence of some extreme values that are not the result of errors in data entry might affect the analysis and conclusions about the results. These major outliers might affect the results of the analysis significantly; therefore, major outliers should be excluded to avoid potential bias. The mathematical way of detecting and excluding outliers was implemented through the interquartile ranges which were used to identify major outliers. The outer upper fence and the outer lower fence were calculated using Excel, then all data points that were found to be out of the range of the two outer fences were considered as major outliers, so they were eliminated to exclude the potential bias (Park, 2011). Then, a summary of the data used in the current research is presented through the following table that includes descriptive statistics of the variables of the main dataset collected from the quarterly financial reports of the sample banks, in addition to the macro data collected from the Euromonitor International and Trading Economics databases.

Table (6.1): Descriptive Statistics

Variables	Mean	Maximum	Minimum	Standard Deviation
ROA	0.0045	0.0121	-0.0059	0.0032
ROE	0.0499	0.1551	-0.0571	0.0361
Capital Adequacy	0.0953	0.1991	0.0161	0.0374
Credit Risk	0.1129	0.3495	0.0028	0.0807
Liquidity Risk	0.5742	0.8869	0.2286	0.1284
Revenue Diversification	-0.1058	0.1530	-0.3788	0.0939
Operational Efficiency	4.9656	15.5279	-4.7574	3.9059
Bank Size	10.2174	11.2116	9.3034	0.3918
Financial Structure	0.9266	0.9856	0.8250	0.0346
Economic Growth	0.0113	0.0740	-0.0800	0.0359
Inflation	0.0226	0.0560	0.0030	0.0140
Interest Rate	0.0899	0.1000	0.0825	0.0059
Money Supply Growth	0.0409	0.1140	-0.0180	0.0266

The previous table reports that ROA, which is used as a measure of bank profitability in the main discussion of the analysis results, has a mean value of 0.45% that reflects the average return of the sample banks throughout the sample period relative to the size of assets. This means that the sample banks generated 0.45 EGP return for each 100 EGP of assets on average during the sample period. However, the dispersion from the mean ROA is 0.32% which is considered a relatively high dispersion relative to the small mean value. Additionally, the minimum ROA value is -0.59% which means that the bank with the smallest value generated losses at a certain point of time that is reflected in the negative ROA value. However, checking the values of ROA as presented in the datasets showed that there are many negative values of ROA. An example would be Abu Dhabi Islamic bank that generated losses in the early years of the sample since Abu Dhabi Islamic bank acquired the National Bank for Development only since 2007 and the bank was suffering from extreme losses. Then the bank started to gain a good financial position and earn profits in more recent years. Other examples include; Faisal Islamic Bank, Egyptian Gulf Bank, Union National Bank, Suez Canal Bank and Al Baraka Bank.

The negative income for some banks represents an interesting result that might indicate bank failures in Egypt in the absence of strict regulations in case of deteriorating bank capitalization as indicated in the Basel regulations with its different Accords. However, these results represent only the quarterly income that is reported for each separate quarter, indicating that the negative income

reported in some quarters might turn into profits for the reported yearly income. Furthermore, the used data is collected from the unconsolidated bank statements to avoid differences among accounts of headquarters and branches that might negate each other following Trujillo-Ponce (2013). While, BCBS (2006) stated that the Basel II framework includes the consolidated entity of internationally active banks, as a way to ensure the integrity of banks with subsidiaries by preventing double-gearing effect. Therefore, it cannot be concluded that negative income generated by banks at a specific point of time on the unconsolidated level, caused a negative consolidated net income. Moreover, observing the data indicated that all of the sample banks preserved positive profits for the most recent years after imposing Basel II regulations since 2013. The descriptive statistics of ROE is close to that of ROA with a mean value of around 5% and a relatively high dispersion of 3.61%, while maximum and minimum values are 15.51% and -5.71%. As the ROE share the same numerator as the ROA, so the same applies concerning the minimum negative values of ROE.

The capital adequacy variable has an average of 9.53% for the sample banks over the whole sample period. The average ratio is a good ratio in general, compared to the standard Basel II ratio of 8% for the required regulatory capital ratio. The average dispersion is evident from the standard deviation of 3.74%, while the maximum value of 19.91% is a very high value relative to the mean value; this result was recorded by the UNB-Egypt. The credit risk variable as measured by the loan loss reserves as a percentage of total bank loans showed an average of 11.29% with a relatively high dispersion of 8.07%, and a very high maximum value relative to the mean value, which was reported by the Suez Canal bank representing the highest credit risk figure encountered by a bank in the sample. Liquidity risk as measured by the ratio of total loans to total customer deposits has a mean value of 57.42% and a relatively small standard deviation of 12.84% indicating that on average sample banks keep close to the average liquidity risk values and manage to sustain the ratio of loans to customer deposits to preserve their liquidity positions and find the necessary finance for their loans. It’s worth mentioning here that negative values of the average and minimum revenue diversification are also due to the fact that figures used to calculate these values are measured for each quarter separately. Therefore, a negative non-interest income of one bank in a quarter might result in negative figures. The same applies on the negative minimum value of operational efficiency variable. The high standard deviation of the operational efficiency variable relative to its mean indicates a great variation in management’s ability of managing expenses

for the sample banks. Different sizes of the sample banks play a role in the banks' efficiency, since larger banks are supposed to have better ability to utilize new technologies to improve their systems and increase efficiency. However, differences in bank sizes are not evident from the descriptive statistics reported above which show little variation indicated by the reported values. However, the fact that the bank size variable is measured by the natural logarithm of total assets mitigated the effect of different sizes between sample banks as can be noted from comparing bank assets in the previous chapter.

Additionally, the financial structure variable shows an average of 92.66% with a low standard deviation indicating the high dependence of the sample banks on customer deposits as source of finance relative to other liabilities. The maximum value of 98.56% recorded by Abu Dhabi Islamic Bank reflects the total dependence on customer deposits with only minor percentage of other liabilities of 1.44%. Also, the negative minimum value of GDP growth of -8% is worth mentioning here, which is recorded in the first quarter of 2011. This can be linked to the effect of the Egyptian revolution in 2011 on the Egyptian economy as a whole as recorded by the highest negative growth over the sample period. Similarly, the minimum value of the growth of money supply of -1.80% reported in the last quarter of 2008, the year of the 2007/2008 Global Financial Crisis, indicates the potential effect of the crisis on the Egyptian economy through the negative impact on money circulation. Finally, the interest rate of Egypt showed stable figures between 8.25% and 10% with an average of 9% throughout the sample period indicating the strict policies imposed by the CBE.

6.2 Correlation analysis

Pearson product-movement coefficient or Pearson correlation is used a is a way of measuring the level of association between two or more variables. An index of both the direction and magnitude between two variables is provided by the correlation coefficient. However, the correlation coefficient does not provide any implication for causality and it ranges from a perfect positive relationship denoted by (+1) to a perfect negative relationship denoted by (-1), and the absolute value of the coefficient is an indication of the magnitude. Brooks (2008) motioned that if x and y are correlated, a linear relationship can be implied between both x and y without any implications for causality, also it can be stated that movements in the two variables are related which can be indicated by the correlation coefficient.

Table (6.2): Correlation Matrix

	ROA	ROE	Capital Adequacy	Credit Risk	Liquidity Risk	Revenue Diversification	Operational Efficiency	Size	Financial Structure	Economic Growth	Inflation	Interest Rate	Money Supply Growth
ROA	1.0000												
ROE	0.8289*	1.0000											
Capital Adequacy	0.1958*	-0.2576*	1.0000										
Credit Risk	-0.2905*	-0.2862*	0.0730	1.0000									
Liquidity Risk	-0.2581*	-0.3500*	0.0241	0.1791	1.0000								
Revenue Diversification	0.4796*	0.4041*	-0.0503	-0.0399	-0.1045*	1.0000							
Operational Efficiency	-0.5055*	-0.3118*	-0.0689	-0.0484	-0.1191*	-0.1837	1.0000						
Size	0.4408*	0.5375*	-0.2600*	-0.4223*	-0.1218*	0.0914	-0.1461	1.0000					
Financial Structure	0.0332	0.0026	-0.0258	0.1555*	0.0202	0.1568*	0.0160*	0.0145	1.0000				
Economic Growth	0.0192	0.0192	-0.0041	0.0454	0.0298	0.0792	-0.0204	-0.0464	0.0331	1.0000			
Inflation	-0.0007	-0.0035	0.0431	-0.0270	-0.0716	-0.1702	-0.0547	0.0945*	0.0427	0.1727*	1.0000		
Interest Rate	-0.0451	0.0072	-0.1062*	0.1485*	0.1058*	0.1132	0.0756	-0.1713*	-0.0589	-0.0050	-0.2738*	1.0000	
Money Supply Growth	0.0033	0.0360	-0.0401	0.0508	0.0017	0.1083	0.0372	-0.0522	-0.0158	0.4786*	0.0821	0.0299	1.0000

*Correlation is Significant at the 0.05 Level

The previous table shows the correlation matrix that includes all of the dependent and independent variable. A first look at the matrix shows a significant positive association between ROA and capital adequacy or capitalization; however, the association turns to be negative when profitability is represented by ROE. The positive correlation between capitalization and ROA is consistent with the theories that discussed the positive relationship between capitalization and bank profitability as discussed in the literature; the Signalling Hypothesis and the Expected Bankruptcy Cost Hypothesis. The Signalling hypothesis supports the view that banks send good future prospects and ability to generate cash flows through better capital adequacy. Therefore, higher capitalization or lower debt is expected to be associated with banks with good future expectations. Furthermore, the Expected Bankruptcy Cost Hypothesis supports the view that banks expecting the bankruptcy costs to increase because of some external factors will be more willing to enhance capitalization to protect the bank against potential losses. There is a great consensus in the previous literature as stated by Trujillo-Ponce (2013) that better capitalization enhances bank solvency and decrease costs of external debt that more than offset the higher cost of equity. However, the DuPont analysis indicates that ROE is the product of ROA and equity multiplier. Therefore, an increase in capital and an increase in total equity as a consequence will reduce equity multiplier (assets/equity), which in turn will decrease ROE. Additionally, when considering the effect of decreasing debt as a result of decreasing equity multiplier. The result would be a reduction in the tax-shield savings and a subsequent reduction in the after tax earnings, which will eventually decrease profitability. Therefore, a negative association between capital and ROE is expected based on the DuPont analysis (Tran *et al.*, 2016).

The matrix also reveals a negative association between bank profitability, as measured by both ROA and ROE, and credit risk as measured by loan loss reserves to total loans which is in line with the expectations, based on the literature review. The negative association between this variable and profitability is expected as higher values of loan loss reserves to total loans means lower asset quality and higher credit risk. Higher ratios of credit risk represents an increase in the amount provided for but not charged off in the loan portfolio which leads to less interest income and more provisions costs and hence lower profitability. Additionally, the matrix shows a negative association between profitability, as measured by both ROA and ROE, and bank liquidity risk, as measured by loans to customer deposits. The higher the ratio of loans to total customer deposits, the lower the bank liquidity and the higher the liquidity risk.

Based on reviewing relevant literature, it can be argued that there are different views on the relationship between profitably and liquidity. On one hand, higher ratios might indicate higher rates of return from loans as discussed by Kosmidou (2008). On the other hand, Ahamed (2017) argued that the higher the amount of loans, the more aggressive banks should be towards profitability to pay off their interest; however, the increase in loans means more risk-bearing activities which will affect the non-interest activities and lower profitability. The sample banks showed negative association between liquidity management and bank profitability which is in line with what was explained by Ahamed (2017), as higher ratios might affect non-interest bearing activities and cause lower profitability. This is also evident from the strong positive correlation between both measures of bank profitability, ROA and ROE, and the revenue diversification variable as measured by non-interest income to total revenues. This indicates the importance of non-interest income activities and its association with improved profitability through the increased income that is generated from non-core banking activities.

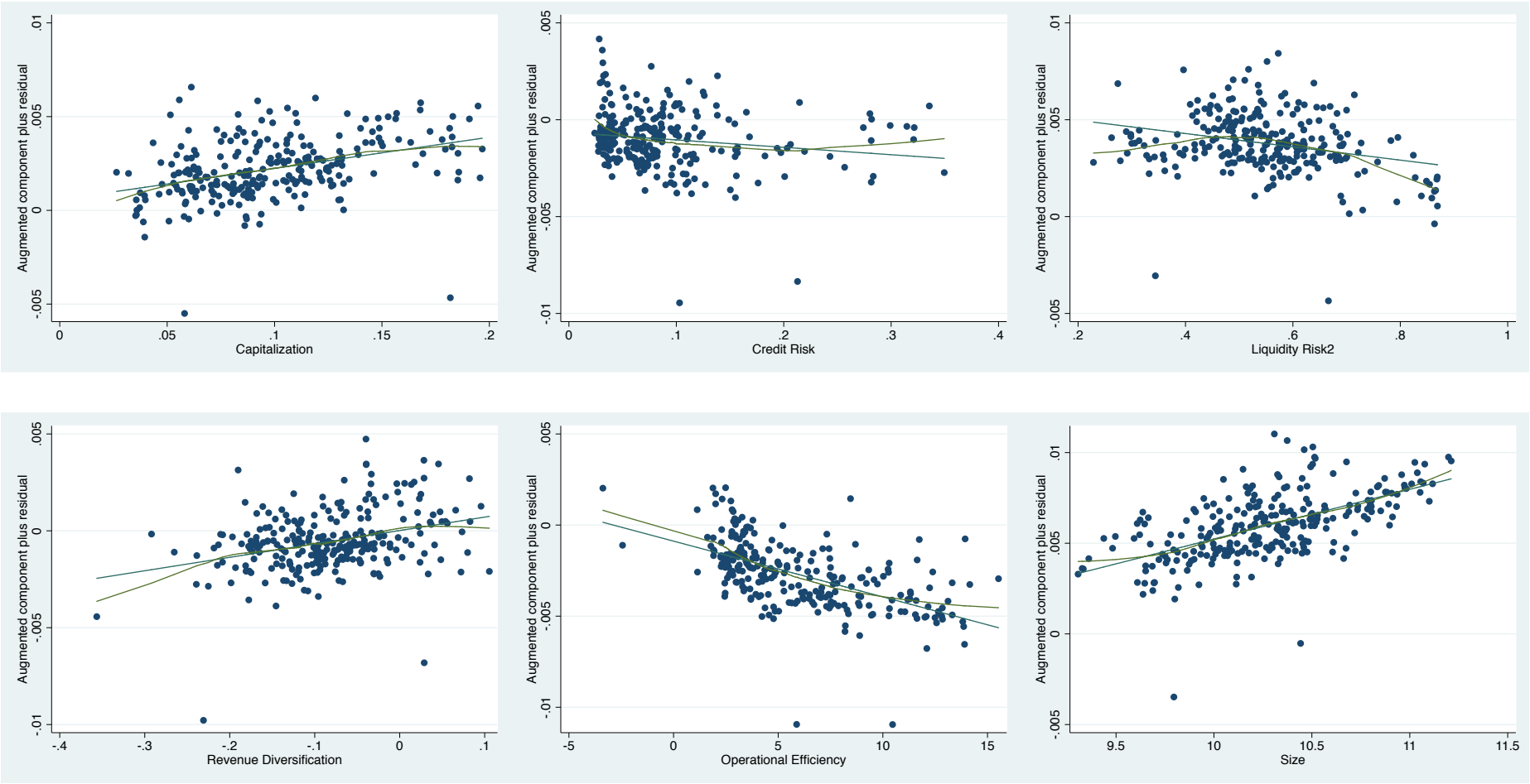
Operational efficiency variable, as measured by the cost to income ratio, shows significant negative correlations with both measures of bank profitability. This is expected, as more efficient banks with higher profitability are expected to operate at lower costs. There is a consensus in previous studies; e.g. Pasiouras and Kosmidou (2007), Athanasoglou *et al.* (2008), Kosmidou (2008), Ali *et al.* (2011), Dietrich and Wanzenried (2011), and Trujillo-Ponce (2013), that more efficiency leads to more profitable banks, which means that more efficient banks that have better management of their expenses proved to be more profitable. It can be claimed that the new technological advancements in the banking systems worldwide and also in Egypt have enabled banks to manage their expenses more efficiently, which helps in improving profitability, and vice versa for banks with lower operational efficiency. Furthermore, the size variable proved to have a significant positive association with bank profitability measures as evident from the correlation matrix. The relationship between bank size and profitability is inconclusive in the literature. However, the positive effect is supported by the view that larger banks will have better ability to apply new technologies and develop their systems which will enhance their operational efficiency and hence improve profitability. This means that the sample banks seem to benefit from economies of scale in improving their profitability. Additionally, revenue diversification, financial structure, economic growth, inflation, interest rate, and the growth of money supply seem to have insignificant associations with bank profitability as indicated in the correlation matrix. Indeed, all of the previously

discussed associations represent indicators for the existence of a linear relationship between variables, and that the variables under discussion have related movements as indicated by the sign of the correlation coefficient. However, causal relationships will be further investigated through more detailed analyses. The next section will discuss the classical linear regression assumptions before discussing regression analyses.

6.3 Assumptions of Classical Linear Regression Model

Testing the assumptions of the classical linear regression model is the first step that needs to be done before estimating a regression model. First of all, linearity of the relationships between variables should be tested, which is done in this research using the augmented component-plus-residual plot (acprplot) and the scatter plot, where the graphical representation failed to identify any major nonlinearity problems, figures (6.1) and (6.2) shows different acprplots. Then, the main assumptions of linear regression models should be tested including tests for the zero average value of error term, homoscedasticity, absence of autocorrelation, normality, and series multicollinearity. Finally, the Hausman test for comparing fixed to random effects model will be illustrated. Starting with the assumption of average value of the error term to be zero ($E(\mu_t)=0$); the inclusion of the constant term (α) in the regression equation guarantees satisfaction of this assumption that requires the average value of the error to be zero. The constant term absorbs the non-zero mean of the error term and allows for the assumption that the "remaining" error-term has a zero mean, which indicates satisfaction of this assumption.

Figure (6.1): Augmented Component-Plus-Residual Plots (ROA Model)



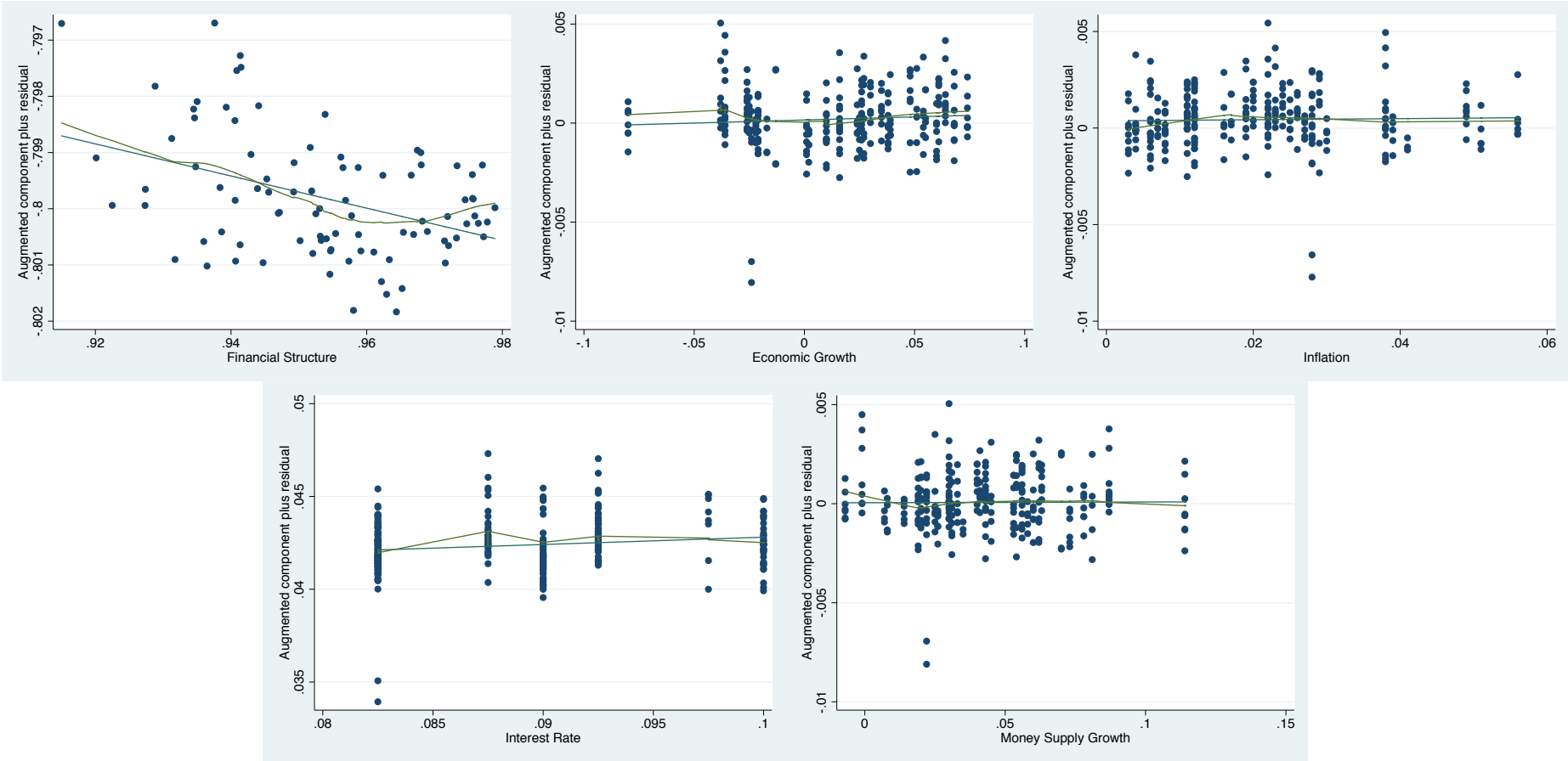
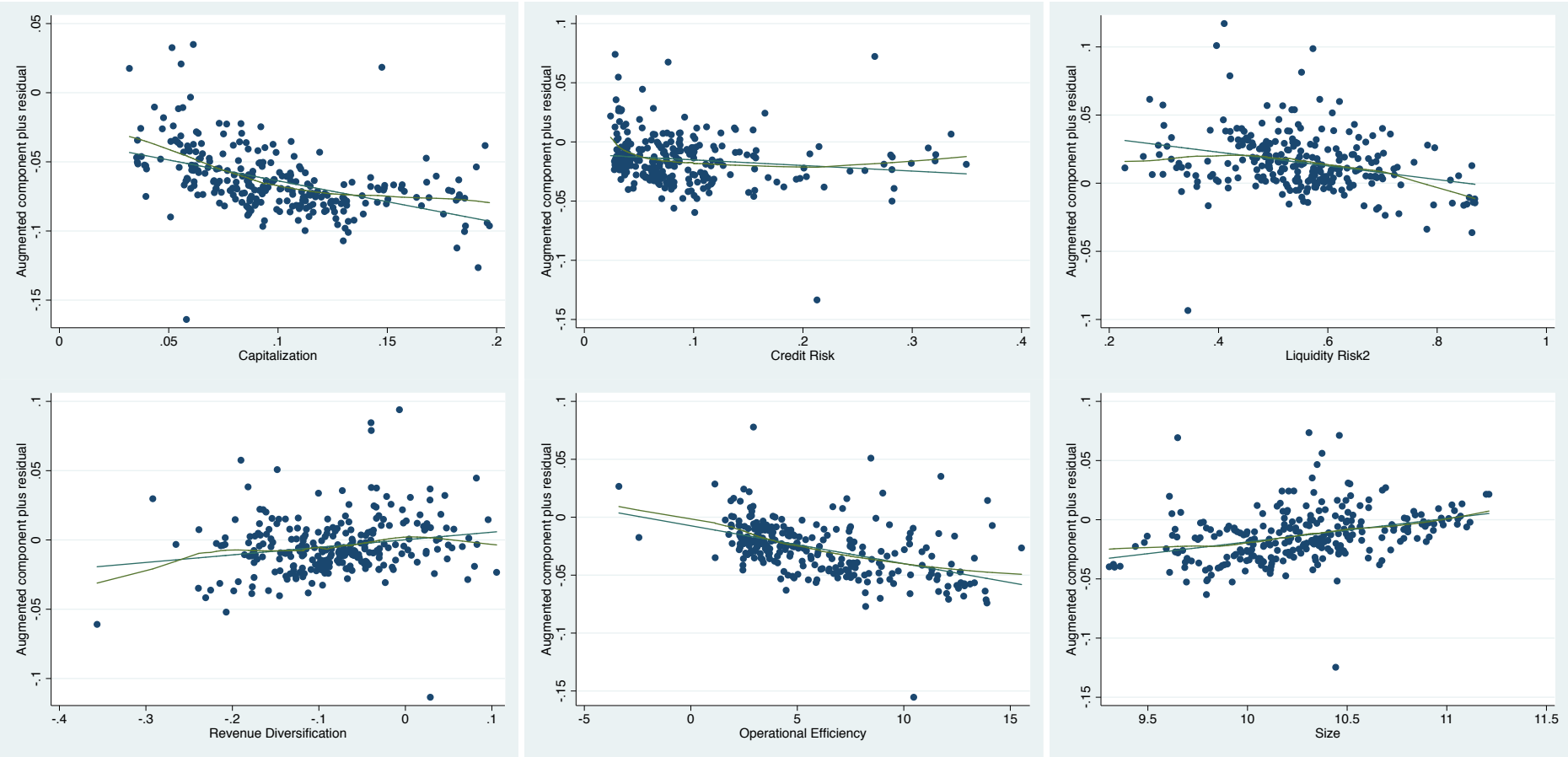
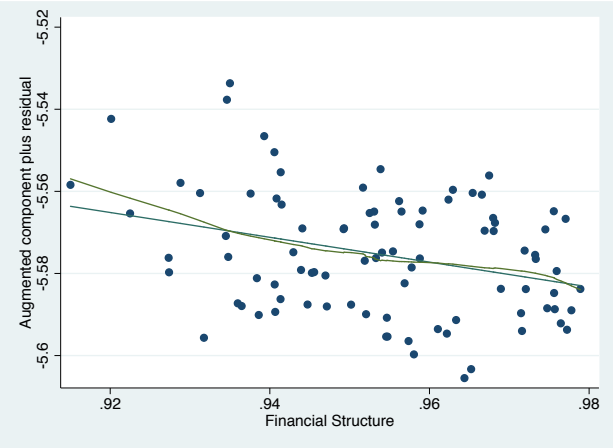
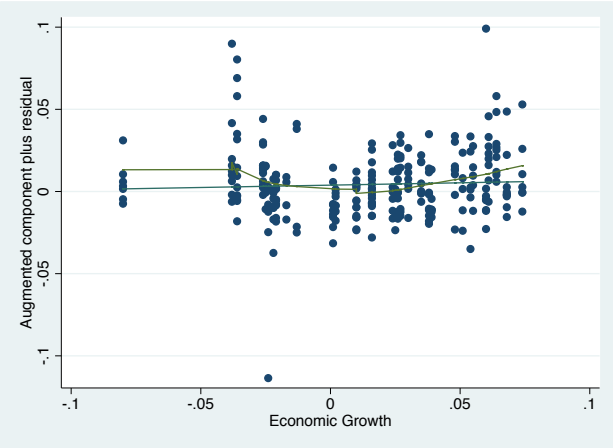
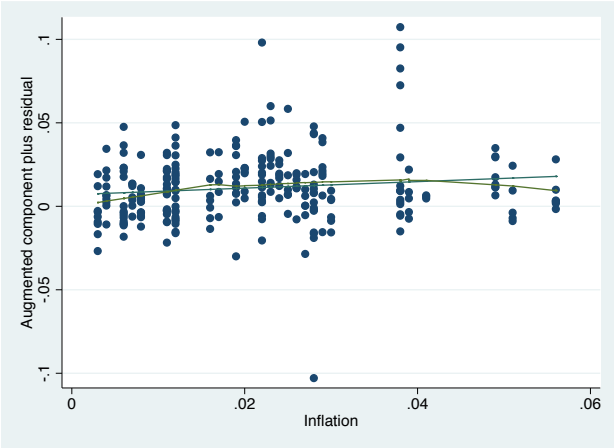

Augmented component plus residual
-.797
-.798
-.799
-.8
-.801
-.802
.92
.94
.96
.98
Financial Structure
Augmented component plus residual
.005
0
-.005
-.01
-.1
-.05
0
.05
.1
Economic Growth
Augmented component plus residual
.005
0
-.005
-.01
0
.02
.04
.06
Inflation
Augmented component plus residual
.05
.045
.04
.035
.08
.085
.09
.095
.1
Interest Rate
Augmented component plus residual
.005
0
-.005
-.01
0
.05
.1
.15
Money Supply Growth

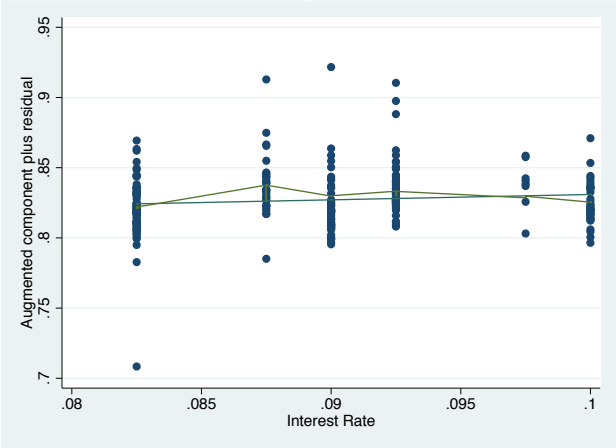
Figure (6.2): Augmented Component-Plus-Residual Plots (ROE Model)




Augmented component plus residual
-5.52
-5.54
-5.56
-5.58
-5.6
.92
.94
.96
.98
Financial Structure


Augmented component plus residual
.1
.05
0
-.05
-.1
-.1
-.05
0
.05
.1
Economic Growth


Augmented component plus residual
.1
.05
0
-.05
-.1
0
.02
.04
.06
Inflation


Augmented component plus residual
.95
.9
.85
.8
.75
.7
.08
.085
.09
.095
.1
Interest Rate

Augmented component plus residual
.1
.05
0
-.05
-.1
0
.05
.1
.15
Money Supply Growth

Another assumption that is needed for the fitness of the model requires a constant standard deviation of the errors with no dependence on values of x which is known as the assumption of homoscedasticity. However, heteroscedasticity is present when the errors do not have a constant standard deviation. Therefore, the Modified Wald test for group-wise heteroscedasticity is used in this research to check for the existence of heteroscedasticity in fixed effects regression models. Based on the Modified Wald test for both the ROA and the ROE models, heteroscedasticity can be concluded. In both cases, the null hypothesis shall be rejected, with (Prob>chi2 = 0.0000), and the existence of heteroscedasticity can be concluded. The existence of heteroscedasticity should be taken into consideration and corrected during analysis using Stata by including options for estimating robust standard errors which addresses problems arising when errors are not independent and identically distributed. This option of robust standard errors will not cause a change in the coefficient estimates provided by the regression, but will change both the standard errors and significance tests. The robust standard errors option adjusts for some concerns to meet the assumptions of linear regressions, like minor concerns about normality, heteroscedasticity, and autocorrelation. It's worth mentioning here that King and Roberts (2015) argued that the classical and robust standard errors should be the same for any well-specified model. Furthermore, Wooldridge test for autocorrelation in panel data was used in the regression models to test for the assumption that errors are not related with one another or not auto-correlated. Based on the Wooldridge test, in both the ROA and the ROE models, the null hypothesis stating that no autocorrelation exists shall not be rejected, with (Prob>F = 0.8118) for the ROA model and (Prob>F = 0.0991) for the ROE model, which indicates the absence of autocorrelation in both models. Also, testing for normality of error terms was conducted through graphing the residuals using graphical representations such as Histogram, P-P plot, and Q-Q plot. Graphical representations indicated that residuals are approximately normal. The following figures represents the histogram of both models; ROA and ROE, to illustrate the normality of the residuals.

Figure (6.3): Histogram, ROA Model

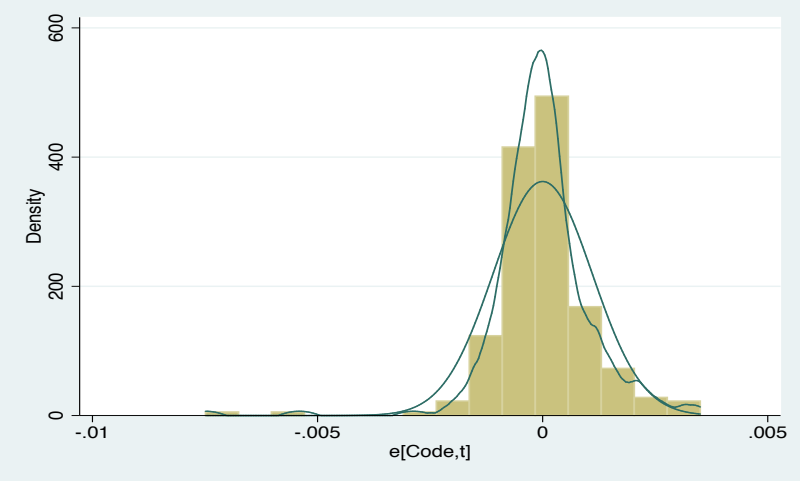
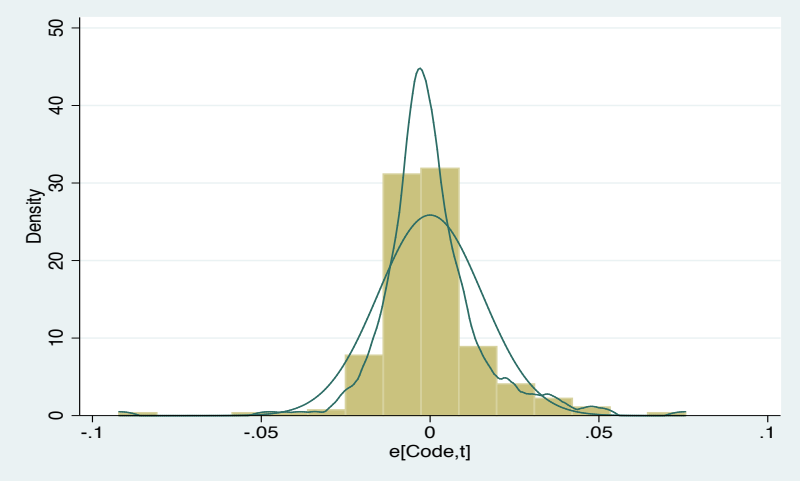


Figure (6.4): Histogram, ROE Model



Furthermore, testing for the absence of series multicollinearity is needed. Perfect collinearity exists if one independent variable in a model is an exact linear combination of another independent variable in the same model; in this case it cannot be estimated using OLS (Brooks, 2008). Multicollinearity exists when there is high, but not perfect, correlation among two or more of the explanatory variables (Cameron and Trivedi, 2009). The standard statistical method for testing for multicollinearity is to analyse the explanatory variables correlation coefficients and variance inflation factor (VIF). However, the specific cut off point for correlation coefficients that determines multicollinearity is not clearly defined in the literature. Hair *et al.* (2006) stated that correlation coefficients that do not exceed 0.9 may not result in serious multicollinearity. However, correlation coefficients above 0.80 represents a source of concern according to Studenmund (2011). Also, Kennedy (2008) suggested that any correlation

coefficient that is above 0.7 might cause a serious multicollinearity problem that may lead to inefficient estimations and unreliable results. However, an examination of table (6.3) that presents the bivariate correlation coefficients shows that correlation coefficients among explanatory variables do not exceed the recommended levels, which indicates the absence of any multicollinearity problems in the variables.

Additionally, the variance inflation factor (VIF) has also different recommended levels in the literature, such as the value of (10) which corresponds to a tolerance level of (0.10) that was recommended as a maximum level in more than one reference such as Marquardt (1970) and Neter *et al.* (1989). However, Rogerson (2001) recommended a maximum value of VIF of (5); while a maximum level of (4) was recommended by Pan and Jackson (2007). However, table (6.4) presents the results of the VIF test for all explanatory variables, indicating that all VIF values do not exceed 2, which is far below the recommended levels. This represents another check on the existence of multicollinearity that indicates the absence of any multicollinearity problems among the variables. Therefore, it can be concluded that both tests indicated the absence of any multicollinearity based on the most conservative approaches of evaluating multicollinearity problems.

Table (6.3): Bivariate Correlation Matrix to test Multicollinearity

	Capital Adequacy	Credit Risk	Liquidity Risk	Revenue Diversification	Operational Efficiency	Size	Financial Structure	Economic Growth	Inflation	Interest Rate	Money Supply Growth
Capital adequacy	1.0000										
Credit Risk	0.2205	1.0000									
Liquidity Risk	0.0602	0.0036	1.0000								
Revenue Diversification	-0.0332	0.0696	0.0751	1.0000							
Operational Efficiency	-0.3465	0.0791	-0.0655	-0.1390	1.0000						
Size	-0.2757	-0.5869	-0.0364	0.0305	-0.2505	1.0000					
Financial Structure	0.1630	0.0961	0.0813	0.0550	-0.0269	0.0179	1.0000				
Economic Growth	0.0091	0.0556	0.0609	0.0738	-0.0209	-0.0961	0.0196	1.0000			
Inflation	0.0569	-0.1604	-0.1365	-0.1563	-0.0059	0.1469	0.0633	0.1298	1.0000		
Interest Rate	-0.1277	0.2214	0.1997	0.1749	0.0885	-0.2555	-0.0667	0.0567	-0.2900	1.0000	
Money Supply Growth	-0.0591	0.0321	0.0007	0.0994	0.0803	-0.0648	-0.0334	0.4788	-0.0222	0.0118	1.0000

Table (6.4): Variance Inflation Factor for Explanatory Variables

Variables	VIF	1/VIF
Size	1.98	0.504973
Operational Efficiency	1.67	0.598044
Capital Adequacy	1.63	0.613816
Credit Risk	1.58	0.633828
Economic Growth	1.38	0.724580
Money Supply Growth	1.32	0.759070
Interest Rate	1.28	0.781130
Revenue Diversification	1.21	0.826552
Inflation	1.20	0.834018
Liquidity Risk	1.09	0.921025
Financial Structure	1.08	0.929349
Mean VIF	1.40	

Furthermore, testing of the appropriateness of the fixed effects estimator versus the random effects estimator can be determined using the Hausman test. As discussed before, the Hausman test compares coefficient vectors of both estimators to test whether the point estimates of the estimators are different. If both estimators are consistent, point estimates shouldn't differ greatly. Therefore, the point estimates of the inconsistent one are expected to be different, where the null hypothesis of the test assumes that the fixed effects is always consistent but inefficient, while the random effects is both consistent and relatively efficient. This means that in case of rejecting the null hypothesis, it can be concluded that the fixed effects estimator is the more appropriate one as compared to the random effects. The Hausman Test is used in this research to determine the most appropriate estimator for the regression analysis. The test results indicated that the use of fixed effects estimator is more appropriate in the ROA model as well as the ROE model, which is supported by the use of fixed effects estimation in most of the previous studies. The results of the Hausman tests indicated the rejection of the null hypothesis that differences in coefficients are not systematic for both ROA and ROE models with (Prob>chi2 = 0.0000) in both cases.

6.4 Main Analysis Results

This section will discuss the results of the models estimated using the system GMM estimator, as well as a comparison with the fixed effects estimator which is preferable to the random effects estimator based on the results of the Huasman test, and following previous studies who used the fixed effects estimator along with the GMM estimator. Pervan *et al.* (2015) stated that the dynamic nature, or the introduction of a lagged dependent variable as explanatory variable, of bank profitability models has to be accounted for using the GMM estimations, as other estimators will become biased. Therefore, autoregressive term was introduced in the estimated models to control for past levels of profitability and cope with any observed persistence of profits. However, unobservable heterogeneity, profit persistence, and reverse causality might represent problems to the estimation as previously discussed in the methodology chapter. Therefore, the GMM estimation is needed, as it is better designed to deal with different endogeneity problems compared to the fixed effects autoregressive models that tend to suffer from the Nickell bias. The GMM estimators better control for unobservable heterogeneity and use the lagged values of the dependent variable in level and in differences as instruments, in addition to the lagged values of other independent variables that might suffer from endogeneity problems. Therefore, the system GMM proposed by (Arellano and Bover, 1995; and Blundell and Bond, 1998) is estimated in this research to account for these problems, which is done in Stata using the “xtabond2” command, following Bandt *et al.* (2017). The “xtabond2” Stata command was originally designed by David Roodman and was explained in details in his article “How to do xtabond2: An introduction to difference and system GMM in Stata”, that presented a comparison of different estimation methods and explained in details the expected bias for each one. In addition to providing a full set of Stata codes that can be used for the GMM estimations. His famous article recorded around 7,000 citations on Google Scholar so far (Roodman, 2009). The system GMM estimation method estimates a system of equations simultaneously using both levels and first-differences, as it uses the first differences to instrument levels, and uses levels to instrument first differences.

The difference GMM was originally developed by Arellano and Bond (1991), then Arellano and Bover (1995) and Blundell and Bond (1998) developed the system GMM as an alternative to the difference GMM. The system GMM allows the use of a lagged dependent variable to exploit the dynamic nature of the data and test

the effect of past values on future values of the dependent variable, in addition to controlling for endogeneity problems of independent variables through using lagged levels and lagged differences of the independent variables as instruments. On the other hand, Roodman (2009) stated that the use of the fixed effects estimator in dynamic models with large T might be justified as the dynamic panel bias becomes insignificant, since the number of instruments explodes by T. Moreover, the cluster-robust standard errors, and the Arellano-Bond auto-regression test in the GMM estimation might not also be reliable in case of small N. Therefore, the results of both the fixed effects estimator and the system GMM estimator will be reported in the following sections for both the ROA and ROE models, to allow for a comparison of results and check its robustness with different estimations and among different models.

6.4.1 Results of the ROA Model

The following tables provide the results of the fixed effects estimator and the system GMM estimator for the ROA model to allow for a comparison of the two estimations as illustrated earlier. The fixed effects was estimated using the robust standard errors to account for potential minor problems as discussed earlier, e.g. minor problems concerning heteroscedasticity, autocorrelation, and normality. An examination of the results' tables shows that the number of observations is 243 and the number of groups is 11, while the explanatory power of the fixed effects estimation model is reported by the within R-squared and is equal to 63.5% reflecting a good explanatory power of the model and indicating that 63.5% of the change in the profitability variable can be explained though the model's regressors. Additionally, the F statistics of the fixed effects model is reported by Stata as missing due to the use of robust standard errors. Stata results highlighted that these statistics are not reported, not to be misleading and not because there is something wrong with the model. The model test statistic issue is that; the test of all coefficients are equal to zero cannot be estimated simultaneously because there is no enough information; therefore, a subset could be tested but not all. The maximum number of coefficients that can be tested simultaneously is reported by the degrees of freedom F(10, 10); therefore, Stata refuses to report the overall model test statistic.

Table (6.5): Fixed Effects Results for Determinants of Bank Profitability, ROA Model

Variables	ROA (1)	ROA (2)
L.ROA	0.2305*** (0.0304)	0.2304*** (0.0303)
D1	0.0351** (0.0118)	-0.0349** (0.0118)
D2	-0.0007 (0.0004)	-0.0006 (0.0004)
CA	0.0142** (0.0060)	0.0142** (0.0059)
CR	0.0018 (0.00177)	-0.0018 (0.0018)
LR2	0.0013 (0.00127)	-0.0013 (0.00126)
RD	0.0126*** (0.0027)	0.0126*** (0.0027)
OE	0.0002*** (0.00004)	-0.0002*** (0.00004)
BS	0.0037*** (0.00095)	0.0037*** (0.0010)
FS	-0.0007 (0.0026)	-0.0007 (0.0025)
EG1	0.0018 (0.0023)	
EG2		0.0020 (0.0022)
INF	-0.0052 (0.0061)	-0.0054 (0.0061)
IR	0.0495*** (0.0147)	0.0497*** (0.0146)
MSG	-0.0006 (0.0034)	-0.0008 (0.0034)
Constant	0.0003 (0.0002)	-0.0003 (0002)
Observations	243	243
R-squared	0.6356	0.6360
No. of banks	11	11

Note: The table reports the fixed effects results for bank profitability determinants for a sample of 11 banks listed on the Egyptian Stock Exchange for the period (2005-2015). The main dependent variable is bank profitability as measured by ROA. ROA (1) model is the main model; while ROA (2) is used to check the robustness of the results by using another measure of economic growth. L.ROA stands for the lagged dependent variable of bank profitability, D1 stands for dummy 1 that represents the Arab Spring period (2011-2013), D2 stands for dummy 2 that represents the Global Financial Crisis period (2007-2009), CA is the capital adequacy measured by equity to total assets ratio, CR stands for credit risk as measured by the ratio of loan loss reserves to total loans, LR2 stands for liquidity risk as measured by total loans to total customer deposits, RD stands for revenue diversification as measured by non-interest income to total revenues, OE stands for operational efficiency as measured by the cost-to-income ratio, BS stands for bank size as measured by natural logarithm of total assets, FS stands for financial structure as measured by total customer deposits to total liabilities, EG1 stands for economic growth as measured by % change in real GDP (which is used in the main model), EG2 stands for the second measure of economic growth as measured by deviations of real GDP from its trend calculated using the the Hodrick-Prescott (HP) filter (which is used in the robustness check), INF stands for inflation as measured by % change in CPI, IR stands for interest rate as measured by overnight deposit rate, MSG stands for money supply growth as measured by growth of M1. The fixed effects estimation is used following the results of the Hausman test. There is no evidence of high level of collinearity between variables based on analysis of correlations and VIF. Standard errors are in parentheses. 1%, 5% and 10% significance levels are indicated by ***, ** and *; respectively. The robustness check produced very similar results, in terms of significance and signs of coefficients, as the main results.

Table (6.6): Dynamic Panel Results for Determinants of Bank Profitability, ROA Model

Variables	ROA (1)	ROA (2)
L.ROA	0.1650***	0.1655***
	(0.0526)	(0.0526)
D1	-0.0348***	-0.0346***
	(0.0062)	(0.0061)
D2	0.0006**	-0.0006**
	(0.0003)	(0.0003)
CA	0.0199***	0.0199***
	(0.0062)	(0.0062)
CR	0.0008	0.0008
	(0.0019)	(0.0019)
LR2	-0.0023***	-0.0023***
	(0.0007)	(0.0007)
RD	0.0094***	0.0094***
	(0.0013)	(0.0013)
OE	-0.0002***	-0.0002***
	(0.00004)	(0.00004)
BS	0.0040***	0.0040***
	(0.0006)	(0.0006)
FS	-0.0063**	-0.0063**
	(0.0028)	(0.0028)
EG1	0.0037	
	(0.0025)	
EG2		0.0040
		(0.0025)
INF	-0.0047	-0.0049
	(0.0066)	(0.0066)
IR	0.0566***	0.0573***
	(0.0155)	(0.0155)
MSG	-0.0022	-0.0022
	(0.0036)	(0.0036)
Constant	-0.00005	-0.00003
	(0.0002)	(0.0002)
Observations	243	243
No. of banks	11	11
No. of instruments	141	141
AR2 Test (p-value)	0.838	0.840
Sargan Test (p-value)	0.123	0.123

Note: The table reports the dynamic panel results for bank profitability determinants for a sample of 11 banks listed on the Egyptian Stock Exchange for the period (2005-2015). The one-step system GMM is used, developed by Arellano and Bover (1995) and Blundell and Bond (1998). The main dependent variable is bank profitability as measured by ROA. ROA (1) model is the main model; while ROA (2) is used to check the robustness of the results by using another measure of economic growth. L.ROA stands for the lagged dependent variable of bank profitability, D1 stands for dummy 1 that represents the Arab Spring period (2011-2013), D2 stands for dummy 2 that represents the Global Financial Crisis period (2007-2009), CA is the capital adequacy as measured by equity to total assets ratio, CR stands for credit risk as measured by the ratio of loan loss reserves to total loans, LR2 stands for liquidity risk as measured by total loans to total customer deposits, RD stands for revenue diversification as measured by non-interest income to total revenues, OE stands for operational efficiency as measured by cost-to-income ratio, BS stands for bank size as measured by natural logarithm of total assets, FS stands for financial structure as measured by total customer deposits to total liabilities, EG1 stands for economic growth as measured by % change in real GDP (which is used in the main model), EG2 stands for the second measure of economic growth as measured by deviations of real GDP from its trend calculated using the HP filter (which is used in the robustness check), INF stands for inflation as measured by % change in CPI, IR stands for interest rate as measured by overnight deposit rate, MSG stands for money supply growth as measured by growth of M1. There is no evidence of high level of collinearity between the variables based on analysis of correlations and VIF. Standard errors are in parentheses. 1%, 5% and 10% significance levels are indicated by ***, ** and *; respectively. The robustness checks produced similar results, in terms of significance and signs of coefficients, as the main results.

The analysis included specifications of dummy variables to account for different serious shocks that existed throughout the sample period as discussed in chapter 2 that presented the Egyptian context. The sample period (2005-2015) included two different periods of relative instability that might have affected the political and economic environments in Egypt. Therefore, to test the effect of the (2007/2008) Global Financial Crisis, a dummy variable category is included for the period of the financail crisis (2007-2009) titled “dummy 2” in the analysis table. The dummy variable tabulation is illustrated in the the “Stata do file” included in the appendices. Similarly, the Arab Spring that hit many countries in the MENA region was accounted for using “dummy 1” category. Dummy 1 or the Arab Spring dummy represents the period (2011-2013) that witnessed a massive political and economic problems which affected economies of the whole region as discussed in chapter 2. Therefore, testing the potentail effect of this period on profitability of the sample banks is warranted. The remaining periods were included as periods of relative stability with no major problems compared to other periods with serious events. The remaining periods were included through “dummy 3” category in the analysis that includes quarters of the following years; 2005, 2006, 2010, 2014 and 2015.

Furthermore, the system one-step GMM estimation modeled some variables as endogeneous variables to account for potential endogeneity that might exist for the independent variables, through using the lagged levels and lagged differences of the potentially endogenous variables as instruments. Different previous studies provided some evidence for potential endogeneity problems of explanatory variables in bank profitability models, such as bank capitalization and bank size. Athanasoglou *et al.* (2008) recommended in their research that capitalization is better modelled as an endogenous determinant in bank profitability models. Similarly, Saona (2016) used capitalization variable up to three years’ lags as instruments. Furthermore, Bandt *et al.* (2017) argued that endogeneity of the level of capitalization in profitability models should be taken into consideration. While, Djalilov and Piesse (2016) discussed the causality between size and profitability which might have the opposite direction, as banks with high profitability have the ability to increase their equity through retained earnings and through having the ability to better market themselves and therefore, banks get larger with better profitability.

The resutls reported in the previous tables indicate that the lagged dependent variable of bank profitability, measured by L.ROA, is strongly significant which provides an evidence of profit persistence in the model tested for the sample

banks and confirms its dynamic nature, as expected and discussed in most of the previous studies. The value of the coefficient of the lagged depedent variable is relatively low, indicating a relatively high competition among sample banks similar to the coeffieicnts reported by Pervan *et al.* (2015) and Djalilov and Piesse (2016) in their models. Furthermore, the resutls report significant negative effect of dummy 2 in the GMM esimtaion, which represents the crisis period but the fixed effects estimation reported insignificant effect of the crisis dummy. As well as the estimated singificant negative effect of dummy 1 that represents the Arab Spring period, that is represented by the constant terms since it is the omitted category of the dummy variable, which is evident in both estimations. Therefore, the reported results of the ROA model might indicate that the crisis period and the Arab Spring period had an effect on bank profitability. However, these results might conradict what was discussed in a very recent report by the International Monetary Fund, IMF (2017). The IMF report stated that the Egyptian banking sector has been resilient to different shocks including the Global Financial Crisis and the Arab Spring due to the strict policies of the Central Bank on one hand; while on the other hand, the lack of full integration of the Egyptian banking sector with the world financial system, gives some protection against global and regional shocks. Therefore, the results in the ROA model point to a potential negative effects of the crisis and the Arab Spring periods on the sample banks' profitability as measured by ROA.

Additionally, bank capitalization as measured by the ratio of equity to total assets has a significant positive impact on bank profitabilty measured by ROA, based on the estimated coefficients of both the fixed effects estimator and the GMM estiamtor. This result is consistent with the Signalling and Expected Bankruptcy Cost Hypotheses that support the positive relationship between profitability and capitaliztion. This is also consistent with the results of the correlation analysis that showed a positive association between capitalization and profitability of the sample banks. The Signalling Hypothesis supports the veiw that banks with good futur prospects tend to signal it through better capitalization. Moreover, the expected bankruptcy costs hypothesis suggests that when the bankruptcy probability increases for any external reasons, good banks tend to increase their capitalization as a sfety margin against expected losses to reflect their strong position. The sample period was full of exradordinary events, then it was important for banks to build strong capitalization to protect themselves from the strong shocks and to signal their capabilities through better capitalization to face any potential competition and protect against expectd losses. This reslut is also compatible with what was discussed in most of the previous studies concerning

the positive impact of capitalization on bank profitability. The most common view in the financial literature argues that higher capitalization would decrease the cost of external funding needed which means less interest expense, that would more than offset the increased cost of equity. Additioanlly, more capital means better ability to expliot business opportuniteis and handle unexpected losses which wil eventually improve a bank's profitability. The positive relationship between bank profitability and capitallization is explained and supported by most of the previous studies including; Trujillo-Ponce (2013); Saeed (2014); Md. Noman *et al.* (2015); Rahman *et al.* (2015); Djalilov and Piesse (2016); Islam and Nishiyama (2017) and de Bant *et al.* (2017) among others.

Liquidity risk, as measured by the liquidity management ratio or the ratio of total bank loans to total customer deposits, showed a strongly significant negative relationship with bank profitability as measured by ROA under the system GMM estimation. This ratio measures the amount of loans a bank holds relative to funding from customer deposits, which means that the higher the ratio the lower the bank's liquidity and the higher the risk. Therefore, lower liquidity or higher liquidity risk is associated with lower bank profitability as measured by ROA in the tested model. Higher liquidity risk might affect the solvency of the bank indicating a lower ability of a bank to finance increases in its assets or decreases in its liabilities. This also might affect the bank's ability to meet its demands and increases the probability of bankruptcy, and hence lower profitability as discussed by Kutsienyo (2011). The negative relationship between liquidity risk as measured by loans to customer deposits and bank profitability is also consistent with the results found by Kosmidou (2008), who found that the higher the ratio, the lower the bank liquidity which does not provide enough protection against insolvency problems. Additionally, the negative relationship between liquidity risk and bank profitability as measured by ROA is in line with what was explained by Ahamed (2017) concerning the effect of increased loans on bank's non-interest bearing income. Ahamed argued that higher amounts of loans reflected in the higher liquidity risk, means more risk-bearing activities which will affect the non-interest activities and will eventually affect profitability negatively. This is also evident from the strongly significant positive effect of revenue diversification variable in the tested model as measured by non-interest income to total revenues on bank profitability as measured by ROA.

Moreover, operational efficiency variable, as measured by cost-to-income ratio, has a significant negative relationship with bank profitability as measured by ROA under both estimations. This means that the higher the ratio, the less

efficient the bank is in managing its costs, which affects profitability negatively. Most of the previous studies argued that more efficient banks, with lower operational efficiency ratios, are expected to earn higher profitability including; Pasiouras and Kosmidou (2007), Athanasoglou *et al.* (2008), Kosmidou (2008), Ali *et al.* (2011), Dietrich and Wanzenried (2011), and Trujillo-Ponce (2013), among others. New technological advancements and improvements in management skills (X-efficiency) might result in improved efficiency and higher profitability. Furthermore, the bank size as measured by the natural logarithm of total assets is reported in both the fixed effects and the system GMM estimations to have a significantly positive effect on bank profitability as measured by ROA. This result means that larger banks in the sample of the listed banks in Egypt are more capable of utilizing economies of scale to have cost advantages over small competitors and lower their operating costs. In addition to being able to bring more advanced technologies and develop better management skills to improve their operational efficiency and enhance profitability. Additionally, Pervan et al. (2015) argued that profitability might be enhanced through better marketing campaigns of larger banks and better reputation which is evident in case of the sample banks such as; the CIB and QNBALAHLI banks which are considered the largest in the sample as discussed earlier. Those two banks were capable of leading huge marketing campaigns to reach wider range of customers and enhance their image, which helped in enhancing their profitability.

The GMM estimation shows also a statistically significant negative effect of the financial structure variable on ROA. The financial structure variable reflects the ratio of customer deposits to total liabilities and since customer deposits are considered a cheap source of finance compared to other sources, so higher amounts of customer deposits are expected to boost profitability. However, Trujillo-Ponce (2013) pointed out that increases in customer deposits of a bank might affect profitability negatively in case of deposit wars. Where banks increase interest rates to attract customer deposits. This policy is adopted by banks in Egypt more aggressively during times of slow economic growth and bad economic and political conditions which was the case during different times of the sample periods as discussed earlier. Moreover, Interest rate showed a statistically positive effect on bank profitability as measured by ROA under the GMM estimation as well as the fixed effects estimation which is consistent with the results of Pasiouras and Kosmidou (2007) and Saeed (2014). The positive impact of interest rate on bank profitability might be explained through the argument that decreasing interest rates will put pressures on banks to lower their prices which will affect profitability negatively. However, higher interest rates

would enable banks to improve revenues and would provide for a positive effect on bank profitability, which implies a direct relationship between interest rates and profitability as found in the estimated models.

Finally, the validity of the system GMM estimation presented above is tested using the Sargan test of over-identifying restrictions, which is a test of the null hypothesis that the instrumental variables do not correlate with the residuals. The p-value of the test is 0.123 in the estimated system GMM model which is above 0.05. This means that the null hypothesis cannot be rejected indicating that the partiality of estimators does not increase significantly, all conditions for the moments are met, and there is no evidence of over-identifying restrictions. Furthermore, the first order autocorrelation AR (1) as well as the second-order autocorrelation AR (2) tests that check the first-order and second-order autocorrelation between the residual differences are necessary. If the null hypotheses of both tests are not rejected, this will indicate the independence of residual differences as discussed earlier. The results of the system GMM estimation indicates that the p-value of AR(1) = 0.000, while the p-value for AR(2)= 0.838. This means that the null hypothesis of the first-order autocorrelation test is rejected and the null hypothesis of the second-order autocorrelation test is not rejected. However, following Saona (2016); $\Delta\varepsilon_{it=}\varepsilon_{it} - \varepsilon_{it-1}$ might be correlated with $\Delta\varepsilon_{it-1=}\varepsilon_{it-1} - \varepsilon_{it-2}$, as both have the same term ε_{it-1} , which means that rejecting the null hypothesis of the AR (1) would not cause a problem in the estimated model. The AR (2) doesn't reject the null of no second-order autocorrelation; therefore, the moment conditions are valid and the estimated model has met the diagnostic tests.

6.4.2 Results of the ROE Model

The following tables report the results of the fixed effects estimation as well as the one-step system GMM estimation for the ROE model under the same model specifications discussed earlier in the ROA model. The tables report a similar number of observations (243) and the same number of groups (11). While the explanatory power of the fixed effects is close to that of the ROA model, reported by the within R-squared to be 62.1%, reflecting a good explanatory power of the regressors in explaining the change in the dependent variables as measured by the ROE. This means that 62.15 of the change in profitability, as measured by ROE cab be explained by the regressors of the estimated model.

Table (6.7): Fixed Effects Results for Determinants of Bank Profitability, ROE Model

Variables	ROE (1)	ROE (2)
L.ROE	0.1769**	0.1766**
	(0.0578)	(0.0577)
D1	-0.3437	-0.3450
	(0.1933)	(0.1947)
D2	-0.0055	-0.0056
	(0.0050)	(0.0050)
CA	-0.2870**	-0.2866**
	(0.1151)	(0.1149)
CR	-0.0375	-0.0375
	(0.0326)	(0.0327)
LR2	-0.0195	-0.0196
	(0.0131)	(0.0132)
RD	0.1221***	0.01221***
	(0.0347)	(0.0347)
OE	-0.0029**	-0.0029**
	(0.0009)	(0.0009)
BS	0.0400**	0.0401**
	(0.0162)	(0.0163)
FS	-0.0041	-0.0044
	(0.0519)	(0.0520)
EG1	-0.0159	
	(0.0321)	
EG2		-0.0146
		(0.0322)
INF	0.0114	0.0109
	(0.0778)	(0.0781)
IR	0.6413**	0.6382**
	(0.2249)	(0.2214)
MSG	0.0068	0.0057
	(0.0480)	(0.0478)
Constant	-0.0013	-0.0014
	(0.0023)	(0.0023)
Observations	241	241
R-squared	0.6206	0.6205
No. of banks	11	11

Note: The table reports the fixed effects results for bank profitability determinants for a sample of 11 banks listed on the Egyptian Stock Exchange for the period (2005-2015). The main dependent variable is bank profitability as measured by ROE. ROE (1) model is the main model; while ROE (2) is used to check the robustness of the results by using another measure of economic growth. L.ROE stands for the lagged dependent variable of bank profitability, D1 stands for dummy 1 that represents the Arab Spring period (2011-2013), D2 stands for dummy 2 that represents the Global Financial Crisis period (2007-2009), CA is the capital adequacy measured by equity to total assets ratio, CR stands for credit risk as measured by the ratio of loan loss reserves to total loans, LR2 stands for liquidity risk as measured by total loans to total customer deposits, RD stands for revenue diversification as measured by non-interest income to total revenues, OE stands for operational efficiency as measured by the cost-to-income ratio, BS stands for bank size as measured by natural logarithm of total assets, FS stands for financial structure as measured by total customer deposits to total liabilities, EG1 stands for economic growth as measured by % change in real GDP (which is used in the main model), EG2 stands for the second measure of economic growth as measured by deviations of real GDP from its trend calculated using the the HP filter, used in the robustness check), INF stands for inflation as measured by % change in CPI, IR stands for interest rate as measured by overnight deposit rate, MSG stands for money supply growth as measured by growth of M1. The fixed effects estimation is used following the results of the Hausman test. There is no evidence of high level of collinearity between variables based on analysis of variables correlations and VIF. Standard errors are in parentheses. 1%, 5% and 10% significance levels are indicated by ***, ** and *; respectively. The robustness check produced very similar results, in terms of significance and signs of coefficients, as the main results.

Table (6.8): Dynamic Panel Results for Determinants of Bank Profitability, ROE Model

Variables	ROE (1)	ROE (2)
L.ROE	0.1882***	0.1880***
	(0.0624)	(0.0.0624)
D1	-0.0016	-0.0017
	(0.0029)	(0.0029)
D2	-0.0064**	-0.0064**
	(0.0032)	(0.0032)
CA	-0.1641*	-0.1636*
	(0.0840)	(0.0840)
CR	-0.0195	-0.0197
	(0.0279)	(0.0280)
LR2	-0.0380***	-0.0381***
	(0.0101)	(0.0101)
RD	0.0849***	0.0849***
	(0.0177)	(0.0177)
OE	-0.0016***	-0.0016***
	(0.0006)	(0.0006)
BS	0.0362***	0.0362***
	(0.0078)	(0.0078)
FS	-0.0905**	-0.0906**
	(0.0393)	(0.0392)
EG1	0.0077	
	(0.0350)	
EG2		0.0103
		(0.0346)
INF	0.0163	0.0147
	(0.0924)	(0.0925)
IR	0.6924***	0.6933***
	(0.2215)	(0.2212)
MSG	-0.0214	0.0228
	(0.0495)	(0.0491)
Constant	-0.2439***	-0.2437***
	(0.0852)	(0.0850)
Observations	241	241
No. of banks	11	11
No. of instruments	141	141
AR2 Test (p-value)	0.973	0.974
Sargan Test (p-value)	0.104	0.105

Note: The table reports the dynamic panel results for bank profitability determinants for a sample of 11 banks listed on the Egyptian Stock Exchange for the period (2005-2015). The one-step system GMM is used, developed by Arellano and Bover (1995) and Blundell and Bond (1998). The main dependent variable is bank profitability as measured by ROE. ROE (1) model is the main model; while ROE (2) is used to check the robustness of the results by using another measure of economic growth. L.ROE stands for the lagged dependent variable of bank profitability, D1 stands for dummy 1 that represents the Arab Spring period (2011-2013), D2 stands for dummy 2 that represents the Global Financial Crisis period (2007-2009), CA is the capital adequacy as measured by equity to total assets ratio, CR stands for credit risk as measured by the ratio of loan loss reserves to total loans, LR2 stands for liquidity risk as measured by total loans to total customer deposits, RD stands for revenue diversification as measured by non-interest income to total revenues, OE stands for operational efficiency as measured by cost-to-income ratio, BS stands for bank size as measured by natural logarithm of total assets, FS stands for financial structure as measured by total customer deposits to total liabilities, EG1 stands for economic growth as measured by % change in real GDP (which is used in the main model), EG2 stands for the second measure of economic growth as measured by deviations of real GDP from its trend calculated using the HP filter (which is used in the robustness check), INF stands for inflation as measured by % change in CPI, IR stands for interest rate as measured by overnight deposit rate, MSG stands for money supply growth as measured by growth of M1. There is no evidence of high level of collinearity between the variables based on analysis of correlations and VIF. Standard errors are in parentheses. 1%, 5% and 10% significance levels are indicated by ***, ** and *; respectively. The robustness checks produced similar results, in terms of significance and signs of coefficients, as the main results.

The first look at the previous results indicates that the lagged dependent variable as measured by L.ROE is strognly significant in both the fixed effects estimation as well as the system GMM estimation, confirming the dynamic nature of the model and indicating profit persistence with a relatively high competition among sample banks, similar to that reported in the ROA model. The dummy variables for the Global Financial Crisis and the Arab Spring showed insignficant coefficients in the fixed effects estimation, while the GMM estimaion reported a significant effect of the crisis dummy only. Bank Capitalization showed significant negative effect on bank profitability when mesured by ROE. This result is better explained through the DuPont analysis discussed earlier in the methodology chapter; as ROE is the product of both the ROA and equity multiplier (assets/equity). Therefore, an increase in capital would result in a decrease in the equity multiplier and a decrease in ROE as a consequence. The results obtained for the effect of capitalization on ROA and ROE is similar to what was explained by Trujillo-Ponce (2013). Trujillo-Ponce (2013) showed that the effect of capitalization on profitability is positive when measured by ROA, however the relationship is negative when measured by ROE. The increase in capital would result in decreasing ROE which can be seen as the result of the decreased leverage or indebtedness of the bank rather than the result of a decrease in the wealth creation from invested capital.

Moreover, the strongly significant effect of bank liquidity risk, as measured by loans to customer deposits, on bank profitability in the ROE model confirms the results obtained in the ROA model. Which indicates that the increase in liquidity risk affects the bank's solvency and means lower ability to meet demands that will eventually affect profitability as measured by ROE. In addition to the effect of increasing loans on the non-interest income activities of the bank that might decrease income from non-interest sources and result in lower profitability. Similar to what was discussed earlier in the ROA model, the strongly significant positive impact of revenue diversification variable in the ROE model confirms the same conclusion about the important effect of the non-interest income sources on bank profitability of the sample banks. Therefore, the increase in banks' loans might mean higher risk-bearing activities and lower income from non-interest activities which might affect profitability negatively as discussed.

Moreover, the operational efficiency variable reported the same relationship with ROE in both the system GMM estimation as well as the fixed effects estimation. Which confirms the same results obtained in the ROA model concerning the negative effect of operational efficiency variable on bank profitability. As

discussed earlier, this result is consistent with previous studies that discussed the effect of technological advancements and management skills in improving banks' operational efficiency and expenses management that affects bank profitability positively. The bank size variable is also significantly affecting bank profitability as measured by ROE in a positive way which confirms the results discussed earlier in the ROA model under both the fixed effects and the system GMM estimations. This means that economies of scale is utilized by larger banks in the sample which gives cost advantage over their competitors as discussed earlier. Additionally, the same significant negative effect of financial structure on bank profitability is also evident in the ROE model. As well as the significant positive effect of interest rate on bank profitability in the ROE model, that also confirms the same conclusion about the direct relationship between interest rates and bank profitability in the ROA model.

The validity of the estimated ROE model under the system GMM estimation is also tested using the Sargan test of over-identifying restrictions as well as the AR (1) and AR (2) tests of the first-order and second-order autocorrelation between residual differences. The p-value of the Sargan test is 0.104 which means that the null hypothesis cannot be rejected and there is no evidence of over-identifying restrictions. Additionally, the p-value of AR (1) is 0.000 and the p-value of AR (2) is 0.973, which means that the null hypothesis of the AR (1) test is rejected, while the null hypothesis of AR (2) is not rejected. Similar to the discussion in the ROA model rejection of the null hypothesis of AR (1) would not cause a problem in the estimated model and not rejecting the null hypothesis of AR (2) indicates that the moment conditions are valid and the estimated model has met the diagnostic tests, which proves the validity of the estimated ROE model under the system GMM estimation.

6.5 The Effect of Regulatory Capital

The additional dataset collected from Reuters databases for the sample banks was used to run an additional analysis covering a more recent period, starting with the first quarter of 2014 until the second quarter of 2016 (2014Q1-2016Q2). The additional dataset included full information about the regulatory capital ratio for the period (2014Q1-2016Q2), which was used to estimate the effect of regulatory capital on the sample banks profitability as measured by ROA. The availability of data represented a constraint on testing the effect of regulatory capital on bank profitability in Egypt for a longer period. Consistent data for the

regulatory capital ratio is only available for the most recent quarters since the uniform application of Basel II regulatory capital ratios in Egypt. As discussed earlier, the Central Bank of Egypt (CBE) started applying Pillar I of Basel II as a formal requirement for all banks operating in Egypt since the 2012/2013 fiscal year. Therefore, consistent reporting of the regulatory measures is only available in subsequent periods. It has been found that the most reliable source that reports data for the sample banks in the most recent periods is Reuters which is used to collect data needed for analysing the effect of regulatory capital on profitability of the listed banks in Egypt for the period (2014Q1-2016Q2).

The following table presents the bank profitability model estimated using the system GMM estimator under the same model specification of the main discussion. However, the number of observations is much smaller due to the constraint on data availability (81) and the number of groups is (9). The lagged dependent variable of the estimated model reports a significant coefficient indicating profit persistence in the estimated model with a relatively high competition in the sample as indicated by the relatively low value of the coefficient similar to that discussed in estimations of the main models. The dynamic nature is therefore evident in this model as well as all of the previously estimated models. The main focus in this model will be on evaluating the impact of regulatory capital on bank profitability of the sample banks which was not possible in the main discussion model due to unavailability of data. Moreover, a full set of explanatory variables were controlled for in the model.

Table (6.9): Dynamic Panel Results for Regulatory Capital Model

Variables	ROA (1)	ROA (2)
L.ROA	0.2637***	0.2641***
	(0.0867)	(0.0862)
RCA	-0.0077***	-0.0077***
	(0.0027)	(0.0027)
CR	-0.0298***	-0.0299***
	(0.0050)	(0.0049)
LR1	-0.0208***	-0.0208***
	(0.0043)	(0.0043)
RD	0.0096***	0.0096***
	(0.0010)	(0.0010)
OE	0.0002**	0.0002**
	(0.00007)	(0.00007)
BS	0.0025***	0.0025***
	(0.0008)	(0.0008)
FS	-0.0335***	-0.0337***
	(0.0068)	(0.0067)
EG1	-0.0054*	
	(0.0031)	
EG2		-0.0058*
		(0.0031)
INF	-0.0033	-0.0029
	(0.0063)	(0.0063)
IR	0.0129	0.0116
	(0.0082)	(0.0084)
MSG	0.0103*	0.0109*
	(0.0055)	(0.0055)
Constant	0.0294***	0.0299***
	(0.0094)	(0.0093)
Observations	81	81
No. of banks	9	9
No. of instruments	37	37
AR2 Test (p-value)	0.616	0.605
Sargan Test (p-value)	0.370	0.385

Note: The table reports the dynamic panel results for the effect of regulatory capital using a more recent dataset after application of Basel II in Egypt (2014Q1-2016Q2). The one-step system GMM is used, developed by Arellano and Bover (1995) and Blundell and Bond (1998). The main dependent variable is bank profitability as measured by ROA. ROA (1) model is the main model; while ROA (2) is used to check the robustness of the results by using another measured of economic growth. L.ROA stands for the lagged dependent variable of bank profitability, RCA is the regulatory capital ratio measured by capital to risk-weighted assets as set by the BCBS, CR stands for credit risk as measured by the ratio loan loss reserves to total loans ratio, LR1 stands for liquidity risk as measured by total loans to total assets, RD stands for revenue diversification as measured by non-interest income to total revenues, OE stands operational efficiency as measured by cost-to-income ratio, BS stands for bank size as measured by natural logarithm of total assets, FS stands for financial structure as measured by total customer deposits to total liabilities, EG1 stands for economic growth as measured by % change in real GDP(which is used in the main model), EG2 stands for the second measure of economic growth as measured by deviations of real GDP from its trend calculated using the HP filter, used in the robustness check), INF stands for inflation as measured by % change in CPI, IR stands for interest rate as measured by overnight deposit rate, MSG stands for money supply growth as measured by growth of M1. There is not a high level of correlation between the variables used in the models based on analysis of correlations and VIF. Standard errors are in parentheses. 1%, 5% and 10% significance levels are indicated by ***, ** and *; respectively. The robustness check produced very similar results as the main results. The same analysis was conducted using ROE as the main dependent variable; however, the validity of the system GMM estimation couldn't be proved, as the Sargan test of over-identifying restrictions reported a p-value of (0.003), which means that the null hypothesis , stating that the instrumental variables do not correlate with the residuals, is rejected. Furthermore, tests for the independence of residual differences reported that the p-value of AR(2)= 0.061. This means that the null hypothesis of the second-order autocorrelation test is rejected. Therefore, the moment conditions are not valid and the estimated model has not met the diagnostic tests.

The previously estimated model showed that bank regulatory capital has a significant but negative relationship with bank profitability as measured by ROA. This result indicates a negative impact of the new regulatory constraint in Egypt for the most recent periods following the uniform application of the first pillar of Basel II. This interesting result was discussed in some previous studies that highlighted the negative impact of regulatory constraints on developing countries especially during times of regional or global instability. Regulatory constraints might result in misallocation of resources by banks, especially in developing countries as discussed by Ayadi *et al.* (2016). Furthermore, Tran *et al.* (2016) mentioned that Basel regulatory capital, as measured by capital to risk-weighted assets ratio as determined by the BSCB, measures are less conservative compared to capitalization, as measured by the equity to total assets ratio, especially during times of regional or global shocks. This was explained by the authors as a result of banks' tendency to have sufficient regulatory capital on average but lower ratios of capital when calculated using equity to total assets ratio. However, the results of the tested model in this research take the most recent years into account for the listed banks in Egypt. Therefore, it reveals that banks' profitability was negatively affected by the regulatory capital ratio for the sample period (2014Q1-2016Q2), which is a relatively short period. This suggests that further investigation of these results for a wider range of data and longer periods is recommended for future research focusing on the Egyptian banking sector. This might also include a larger sample that will help in getting more accurate results. From this we can infer also that the regulatory authorities in Egypt are recommended to be cautious when applying the remaining pillars of Basel II and the updates of Basel III regulations and to test the effect of various regulations on bank performance empirically to check for any potential negative effects of such regulations on bank profitability.

6.6 Credit and Liquidity Risks: Granger Causality Tests

Based on a review of the studies that focused on bank performance and its main dimensions profitability and risk; it can be found that previous studies draw some conclusions showing mutual effects between credit and liquidity risks and how their interaction might affect bank stability. This relationship between liquidity and credit risks and how their interaction could affect bank performance is considered to be part of the main model tested under different estimations in the previous sections. Moreover, credit and liquidity risks are considered to be amongst the most important financial risks that affect bank profitability. Therefore, the

relationship between credit and liquidity risks is examined in this section in an attempt to uncover the ambiguity of the relationship between both risk types in previous studies, as previous studies have not reported a conclusive results concerning a meaningful causal relationship between the two types of bank financial risks; credit risk and liquidity risk.

Therefore, a set of tests are performed for the purpose of testing the causal relationship between the two risk types for the listed banks in Egypt over the sample period (2005-2015). Starting with panel unit-root tests, that are used to test for the stationarity of variables, then a PVAR model is estimated under a GMM framework based on selecting lag length through the method of Andrews and Lu (2001) using the three-model selection criteria. Also, a test of over-identifying restrictions is also needed to test the validity of instruments used in the estimation. Finally, a Granger causality Wald test is performed for each separate equation in the underlying model. Im-Pesaran-Shin (IPS) unit-root test is used to check the stationarity of the variables. The test has the null hypothesis of the existence of a unit root; however, the results of the test indicate that all variables are stationary at level. The p-values are less than 0.05 indicating a rejection of the null hypotheses which can be used as an evidence for stationarity of the variables. The p-value for the credit risk variable is (0.0213), while the p-value for the liquidity risk variable is (0.0022). The same result is reported for both the credit risk variable and the liquidity risk variable.

Additionally, a Fisher-type unit-root test based on Phillips-Perron tests is used to confirm the stationarity of the variables proved by the IPS tests. The Fisher unit-root test has a similar null hypothesis to that of the IPS test, indicating that all panels have unit roots. Therefore, a rejection of the null hypothesis proves the stationarity of the tested variables, which is evident from the p-values of all the reported test statistics. The p-values of all the test statistics are less than 0.05 for both the credit risk as well as the liquidity risk variables. For the credit risk variable p-values for all tests P, Z, L*, and Pm are smaller than 0.01 (0.0001, 0.0046, 0.0004, and 0.0000; respectively), which means that the null hypothesis can be rejected at the 1% level of statistical significance. For the liquidity risk variable p-values for all tests P, Z, L*, and Pm are also smaller than 0.01 (0.0000, 0.0006, 0.0001, and 0.0000; respectively), which means again that the null hypothesis can be rejected at the 1% level of statistical significance. Then, the three model selection criteria proposed by Andrews and Lu (2001) is used as previously mentioned to select the appropriate lag length for the model to be estimated. The results in the following table indicate that the first-order PVAR

has the smallest modified Akaike information criteria (MAIC), modified Bayesian information criteria (MBIC), and modified Hannan-Quinn information criteria (MHQIC); which means that the first-order PVAR is the preferred model.

Table (6.10): Selection of Lag Length

Lag	CD	J	J p-value	MBIC	MAIC	MQIC
1	0.9912	15.5407	0.7447	-99.3834	-24.4593	-54.4009
2	0.9926	14.4645	0.5642	-77.4747	-17.5355	-41.4887
3	0.9928	8.0352	0.7824	-60.9193	-15.9648	-33.9298
4	0.9903	1.8618	0.9850	-44.1078	-14.1382	-26.1148
5	0.9855	1.2555	0.8689	-21.7293	-6.7445	-12.7328
Observations		313				
No. of Panels		11				

Therefore, the next step is to estimate the first-order PVAR model to test the causal relationship between credit and liquidity risks using the GMM estimation. The following tables present the results of the estimated PVAR model under the GMM estimation, using the Stata code developed by Inessa Love which was applied in her paper (Love and Zicchino, 2006). Additionally, the results table presents the Hansen's test that is used to test the validity of instrumental variables used in the estimated model. Hansen's test is a test of the null hypothesis that the instrumental variables are not correlated with the error term. The results of Hansen's test showed p-value of (0.745) which is an indicator that the test does not reject the null hypothesis that the instrumental variables are valid to be used in the estimation. Furthermore, the results table reports also the Granger causality Wald test used to check each equation of the underlying model. The Wald test is a test of the null hypothesis of no causality between the variables, which states that excluded variable doesn't Granger-cause equation variable. Wald test for the credit risk equation reported a p-value of (0.037) which implies the rejection of the null hypothesis that liquidity risk does not grange cause credit risk. Therefore, there is an evidence of causality running from liquidity risk to credit risk. While in the liquidity risk equation, the Wald test reported a p-value of (0.407) indicating the failure of the test to reject the null hypothesis that credit risk does not grange cause liquidity risk. This result indicates that that there is no causality running from credit risk to liquidity risk.

Table (6.11): PVAR Granger Causality Results

Variables	CR	LR1
CR (t-1)	1.0283*** (0.0768)	0.0261 (0.0315)
LR1 (t-1)	-0.2435** (0.1169)	1.0392*** (0.1481)
Wald test (p-value)	0.037	0.407
Observations	313	
No. of banks	11	
Hansen's test (p-value)	0.745	

Note: The table reports the results of the PVAR Granger causality model under GMM framework to test the causal relationship between credit and liquidity risks. The first order PVAR is the preferred model, determined using the three model selection criteria proposed by Andrews and Lu (2001). CR stands for credit risk as measured by the ratio loan loss reserves to total loans ratio, CR (t-1) is the first lag of CR, LR1 stands for liquidity risk as measured by total loans to total assets, LR1 (t-1) is the first lag of LR1. There is not a high level of correlation between the variables used in the models based on analysis of correlations and VIF. Standard errors are in parentheses. 1%, 5% and 10% significance levels are indicated by ***, ** and *; respectively.

The previous results show that a unidirectional causality running from bank liquidity risk to bank credit risk is evident in the tested models for the listed banks in Egypt during the sample period (2005-2015). These results support the theoretical assumptions discussed in the literature chapter concerning the existence of the relationship between both risks; such as the Classical Financial Intermediation Theory and the Industrial Organisation Approach. These two models suggested that there is a relationship between credit and liquidity risks with some ambiguity concerning the direction of the relationship. Similarly, previous studies discussed in the literature chapter reported inconclusive results concerning the direction of the relationship between the two risk types. Therefore, the results of this study help in understanding the ambiguity underlying the relationship between liquidity and credit risks. Moreover, the unidirectional causal relationship from liquidity to credit risk supports the point of view of Acharya and Naqvi (2012), who discussed the impact that liquidity risk can have on bank's credit risk, by arguing that excessive liquidity can induce risk-taking behaviour of managers. They further explained that in times of crises and bad economic conditions, households and corporate depositors perform what can be called a "flight for quality" and deposit their assets with banks. This leaves banks flushed with some cash that reduces the "quality" and monitoring of new and existing borrowers. Therefore, they concluded that banks may load their portfolio with doubtful loans if they have higher liquidity holdings and this implies the effect of liquidity on credit risk that is evident in the results of the tested model for the listed banks in Egypt, especially during periods of political and economic instability for the sample period (2005-2015).

However, the results of the current study couldn't provide evidence for a causal relationship running from credit to liquidity risk as explained by Diamond and Rajan (2005). They argued that problems happen when many economic projects that are funded with loans yield insufficient funds and the bank cannot meet depositors' demands. This will lead more depositors to claim back their cash, as a result the bank will call in loans, which will reduce the aggregate liquidity in the market. Similarly, Gorton and Metrick (2012) discussed the relationship between liquidity and credit risks, and they illustrated how the perceived credit risk can lead to liquidity risk in banks. On the other hand, Imbierowicz and Rauch (2014) and Ghenimi *et al.* (2017) stated that they couldn't find a meaningful causal relationship between credit risk and liquidity risk in banks.

Therefore, following the pioneer concept of Granger causality; it can be concluded that the unidirectional causal relationship running from bank liquidity risk to credit risk in the sample of the listed banks in Egypt for the period (2005-2015) may imply that past values of liquidity risk would help in predicting future values of credit risk. Therefore, bank management and policy makers can make important implications about rate of non-repayment of loans or bank's quality of loan portfolio in the future using the history of liquidity risk measurements. Therefore, providing more reliable information about liquidity risk measures will help in predicting credit risk for banks. This might have important implications concerning the identification of potential exposure to credit risk, and as a result highlighting expected effects on bank profitability through both liquidity risk and credit risk.

6.7 Discussion of Findings

Using the fixed effects and the GMM estimators in the ROA and ROE models reported an overall results that confirm the dynamic nature of bank profitability in the sample banks for the period (2005-2015). The existence of profit persistence is confirmed under different esimations with a relatively low value of coefficients of lagged depdendent variables indicating a relatviely high competition in the sample banks which is similar to the results of Pervan *et al.* (2015) and Djalilov and Piesse (2016). Additioanlly, the relationship between bank profitability and bank capitalization showed different signs between the ROA and ROE model. It can be concluded that the effect of capitalization on profitability of the listed banks in egypt depends on whether profitability is mesured in terms of assets or of equity. As the relationship is positive in case of ROA; which means that the

first research hypothesis stating that (***H_{1a}**: Capital adequacy has a positive significant impact on profitability of banks in Egypt)* can be accepted. This is consistent with the Signalling and Expected Bankruptcy Cost Hypotheses that supported the positive impact of capital adequacy on bank profitability. As the signalling hypothesis refers to the tendency of banks with good future prospects to signal it through better capitalization. While the bankrubtcy cost hypothesis supports the view that higher bankruptcy probabilities, which might be due to external reasons, force good banks to build more capital to defend their positions. This result is in line with many of the previous studies including; Pasiouras and Kosmidou (2007), Boudriga *et al.* (2009), Ben Naceur and Omran (2011), Saeed (2014); Md. Noman *et al.* (2015); Rahman *et al.* (2015); Djalilov and Piesse (2016); Islam and Nishiyama (2017), de Bant *et al.* (2017), Hasanov *et al.* (2018), and Batten and Vo (2019). While the relationship between capital adequacy and bank profitability turned to be negative in the ROE model; which means accepting the research hypothesis stating that (***H_{1b}**: Capital adequacy has a negative significant impact on profitability of banks in Egypt).* However the negative relationship in case of ROE is better explained through the decreased leverage of the sample banks in case of increasing capital which decreases the equity multiplier, rather than the decrease in wealth creation from capital. This result agrees with the results of Trujillo-Ponce (2013), and Ghodrati and Ghasemi (2014) who found the effect of capitalization on bank profitability to be negative in case of ROE as compared to the positive effect in the ROA models.

It can be argued that the expected bankruptcy cost hypothesis better explains the relationship between bank capital adequacy and profitability of the sample banks, given the instability conditions that surrounded the Egyptian political and economic environments during the sample period. It was expected that good banks would tend to build up more capital to defend their positions during the sample period, which is consistent with the results of the ROA model. While the results of the ROE model is better explained through the effect of decreased leverage which decreases equity multiplier and affects ROE negatively in case of increasing capital, as discussed previously. On the other hand, the effect of regulatory capital on bank profitability as measured by ROA is proved to be negative for the sample banks during more recent periods following the application of Basel II in Egypt, while no results could be reported for the ROE model as the model failed to satisfy the required diagnostic tests. This results is in line with previous studies that supported the negative relationship between regulatory capital ratio, as measured by capital to risk-weighted assets, and bank profitability of developing countries, especially during instability conditions similar

to those witnessed by Egypt during the sample period. Tran *et al.* (2016) argued that regulatory capital measures tend to be less conservative compared to traditional measures during times of instable market conditions. This is due to the tendency of banks to build up more capital to satisfy the regulatory requirements, while keeping low levels of traditional capital measures. Moreover, Ayadi *et al.* (2016) adopted the view that regulatory constraints lead banks in developing countries to misallocate their resources to satisfy regulators, which doesn't reflect their real performance. This means that The regulatory authorities in Egypt are suggested to be cautious when applying the remaining pillars of Basel II or the updates of Basel III in Egypt, and to test for any negative effects of the regulatory restrictions on profitability. They need also to enhance the supervisory role to avoid any misallocation of resources by banks in an attempt to comply with regulatory constraints.

Moreover, the resutls of both the ROA and ROE models confirmed the positive effect of bank size on bank profitability in the tested sample, which means acccepting the hypothesis stating that (***H_{2a}:*** *Bank size has a positive significant impact on profitability of banks in Egypt)*, and rejecting the hypothesis stating that (***H_{2b}:*** *Bank size has a negative significant impact on profitability of banks in Egypt).* This is consistent with Smirlock (1985), Akhavein *et al.* (1997), Kosmidou (2008), Rachdi (2013), Tabari *et al.* (2013), Ghodrati and Ghasemi (2014), Saeed (2014); Md. Noman *et al.* (2015), Pervan *et al.* (2015), Saona (2016), Trad *et al.* (2017), and Hasanov *et al.* (2018). This means that larger banks in the sample, such as the CIB and QNBALAHLI banks, are more capable of utilizing economies of scale to lower operating expenses, improve their systems and staff, and launch better marketing campaigns that will help enhance their profitability, compared to their smaller competitors. Large banks are more capable of providing very large marketing campaigns and to reach very broad range of customers in the Egyptian market through different channels. Indeed, the CIB and QNBALAHLI banks have built a well-known reputation through their marketing campaigns, which gives them an advantage of the image of big size that can be utilized to decrease their cost of funding as well, and it is reflected in their profitability through having the highest average income throughout the sample period as discussed in chapter 5.

Addtiionally, the positive effect of revenue diversification is evident, which means accepting the hypothesis stating that (***H_{3a}:*** *Revenue Diversification has a positive significant impact on profitability of banks in Egypt)*, while the other hypothesis shall be rejected (***H_{3b}:*** *Revenue Diversification has a negative significant impact*

on profitability of banks in Egypt). This is an indicator of the important impact of non-interest income activities on bank profitaiblity of the listed banks in Egypt. This means that increasing the share of non-interest income activities has a positive effect on enhancing bank profitability as an alternative source to the interest-bearing activities in case of having low level of interest income. The positive impact of revenues diversification on bank profitablity is in line with the arguments of Trujillo-Ponce (2013) and Ahamed (2017). This means that banks in Egypt are suggested to focus on non-interest income as an important source of enhancing profitability. Also the negative impact of bank operational efficiency variable as measured by cost-to-income ratio is confirmed in both the ROA and ROE models. This means accepting the hypothesis stating that (***H_4:*** *Operational efficiency has a negative significant impact on profitability of banks in Egypt).* So, it can be concluded that more efficient banks in the sample have better profitabilty, which might be attributable to better tehcnological tools and mangement skills that help in improving expenses management and the overall operational efficiency which enhances bank profitability. This is in line with Pasiouras and Kosmidou (2007), Athanasoglou *et al.* (2008), Kosmidou (2008), Ali *et al.* (2011), Dietrich and Wanzenried (2011), Trujillo-Ponce (2013), Noman *et al.* (2015), Knezevic and Dobromirov (2016), Garcia and Guerreiro (2016), Rachdi (2013), Noman *et al.* (2015), Rahman *et al.* (2015), Garcia and Guerreiro (2016), and Neves *et al.* (2020).

Additionally, credit risk, as measured by loan loss reserves to total loans, has an insignificant effect on profitability in the estimated models, which means rejecting the hypothesis stating that (***H_5:*** *Credit risk has a negative significant impact on profitability of banks in Egypt).* Although, many previous studies concluded a significant impact of credit risk on bank profitability, this was not the case here. Moreover, this thesis has some limitations on data availability that didn't allow the use of more proxies for credit risk to check the robustness of this result. The same negative effect of bank liqudity risk, as measured by the liquidity management ratio or the ratio of total bank loans to total customer deposits, was reported by both the ROA and ROE models under the GMM estimation. Therefore, the negative impact of liquidity risk on bank profitability of the listed banks in Egypt can be concluded for the sample period. So, the hypothesis stating that (***H_{6a}:*** *Liquidity Risk has a positive significant impact on profitability of banks in Egypt)* shall be rejected, while the hypothesis stating that (***H_{6b}:*** *Liquidity Risk has a negative significant impact on profitability of banks in Egypt)* is accepted. This means that the higher the liquidity risk, the lower the bank's ability to face insolvency problems, and it weakens the bank's ability to meet demands

to increase assets or to decrease liabilities and increases bankruptcy probabilities.This result is consistent with what was reported by Ahamed (2017) concerning the negative effect of increasing the amount of loans, in case of higher liquidity risk ratios, on the non-interest income activities which affects profitability negatively. This is evident in the current sample that is characterized by more significant effect of non-interest income on bank profitability as reported by the significant positive impact of revenue diversification, measured by the ratio of non-interest income to total revenues, on profitability. The strongly significant impact of revenue diversification on bank profitability in the tested models indicates the importance of non-interest income activities and its association with improved profitability for the listed banks in Egypt, through the increased income that is generated from non-core banking activities. This can be taken as an indicator of the negative effect of higher loans on non-interest income, and profitability as a result, in the tested models. This is in line with Kosmidou (2008), Kutsienyo (2011), Knezevic and Dobromirov (2016), Islam and Nishiyama (2016), Ahamed (2017), and Hasanov *et al.* (2018)

Furthermore, the effect of increasing the percentage of customer deposits relative to other sources is proved to be significantly negative on bank profitability, which is evident in both the ROA and ROE model under the GMM estimation. This means rejecting the hypothesis testing the positive effect of financial structure on bank profitability (***H_7: Financial structure has a positive significant impact on profitability of banks in Egypt).*** The financial Structure variable is measured by the ratio of customer deposits to total liabilities and was expected to affect bank profitability positively, as reported by many previous studies. However, a very recent study by Ha (2020) found that the increase in the ratio of deposits negatively affects bank profitability. Ha (2020) explained this result by the increase in interest paid in case of rapid increase in the ratio of deposits, accompanied by failure to use deposits effectively. This argument also applies on the Egyptian banking industry that was characterized by frequent changes in interest rates during the sample period to cope with the changing economic conditions that caused frequent changes in the amount of deposits. Moreover, Trujillo-Ponce (2013) found that the high amounts of customer loans and deposits in the Spanish banks relative to other European banks enhanced bank profitability as measured by ROA and ROE. However, Trujillo-Ponce (2013) argued that these high amounts were due to the high dependence of Spanish banks on retail activities, and less dependence on funding from the whole-sale markets. However, in case of deposit wars this positive effect of the increase in customer deposits works the other way around. This is because banks tend to

increase interest rates to attract customers in a battle of preserving their cheapest source of financing loans. However, the effect of this war becomes negative and affects banks' earnings negatively. Although customer deposits are considered a cheap source of finance, deposit wars might lead banks to adopt aggressive policies of increasing interest rates to attract customer deposits, especially in times of bad economic conditions which was the case in Egypt during the sample period through the effects of the Crisis and the Arab Spring. This is also supported by the relatively high competition among the sample banks, as evident from the analysis. This policy of increasing interest rates was adopted again in Egypt during more recent periods, in 2016/2017, after the devaluation of the Egyptian pound. This trend is also enhanced when there is some difficulties in accessing sufficient international funding resources, which was the case in Egypt after the devaluation. However, less efficient use of the increase in customer deposits accompanied by the increase in interest paid, turned out to negatively affect bank profitability for the sample. Therefore, resorting to other medium and long term wholesale financial resources to finance bank loans might be a good option for banks in Egypt as an alternative to customer deposits with higher cost of finance in this case. Alternative financial resources would represent a flexible alternative with lower cost to offset the short-term increases in the financial costs of maintaining deposits, as recommended by Trujillo-Ponce (2013).

Furthermore, the effect of economic growth on bank profitability was proved to be insignificant in both; the main model using the percentage change in real GDP measure, and also in the robustness check using the measure of deviations of real GDP from its trend calculated using the HP filter. This means rejecting the hypothesis stating that (***H_8:*** *Economic growth has a positive significant impact on profitability of banks in Egypt).* Similar results were obtained by Ben Naceur and Omran (2011), and Batten and Vo (2019) who couldn't conclude any relationship between business cycle measures and bank profitability in their models. The tight policies adopted by the CBE during most of the sample period might have a remarkable impact on protecting the Egyptian banking sector from the adverse economic conditions during the sample period. As the report of the IMF (2017) stated that the Egyptian banking industry was strictly protected by the policies of the CBE, including the relative isolation of the banking sector from the world financial system, that provided some protection against global and regional shocks. Nevertheless, Athanasoglou *et al.* (2008) argued that the effect of business cycle on bank profitability could be partially reflected through the effect

of economic conditions on other factors, such as; lending rate, loan quality, and capital.

Moreover, the inflation rate also proved to have insignificant effect on bank profitability, indicating the rejection of the following two hypotheses (***H_{9a}: Inflation rate has a positive significant impact on profitability of banks in Egypt); and (H_{9b}: Inflation rate has a negative significant impact on profitability of banks in Egypt).*** This might also be explained by the strict policies of the CBE to protect banks from some adverse macroeconomic effects. However, it was concluded that the interest rate variable has a direct relationship with bank profitability of the listed banks in Egypt as was discussed in the ROA and ROE models for the (2005-2015) period. This means accepting the hypothesis stating that (***H_{10a}: Interest rate has a positive significant impact on profitability of banks in Egypt)***, and rejecting the hypothesis stating that (***H_{10b}: Interest rate has a negative significant impact on profitability of banks in Egypt)***. This is in line with the explanation of Trujillo-Ponce (2013), who also concluded a direct relationship between interest rates and bank profitability indicating that increased interest rates improves the ability of banks to generate higher income through charging better prices for their services. While decreased interest rates put limits on bank's margins leading to a negative impact on bank profitability.

Also, the effect of money supply growth on bank profitability proved insignificant, which means rejecting the hypothesis stating that (***H_{11}: Money supply growth has a positive significant impact on profitability of banks in Egypt).*** Although the effect of money supply growth on bank profitability was reported to be positive in some previous studies; however, the study of Kosmidou (2008) reported simiar results to the results of this thesis with no significant effect of money supply growth. Again, this can be explained by the protection provided by the CBE for the Egyptian banking industry. Also, the effect of the crisis and the Arab Spring on bank profitability showed different results between different estimated models. Therefore, it cannot be concluded that the two major events that occurred during the sample period affected bank profitability significantly, as measured by both ROA and ROE. This means that the following two hypotheses cannot be accepted; (***H_{12}: The Global Financial Crisis had a significant negative impact on profitability of banks in Egypt)***, and (***H_{13}: The Arab Spring had a significant negative impact on profitability of banks in Egypt).*** This result is consistent with what was reported by the IMF (2017), as it reported that the Egyptian banking system was not fully integrated in the world's financial system, and showed a general resilience to different shocks due to the strict policies of the CBE that

contributed to protecting the Egyptian banking industry from different global and regional shocks.

Lastly, the Granger causality model showed that there is a unidirectional causality running form liquidity risk to credit risk for the sample. Which means rejecting the hypothesis stating that (***H_{14}:*** *Credit risk of banks in Egypt Granger causes liquidity risk)*, and accepting the hypothesis stating that (***H_{15}:*** *Liquidity risk of banks in Egypt Granger causes credit risk)*.This result is supported by theories that supported the existence of a relationship between both risk types. The first one is the Classical Financial Intermediation Theory , that is adopted mainly by models of Bryant (1980) and Diamond and Dybvig (1983), which models banks as pools of liquidity that provides depositors and borrowers with the cash needed. The second one is the Industrial Organisation Approach which models banks as profit maximizing price takers in the market of loans and deposits. Those two theories are used to highlight the existence of a relationship between both credit and liquidity risks in the financial literature. The results obtained in this thesis is also supported by the views of Acharya and Naqvi (2012), who argued that increased liquidity motivates risk taking by managers and affects credit quality. Therefore, banks and policy makers in Egypt are suggested to consider the importance of liquidity measurements (liquidity risk) in predicting the quality of loan portfolio (credit risk). Moreover, it's important to take into consideration the effect of the "flight for quality" by depositors when they leave banks flushed with large amounts of liquidity (low liquidity risk), during times of bad economic conditions, which affects banks' monitoring of the quality of loans, and consequently deteriorates the quality of loan portfolio (high credit risk).

6.8 Summary

This chapter discussed the main analyses and results of the thesis, including presenting a summary of the data used through descriptive statistics. In addition to presenting analysis of correlations to indicate the existence of any associations between variables. Then, the chapter discussed the assumptions of the classical linear regression model, and presented all the needed diagnostics to validate the estimated regressions, including; linearity, normality, heteroskedasticity, autocorrelation, and multicollinearity. As well as discussing the Hausman test needed to choose among the fixed effects and random effects estimations. The results of the test indicated the appropriateness of the fixed effects estimation which was used to run ROA and ROE models. Along with the

use of the GMM estimation, and the PVAR Granger causality model. The main part of the chapter presented the results of estimating different models; fixed effects, GMM, and PVAR Granger causality, in addition to discussing the reported results and making comparisons with previous studies and relevant theories. Then, the next chapter will present a summary and conclusion of the whole thesis, to provide a focused look for the reader on the whole research, and how different chapters were organised to provide a better understanding of the research focus. Moreover, the next chapter will use the discussion of the results presented in the current chapter to make some conclusions and implications for all the stakeholders, in the light of the background provided in the early chapters of the thesis. Therefore, the reader would expect a closer look on every chapter to be provided in the final one. A summary of the research problem, research findings, the overall conclusions, and contributions will be the main outcomes of the final chapter.

Chapter.7 Summary and Conclusion

7.1 Research Summary

The current research has the main aim of investigating bank performance in Egypt, through analysing the main bank-specific and macroeconomic determinants of bank profitability in Egypt, as well as testing the effect of major serious shocks during the period (2005-2015), which is used as the sample period in the main analysis. As well as investigating the effect of regulatory capital on bank profitability of the sample for more recent period (2014-2016). Additionally, the causal relationship between two major financial risks among the intra-bank profitability determinants was also investigated. After reviewing relevant theoretical background and relevant literature, variables were defined and described and necessary data was collected based on quarterly financial reports of banks listed on the Egyptian stock exchange. Then research hypotheses were developed and tested to answer the main research questions in the process of pursuing the research objectives. Different statistical analyses were employed including; descriptive statistics used to present the data and correlation analysis. In addition to testing the assumptions of the classical linear regression model and different pre and post estimation tests. Fixed effects and system Generalised Method of Moments (GMM) estimators were used in the thesis to estimate the models, in addition to using the Panel Vector Auto-Regression (PVAR) model under a GMM framework to estimate the Granger causality between credit and liquidity risks.

Egypt is the main research context and the subject of all tests and investigations in the thesis. The Arab Republic of Egypt is a country with a long history and interesting current situation, as the country went through some serious political instability since 2011 that still have some effects on the political and economic environments. Therefore, empirical investigations of bank performance in Egypt is not an easy task; however, the country needs every effort to help recover from the consequences of the “Arab Spring”, and academic research should have a vital role in this recovery through the efforts of researchers in investigating potential problems to provide possible solutions. Moreover, the (2007/2008) Global Financial Crisis is considered the worst in the modern history since the Great Depression in the 1930s, the global crisis resulted in major losses in the real economy of most of the advanced countries. However, a report by the

Ministry of Finance in Egypt (MoF, 2010) stated that Egypt, as an emerging economy, is not fully integrated in the world's financial system; therefore, the financial system of Egypt was not seriously affected by the crisis unlike the real economy of Egypt. The services sectors in Egypt were affected following the crisis, as the tourism industry declined by 3% and receipts from Suez Canal declined by 8.4%, while remittances from Egyptians working abroad declined by 8.8%. Furthermore, the Ministry of Finance in Egypt reported that the banking sector in Egypt was resilient to the effects of the crisis due to the weak integration of the Egyptian financial systems into the global financial system, in addition to the reform program started by the Central Bank of Egypt (CBE) in 2004, that helped the banking sector to withstand the effects of the crisis. The reform plan involved many aspects such as; encouraging bank mergers to create stronger larger banking institutions, getting rid of bad debts in the banking portfolios, and restructuring banks from both financial and administrative perspectives, and improving banking supervision to help the banking sector withstand difficult economic situations.

Additionally, the Arab Spring waves started spreading all over the Arab world in late 2010 and early 2011. The poverty rate in Egypt reached 50% in 2011 and incidents of political corruption stimulated the first massive popular demonstration or what is called "25 January Egyptian Revolution" in 2011. Political and economic instability were even worse after the first revolution followed by a period ruled by president Mohamed Morsi who was a member of the Muslim Brotherhood until the second popular revolution in June 2013. A detailed discussion of the deteriorating economic situation in the Arab countries and Egypt is discussed in Chapter 2, which illustrated how the Arab Spring played a major role in shaping the economic situation in the whole Arab region including Egypt in the last 7 years. However, IMF (2017) reported that the Egyptian banking industry has shown great resilience to the effects of several shocks including the Global Financial Crisis and the Arab Spring, even with the great effects on the real economy of Egypt following those events. The IMF reported that banks of Egypt stood with well-capitalization and enough liquidity and the latest figures showed an overall regulatory capital ratio of 13.7%, return on equity of 19%, with non-performing loans amounting to 6.8%, and a ratio of loan-loss provisions of almost 100%.

Therefore, it can be concluded that the Global Financial Crisis and the Arab Spring constituted two major serious shocks that had serious effects on the world economy, the economy of the whole Arab region and the middle east, and

definitely the economy of Egypt. However, the Egyptian banking industry is reported to be resilient to the effects of these shocks, which suggests the need for more empirical investigation of the effects of those shocks on the Egyptian banking in a model that incorporates different intra- and extra-bank profitability determinants. Additionally, review of previous studies that investigated bank performance in different countries revealed that bank profitability determinants are generally divided into intra- and extra-bank determinants. The intra-bank group includes bank-specific determinants that are controllable by bank management; however, the extra-bank group includes industry-specific and macroeconomic determinants that are external to the bank and cannot be controlled by bank management. It has been also found that most of the previous studies estimated dynamic profitability models to examine profit persistence using GMM estimations to account for potential endogeneity problems. In addition to studies that highlighted the importance of financial risks, especially credit and liquidity risks, as important internal determinants of bank profitability. Financial risks include liquidity risk, credit risk, and the two subcategories of market risk; interest rate risk and currency risk. The importance of credit and liquidity risks was highlighted in literature as the main types of financial risks that affect bank performance, which indicates the importance of examining potential causal relationship between credit risk and liquidity risk of banks in Egypt. Therefore, the thesis focuses on the two main dimensions of bank performance; profitability and risk as stated by Rose and Hudgins (2013). The main bank profitability determinants for listed banks of Egypt are investigated in the light of the effects of the Global Financial Crisis and the Arab Spring, in addition to the causal relationship between liquidity risk and credit risk.

Additionally, Basel regulatory frameworks are developed to protect banking systems from adverse effects resulting from incomplete markets, moral hazards, capital adequacy problems, or other negative externalities and risks. Therefore, Basel Committee on Banking Supervision (BCBS) started its first meeting in 1975 after the collapse of the Bretton Woods system of managed exchange. The first regulatory framework was issued by the BCBS in 1988 to set up sufficient regulations for the purpose of enhancing soundness of operations of the banking system worldwide and enhancing global financial stability. However, the regulations of the BSCP are recommendations not legal requirements. The Basel accords provide guidance on how the national authorities could keep the safety and soundness of their banking systems. The members' commitment is the main base for implementing Basel regulations. Chapter 3 provides a full set of details

about the development of Basel regulations, Committee's members, subcommittees, and basics of different Basel accords; Basel I, Basel II, Basel 2.5 and Basel III. In addition to a more detailed discussion of the three pillars of Basel II and the basic guidelines of calculating the minimum capital requirements as set by the BCBS, with necessary details for treatment of credit risk, operational risk, and market risk. The CBE prepared for the application of Basel II in Egypt in the process of the second wave of the CBE's reform program started in 2009, through signing a memorandum of understanding with the European Central Bank, in cooperation with seven other European national banks. The final decision has been fulfilled in December 2012 to apply the first Pillar of Basel II in Egypt staring from December 2012 and June 2013 according to the fiscal year of each bank. Moreover, some reforms of Basel 2.5 and Basel III have been taken into consideration by the CBE in the last few years. The CBE added some formal requirements in 2016 based on Basel III reforms including; requirements for capital conservation buffer, leverage ratio, liquidity coverage ratio, and net stable funding ratio. This makes the study of the impact of such new regulatory reform for the Egyptian banking sector an important subject for academic research. Therefore, this thesis tries to fulfil the need for empirically investigating the impact of the new regulatory capital requirements in Egypt through an additional analysis section using a dataset collected from Reuters for a more recent period.

The sample banks include; Abu Dhabi Islamic Bank, Egyptian Gulf Bank, Credit Agricole-Egypt Bank, Commercial International Bank, El-Baraka Bank-Egypt, NBK-Egypt, Faisal Islamic Bank of Egypt, QNBALAHLI Bank, SAIB Bank, Suez Canal Bank, and UNB-Egypt Bank. Those banks represent the eleven banks that were consistently listed on the Egyptian Stock Exchange for the whole sample period (2005-2015). Therefore, a complete set of data for the sample banks was collected from the unconsolidated quarterly audited financial reports for the period (2005-2015) through Egypt for Information Dissemination company (EGID). Additionally, quarterly macroeconomic data was collected from the EuroMonitro International and Trading Economics databases. Furthermore, a new set of data for the consolidated financial reports of the sample banks was also collected through Reuters' Eikon for a more recent period (2014Q1-2016Q2). This additional dataset contains data of the new regulatory capital requirements applied in Egypt recently, and is used for investigating the effect of regulatory capital on bank profitability in a model covering the shorter sample period.

The system GMM estimator as well as the fixed effects estimator are used in the main estimations investigating different determinants of bank profitability. The GMM estimation is used to account for potential problems associated with dynamic bank profitability models. Additionally the fixed effects is used as an additional estimator following the argument that fixed effects estimation works well in dynamic models with large T and small N as discussed in the methodology chapter. The Stata code “xtabond2” developed by David Roodman is used to run the system GMM in Stata for the main estimation as well as the additional analysis investigating the effect of regulatory capital on bank profitability for the period (2014Q1-2016Q2). Also, the Stata code developed by Inessa Love is used to estimate the PVAR model under the GMM framework and to test for the Granger causality between credit risk and liquidity risk variables. The estimated profitability model included the following internal factors; capitalization, bank size, revenue diversification, operational efficiency, credit risk, liquidity risk and financial structure; while the external factors included are; economic growth, inflation, interest rate, and money supply growth. Moreover, the main profitability measures used in the thesis are Return on Assets (ROA) and Return on Equity (ROE).

Bank profitability variable is measured in this research using both ROA and ROE, where ROA is measured by net income before tax over total assets and ROE is measured by net income before tax over total equity. The intra-bank determinants include; capitalization measured by the equity to total assets ratio in the main model and by the regulatory capital ratio in the additional analysis section. In addition to bank size variable as measured by natural logarithm of total assets, revenue diversification as measured by non-interest income to total revenues, operational efficiency as measured by cost-to-income ratio, financial structure as measured by customer deposits to total liabilities. While the two types of financial risk that are used in all the estimated models include; credit risk measured by loan loss reserves to total loans and liquidity risk as measured by total loans to total assets or total loans to total customer deposits. Moreover, the external macroeconomic variables include; economic growth as measured by percentage change in GDP, inflation as measured by percentage change in consumer prices, interest rate as measured by the overnight deposit rate, and the growth of money supply as measured by percentage change in M1.

7.2 Research Findings

The main model investigates the key profitability determinants of the listed banks in Egypt using a dynamic panel data estimation. The results reported in the analysis chapter confirms the dynamic nature of the estimated models. Therefore, profit persistence is present during the sample period as indicated by all estimations. However, the effects of the Global Financial Crisis and the Arab Spring are not confirmed in the analysis as the results showed different effects between the estimated models. Therefore, the overall conclusion is that the sample banks showed relative resilience to the effects of the Global Financial Crisis and the Arab Spring. The point of view adopted by the report of the IMF (2017) holds based on the results obtained in this thesis, which states that the Egyptian banking industry proved to be resilient to the effects of different shocks due to the strict regulations imposed by the CBE throughout the different waves of the banking reform program, in addition to the weak integration of the Egyptian financial system into the world financial system which protects the banking sector from shocks.

The effect of capitalization on profitability of the sample banks depends on whether profitability is being measured in terms of assets (ROA) or in terms of equity (ROE). As capitalization negatively affects bank profitability measured by ROE and positively affects bank profitability in terms of ROA. The negative effect of the capitalization variable on ROE is explained through the effect of decreased leverage or indebtedness of the bank through the equity multiplier which affects ROE negatively. Furthermore, the additional analysis that investigates the effect of regulatory capital on bank profitability for the period (2014Q1-2016Q2) showed a negative impact of the regulatory capital on bank profitability as measured by ROA. Tran *et al.* (2016) explained that banks tend to keep higher regulatory capital ratios compared to the equity to assets ratios, which makes Basel regulatory capital measures less conservative compared to capitalization as measured by equity to total assets, especially during times of regional or global shocks. Additionally, Ayadi *et al.* (2016) argued that regulatory constraints might direct banks to misallocate their resources which implies a negative impact on profitability. However, the results of the tested model in this research covers a relatively short period for a sample of the listed banks on the Egyptian Stock Exchange, which represents also the beginning of the new regulatory reform in Egypt since only 2013. The results of both the ROA and ROE models reported also the negative impact of liquidity risk, operational efficiency, and financial

structure. However, bank size, revenue diversification, and interest rate showed positive impact on bank profitability. While credit risk, economic growth, inflation, and money supply growth did not show significant effect on bank profitability of the listed banks in Egypt in both the ROA and ROE models.

Additionally, using the statistical code developed by Inessa Love and Stata 14 software package, a PVAR model under a GMM framework was estimated. The three model selection criteria by Andrews and Lu (2001), suggested the use a first-order PVAR. While the verification of the choice of instrumental variables used was done using Hansen's test for over-identifying restrictions. Hansen's test proved that instruments used in estimation are uncorrelated with error term, and therefore are valid instruments. Lastly, a Granger causality Wald test was performed for each equation of the model specified, and the results proved the existence of a unidirectional Granger causality running from liquidity risk to credit risk. This finding provides important implications for policy makers and bank management about the quality of loan portfolio of banks in the future, based on history of liquidity risk measurements. The unidirectional causal relationship running from bank liquidity risk to credit risk in Egypt implies that past values of liquidity risk might help in predicting future values of credit risk, which would help in identifying the potential exposure to credit risk, and highlighting expected effects on bank profitability.

7.3 Contributions

Review of previous literature highlighted the need for more updated research on bank performance in, especially in the light of the serious political and economic changes in Egypt, as well as the major regulatory reforms in the banking sector. Therefore, this thesis focused on the two main dimensions of bank's performance, identified by (Rose and Hudgins, 2013); profitability and risk, and it contributes on both theoretical and practical bases through;

- Investigating the effect of different intra- and extra-bank profitability determinants, in the light of the Global Financial Crisis and the Arab Spring, on bank profitability of Egypt, as one of the emerging economies of the Middle East that was severely hit by the political and economic instability in the last decade. This was done in dynamic panel data models using both the GMM and the Fixed Effects estimations, accounting for profit persistence and other endogeneity problems. The results of these

estimations were compared to the reports of the Egyptian government and the IMF about the effects of serious economic and political events on the Egyptian banking industry. The results highlighted the resilience of the Egyptian banking to global and regional shocks.

- Testing the effect of regulatory capital on Egyptian bank profitability in a separate model for a more recent period following the banking reform program that ended up with the application of Basel II in Egypt in 2013. Which is needed particularly in the light of strategy of the Egyptian Central to help banks fully digest the first pillar of Basel II framework which will help to further implement the other two pillars in addition to implementing the internal models of risk assessment. The analysis results indicated a negative effect of regulatory capital, which was used to highlight some important implications for Egyptian banking. This result confirms what was announced by the Basel Committee upon the issuance of the revised framework of Basel II in 2006; that the adoption of Basel II framework might not be the best option for non-G10 (non-member) countries in the near future, and It seems that the near future should have extended a bit.
- Investigating the Granger causality between credit and liquidity risks following a PVAR estimation under a GMM framework that highlighted the existence of a unidirectional relationship running from liquidity to credit risk, in an attempt to fill in the gap concerning the ambiguity of the relationship between the two risks in financial literature, supported only from theoretical perspective, and draw important implications for the Egyptian banking sector concerning the risk management systems.
- Contributing to the body of literature on bank performance through presenting a comprehensive background on Basel regulatory framework with all its stages and the effect of each stage on the world banking -in general- and the Egyptian banking in specific. In addition to providing an updated review of literature, that involved critically discussing a wide range of recent peer-reviewed articles. As well as conducting a comprehensive analysis of the effect of Global Financial Crisis and the Arab Spring on economies of the Middle East, which was supported by statistical as well as graphical representations. This foundation can benefit future researchers who will be interested in conducting research on bank performance in any context, to make use of this comprehensive background.

7.4 Implications

Developing countries like Egypt need to have more academic research on how to improve bank performance to help in economic development and improvement of investment opportunities. Therefore, this thesis provides some implications that might help banks and policy makers develop appropriate strategies to help improve bank performance. In the light of the research findings the following implications can be concluded;

- Firstly, the negative impact of regulatory capital on bank profitability is an interesting result. Knowing that the relevant model is estimated for a very short period following the application of pillar I of Basel II in 2013. However, the findings indicate the need of regulatory authorities in Egypt to be more cautious when applying the remaining pillars of Basel II and the updates of Basel III regulations and to test the effect of various regulations on bank performance empirically to highlight any potential negative effects of such regulations. It is worth mentioning here that Ayadi *et al.* (2016) reported that regulatory constraints might lead to misallocation of bank resources in developing countries; similarly, Tran *et al.* (2016) argued that banks tend to have sufficient regulatory capital with lower equity to assets ratios. Therefore, the CBE should consider effective enhancement of the supervisory role in the banking sector to make sure that banks comply with the regulatory requirements effectively in a way that does not cause misallocation of resources or lead to any other problems that might affect bank profitability and soundness of the banking sector. This is very important before allowing the use of internal models of Basel regulations and the effective application of the second and third pillars of Basel II.
- Additionally, The negative impact of financial structure variable on bank profitability indicates that increases in customer deposits relative to other sources affects bank profitability negatively. The effect of deposit wars might play a role in this relationship, where banks increase interest rates to attract customer deposits. Therefore, one implication is to resort to more flexible sources of finance in this case as recommended by Trujillo-Ponce (2013). As medium and long term wholesale financial resources might represent good options to finance bank loans in Egypt as an alternative to customer deposits with higher cost of finance in case of rising interest rates.

- Moreover, the negative effect of liquidity risk on bank profitability is the result of lower liquidity that does not support solvency and protection against potential problems. In addition to the effect of increasing loans on decreasing sources of non-interest income which will have an adverse effect on profitability; this is evident in the analysis, as revenue diversification has a significant positive effect on bank profitability. This implies the importance of considering the effect of non-interest income on bank profitability. Therefore, it is recommended to pay more attention to the positive impact of revenue diversification and use it to provide necessary earnings needed to mitigate the risk of lower liquidity as evident from the results.
- Also, the positive impact of new technological advancements and improvements in management skills on bank profitability is evident through the effect of operational efficiency on bank profitability in throughout the sample period. Therefore, an important implication is evident concerning the importance of more investments to bring new technologies and managerial skills that would lead to positive impact on bank profitability. That's to say that spending on improving operational efficiency is considered a type of prevention costs that would lead to overall cost savings and improved profitability of banks.
- Finally, it was found that the percentage of assets tied up in loans can be used to predict future values of loan portfolio quality for the bank through testing the causal relationship between liquidity and credit risks. Therefore, the finding of a unidirectional causal relationship running from liquidity risk to credit risk indicates that bank management and policy makers should pay more attention to these important implications about the quality of loan portfolio that can be predicted in the future based on the history of liquidity measurements. Therefore, improving risk management systems and including more reliable information about liquidity measurements can help in predicting credit risk, and can be used as one way to help in managing both risks in banks. Indeed, some Egyptian banks started taking important steps towards better enterprise risk management systems and better management of risk limits and delegations. It's also recommended to take into consideration the effect of the "flight for quality" by depositors when they leave banks flushed with large amounts of liquidity (low liquidity risk), during times of bad economic conditions, which affects banks' monitoring of the quality of loans, and consequently deteriorates the quality of loan portfolio (high credit risk),

which was the case during the periods of deteriorated economic conditions in Egypt.

7.5 Limitations

According to brooks (2008), there is only one way to reduce the chances of both type I and type II errors through increasing sample size or selecting a sample with more variation, which increases the amount of information used to test hypotheses. Therefore, one of the most important limitations of this research is the sample size and its variation. The main difficulty that may confront researchers in Egypt is the data collection process and the low level of transparency that exists, especially concerning bank data. The current thesis investigated all the available data sources for banks operating in Egypt. However, only the listed banks have full set of data available for enough sample period. Additionally, there was a limitation for data availability concerning the regulatory capital ratios, as it is only available for the most recent years (2014-2016). This provided a great limitation on measuring the effect of regulatory capital on bank profitability for a longer period. Moreover, the lack of research that investigates bank performance in Egypt put some limitations on comparing the results of this research to other results with similar models or estimation methods. Though, it represents a good contribution for the current research. On the other hand, comparing the thesis results with results of other studies in different developing and developed countries support the results and implications. Nevertheless, market discipline is currently being improved in Egypt and it is expected that future research in banking might face less limitations in this concern.

While, the data collected in this thesis was complete and represented a balanced dataset for the sample, it can be argued that the sample misses some other important banks such as; HSBC Bank Egypt, National Bank of Egypt, Banque Misr, Arab African International Bank, Banque du Caire, Alex bank, and Bank Audi. Data availability issues limited the inclusion of other banks with incomplete data for the selected sample period, while only the listed ones have full set of historical data available for the whole sample period. On one hand, a comparison of the sample banks in chapter 5 highlighted that the sample included different variations in terms of size of assets, loans, deposits, and income. Large banks that deal with large multinational companies are included in the sample as well as medium and smaller banks. The largest two banks in the sample recorded a

remarkable size in terms of assets during the latest financial year of the sample period (2015); as the CIB reported total assets of around 180 billion EGP, and QNBALAHLI recorded around 130 billion EGP. On the other hand, banks that were excluded from the sample also involve different banks with different sizes, including other larger banks, such as; National Bank of Egypt that reported total assets of around 520 billion EGP during the same financial year (2015), and Banque Misr that reported around 330 billion EGP for the same financial year. Therefore, although the sample represents a good sample with some variations; but the generalizability of the results is still unguaranteed, due to the limitation on including other larger banks from different ownership groups in the market to account for possible variation effects.

It's worth mentioning here that the sample is drawn from only the publicly listed banks, including 11 banks consistently listed during the sample period out of a total of 38 banks. This represents a point that needs to be taken into consideration when talking about the generalizability of results. As, DeYoung and Li (2019) argued that listed banks are different from private banks, as publicly traded banks have growth advantage over privately held banks, with access to less expensive capital funds that provides an edge in exploiting new investment opportunities. On the other hand, some bank managers might be unwilling to take greater risks, especially in today's highly regulated banking environment, which will result in missing some important opportunities, when there is lack of management monitoring from disinterested shareholders. Therefore, exploitation of new investment opportunities is one aspect that differs between publicly traded and privately held banks and may affect performance. Therefore, there are some differences among publicly traded banks and privately held banks that might represent a concern for generalization of results, and it is better to include banks from different ownership groups in the market to the sample to account for possible variation effects, and enhance the generalizability of results.

7.6 Future Research

One important recommendation for future research is to further investigate the effect of regulatory capital on bank profitability in Egypt using a wider range of data covering longer periods of time when more data is available. This will help the regulatory authorities through providing up to date implications about the application of new regulatory reforms. Additionally, future research should conduct more investigations for the relationship between credit and liquidity risks

in Egypt. The investigation may include the effect of different liquidity measures on the quality of loan portfolio in banks, and other factors that might affect credit risk through the effect on liquidity. Furthermore, more practical ways for liquidity measurements that might help in identifying credit risk may be investigated through case studies that can help identifying all possible effects of liquidity risk on credit risk by providing access to more data for liquidity and credit measures. But this will require access to inside bank data that is considered highly confidential for banks in Egypt. It is also recommended for future research, if the reporting standards of banks in Egypt changed to be more transparent, to try collecting data for more banks that will better represent the Egyptian banking industry and give more accurate implications. The sample banks used in this study is a good representative sample of all the listed banks in Egypt throughout an eleven-year period. However, there are 38 banks operating in Egypt according to the most recent statistics as discussed in chapter 2; other banks include some large banks with comparable operations to the sample. Data limitations provided no opportunity to collect full set of data for those banks. Therefore, generalization of the results of this research might require more investigations that include other important banks in the Egyptian banking sector as well as more comparisons between Egyptian banking sector and banking sectors of other Arab countries. Application of pillar I of Basel II by the CBE recently, following the reform program and collaboration with some European central banks is a good indicator that more developed and transparent banking sector is expected in the future. Therefore, more future academic research in this area is expected in Egypt in the near future.

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Appendices

Appendix A (Stata Do File)

```
* Clearing the Screen
cls
* Clearing all Saved Data in Stata
clear all
* Presenting all Results at Once
set more off
* Opening Log File
log using "/Users/Karim/Analysis/Log_All.smcl", replace
* Importing Dataset 1
import excel
"/Users/Karim/Analysis/Analysis1_Dataset1_2005Q1_2015Q4_BankReports_E
uromonitor_Tradingeconomics.xls", sheet("Analysis Without Outliers1.5IQR")
firstrow clear
* Set Data as Panel
xtset Code Quarter, quarterly
* Generating Dummy Variables (2005, 2006, 2010, 2014, & 2015 Stability _
2007-2009 Crisis _ 2011-2013 Arab Spring)
tabulate Dummy, gen(Dummy)
* Descreptive Statistics
tabstat ROA ROE Capitalization CreditRisk LiquidityRisk2
RevenueDiversification OperationalEfficiency Size FinancialStructure
EconomicGrowth Inflation InterestRate MoneySupplyGrowth, statistics( mean
median max min sd ) columns(statistics)
*Correlation Analysis
pwcorr ROA ROE Capitalization CreditRisk LiquidityRisk2
RevenueDiversification OperationalEfficiency Size FinancialStructure
EconomicGrowth Inflation InterestRate MoneySupplyGrowth, star(.05)
* ROA Model
* Testing for Linearity
quietly reg ROA Capitalization CreditRisk LiquidityRisk2 RevenueDiversification
OperationalEfficiency Size FinancialStructure EconomicGrowth Inflation
InterestRate MoneySupplyGrowth
acprplot Capitalization, lowess
acprplot CreditRisk, lowess
acprplot LiquidityRisk2, lowess
acprplot RevenueDiversification, lowess
```

```
acprplot OperationalEfficiency, lowess
acprplot Size, lowess
acprplot FinancialStructure, lowess
acprplot EconomicGrowth, lowess
acprplot Inflation, lowess
acprplot InterestRate, lowess
acprplot MoneySupplyGrowth, lowess
* Pooled OLS Estimator
reg ROA Capitalization CreditRisk LiquidityRisk2 RevenueDiversification
OperationalEfficiency Size FinancialStructure EconomicGrowth Inflation
InterestRate MoneySupplyGrowth
* Variance Inflation Factor (Multicollinearity)(<10)
vif
* Bivariate Correlation Matrix (Multicollinearity)(<0.9)
correlate Capitalization CreditRisk LiquidityRisk2 RevenueDiversification
OperationalEfficiency Size FinancialStructure EconomicGrowth Inflation
InterestRate MoneySupplyGrowth
* System GMM 1
xtabond2 ROA L.ROA Dummy3 Dummy2 Dummy1 Capitalization CreditRisk
LiquidityRisk2 RevenueDiversification OperationalEfficiency Size
FinancialStructure EconomicGrowth Inflation InterestRate
MoneySupplyGrowth, gmmstyle(L.(ROA Capitalization Size), collapse)
ivstyle(Dummy3 Dummy2 Dummy1 OperationalEfficiency CreditRisk
LiquidityRisk2 RevenueDiversification FinancialStructure EconomicGrowth
Inflation InterestRate MoneySupplyGrowth) nodiffsargan orthogonal small
* F-Test for Fixed vs. Pooled OLS (Significant = Fixed Effects)
reg ROA L.ROA Dummy3 Dummy2 Dummy1 Capitalization CreditRisk
LiquidityRisk2 RevenueDiversification OperationalEfficiency Size
FinancialStructure EconomicGrowth Inflation InterestRate MoneySupplyGrowth
xtreg ROA L.ROA Dummy3 Dummy2 Dummy1 Capitalization CreditRisk
LiquidityRisk2 RevenueDiversification OperationalEfficiency Size
FinancialStructure EconomicGrowth Inflation InterestRate
MoneySupplyGrowth, fe
* Hausman Test for Fixed Versus Random Effects Model (Significant = Fixed
Effects)
quietly xtreg ROA L.ROA Dummy3 Dummy2 Dummy1 Capitalization CreditRisk
LiquidityRisk2 RevenueDiversification OperationalEfficiency Size
FinancialStructure EconomicGrowth Inflation InterestRate
MoneySupplyGrowth, fe
estimates store fixed
```

```
quietly xtreg ROA L.ROA Dummy3 Dummy2 Dummy1 Capitalization CreditRisk
LiquidityRisk2 RevenueDiversification OperationalEfficiency Size
FinancialStructure EconomicGrowth Inflation InterestRate
MoneySupplyGrowth, re
estimates store random
hausman fixed random, sigmamore
* Breush Pagan LM Test (re vs. POOled OLS)
quietly xtreg ROA L.ROA Dummy3 Dummy2 Dummy1 Capitalization CreditRisk
LiquidityRisk2 RevenueDiversification OperationalEfficiency Size
FinancialStructure EconomicGrowth Inflation InterestRate
MoneySupplyGrowth, re
xttest0
* Testing for Errors Autocorrelation (Significant = Autocorrelation)
xtserial ROA Capitalization CreditRisk LiquidityRisk2 RevenueDiversification
OperationalEfficiency Size FinancialStructure EconomicGrowth Inflation
InterestRate MoneySupplyGrowth
* Testing for Errors Heteroskedasticiy (Significant = Heteroskedasticity)
quietly xtreg ROA L.ROA Dummy3 Dummy2 Dummy1 Capitalization CreditRisk
LiquidityRisk2 RevenueDiversification OperationalEfficiency Size
FinancialStructure EconomicGrowth Inflation InterestRate
MoneySupplyGrowth, fe
xttest3
* Final Model, Accounting for Heteroscedasticity and Autocorrelation in fe
Model
xtreg ROA L.ROA Dummy3 Dummy2 Dummy1 Capitalization CreditRisk
LiquidityRisk2 RevenueDiversification OperationalEfficiency Size
FinancialStructure EconomicGrowth Inflation InterestRate
MoneySupplyGrowth, fe cluster(Code)
estimates table, star(.05 .01 .001)
* Displaying R-Squared, and Adjusted R-Squared Respectively
di e(r2),e(r2_a)
*Testing for Normality
quietly xtreg ROA L.ROA Dummy3 Dummy2 Dummy1 Capitalization CreditRisk
LiquidityRisk2 RevenueDiversification OperationalEfficiency Size
FinancialStructure EconomicGrowth Inflation InterestRate
MoneySupplyGrowth, fe cluster(Code)
predict myresiduals1, e
histogram myresiduals1, kdensity normal
*Check (Random Effects)
xtreg ROA L.ROA Dummy3 Dummy2 Dummy1 Capitalization CreditRisk
LiquidityRisk2 RevenueDiversification OperationalEfficiency Size
```

```
FinancialStructure EconomicGrowth Inflation InterestRate
MoneySupplyGrowth, re
estimates table, star(.05 .01 .001)
* ROE Model
* Testing for Linearity
quietly reg ROE Capitalization CreditRisk LiquidityRisk2 RevenueDiversification
OperationalEfficiency Size FinancialStructure EconomicGrowth Inflation
InterestRate MoneySupplyGrowth
acprplot Capitalization, lowess
acprplot CreditRisk, lowess
acprplot LiquidityRisk2, lowess
acprplot RevenueDiversification, lowess
acprplot OperationalEfficiency, lowess
acprplot Size, lowess
acprplot FinancialStructure, lowess
acprplot EconomicGrowth, lowess
acprplot Inflation, lowess
acprplot InterestRate, lowess
acprplot MoneySupplyGrowth, lowess
* System GMM 1
xtabond2 ROE L.ROE Dummy3 Dummy2 Dummy1 Capitalization CreditRisk
LiquidityRisk2 RevenueDiversification OperationalEfficiency Size
FinancialStructure EconomicGrowth Inflation InterestRate
MoneySupplyGrowth, gmmstyle(L.(ROE Capitalization Size), collapse)
ivstyle(Dummy3 Dummy2 Dummy1 OperationalEfficiency CreditRisk
LiquidityRisk2 RevenueDiversification FinancialStructure EconomicGrowth
Inflation InterestRate MoneySupplyGrowth) nodiffsargan orthogonal small
* F-Test for Fixed vs. Pooled OLS (Significant = Fixed Effects)
reg ROE L.ROE Dummy3 Dummy2 Dummy1 Capitalization CreditRisk
LiquidityRisk2 RevenueDiversification OperationalEfficiency Size
FinancialStructure EconomicGrowth Inflation InterestRate MoneySupplyGrowth
xtreg ROE L.ROE Dummy3 Dummy2 Dummy1 Capitalization CreditRisk
LiquidityRisk2 RevenueDiversification OperationalEfficiency Size
FinancialStructure EconomicGrowth Inflation InterestRate
MoneySupplyGrowth, fe
* Hausman Test for Fixed Versus Random Effects Model (Significant = Fixed
Effects)
quietly xtreg ROE L.ROE Dummy3 Dummy2 Dummy1 Capitalization CreditRisk
LiquidityRisk2 RevenueDiversification OperationalEfficiency Size
FinancialStructure EconomicGrowth Inflation InterestRate
MoneySupplyGrowth, fe
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estimates store fixed
quietly xtreg ROE L.ROE Dummy3 Dummy2 Dummy1 Capitalization CreditRisk
LiquidityRisk2 RevenueDiversification OperationalEfficiency Size
FinancialStructure EconomicGrowth Inflation InterestRate
MoneySupplyGrowth, re
estimates store random
hausman fixed random, sigmamore
* Breush Pagan LM Test (re vs. POOled OLS)
quietly xtreg ROE L.ROE Dummy3 Dummy2 Dummy1 Capitalization CreditRisk
LiquidityRisk2 RevenueDiversification OperationalEfficiency Size
FinancialStructure EconomicGrowth Inflation InterestRate
MoneySupplyGrowth, re
xttest0
* Testing for Errors Autocorrelation (Significant = Autocorrelation)
xtserial ROE Capitalization CreditRisk LiquidityRisk2 RevenueDiversification
OperationalEfficiency Size FinancialStructure EconomicGrowth Inflation
InterestRate MoneySupplyGrowth
* Testing for Errors Heteroskedasticiy (Significant = Heteroskedasticity)
quietly xtreg ROE L.ROE Dummy3 Dummy2 Dummy1 Capitalization CreditRisk
LiquidityRisk2 RevenueDiversification OperationalEfficiency Size
FinancialStructure EconomicGrowth Inflation InterestRate
MoneySupplyGrowth, fe
xttest3
* Final Model, Accounting for Heteroscedasticity and Autocorrelation in fe
Model
xtreg ROE L.ROE Dummy3 Dummy2 Dummy1 Capitalization CreditRisk
LiquidityRisk2 RevenueDiversification OperationalEfficiency Size
FinancialStructure EconomicGrowth Inflation InterestRate
MoneySupplyGrowth, fe cluster(Code)
estimates table, star(.05 .01 .001)
* Displaying R-Squared, and Adjusted R-Squared Respectively
di e(r2),e(r2_a)
*Testing for Normality
quietly xtreg ROE L.ROE Dummy3 Dummy2 Dummy1 Capitalization CreditRisk
LiquidityRisk2 RevenueDiversification OperationalEfficiency Size
FinancialStructure EconomicGrowth Inflation InterestRate
MoneySupplyGrowth, fe cluster(Code)
predict myresiduals2, e
histogram myresiduals2, kdensity normal
*Check (Random Effects)
```

```
xtreg ROE L.ROE Dummy3 Dummy2 Dummy1 Capitalization CreditRisk
LiquidityRisk2 RevenueDiversification OperationalEfficiency Size
FinancialStructure EconomicGrowth Inflation InterestRate
MoneySupplyGrowth, re
estimates table, star(.05 .01 .001)
* Granger Causality Model
* Panel Unitroot Tests Using (AIC) Criteria for selecting Lag Length
xtunitroot ips CreditRisk, lags(aic)
xtunitroot ips LiquidityRisk1, lags(aic)
xtunitroot ips CreditRisk, lags(1)
xtunitroot ips LiquidityRisk1, lags(1)
xtunitroot fisher CreditRisk, dfuller lags(1)
xtunitroot fisher LiquidityRisk1, dfuller lags(1)
xtunitroot fisher CreditRisk, pperron lags(1)
xtunitroot fisher LiquidityRisk1, pperron lags(1)
* Lag Length selection Criteria
pvarsoc CreditRisk LiquidityRisk1, maxlag(5) pvaropts(instl(1/6))
* Fitting Panel VAR Model Using GMM Estimation
pvar CreditRisk LiquidityRisk1, lag(1) instl(1/6) overid vce (robust)
* Panel VAR Granger Causality
pvargranger
* Importing Dataset 2
import excel "/Users/Karim/Desktop/New
PhD/Resubmission/Analysis/Analysis2_Dataset2_2014Q1_2016Q2_Reuters_E
uromonitor_Tradingeconomics.xls", sheet("Analysis With Outliers") firstrow
clear
* Set Data as Panel
xtset Code Quarter, quarterly
* System GMM 2
xtabond2 ROA L.ROA RegulatoryCapital CreditRisk LiquidityRisk1
RevenueDiversification OperationalEfficiency Size FinancialStructure
EconomicGrowth Inflation InterestRate MoneySupplyGrowth, gmmstyle(L.(ROA
RegulatoryCapital Size), collapse) ivstyle(OperationalEfficiency CreditRisk
LiquidityRisk1 RevenueDiversification FinancialStructure EconomicGrowth
Inflation InterestRate MoneySupplyGrowth) nodiffsargan orthogonal small
*Robustness Checks
* Clearing all Saved Data in Stata
clear all
* Importing Dataset 1
import excel "/Users/Karim/Desktop/Final PhD_Cardiffmet/Karim's
Resubmission/Analysis1_Dataset1_2005Q1_2015Q4_BankReports_Euromonit
```

```
or_Tradingeconomics.xls", sheet("Analysis Without Outliers1.5IQR") firstrow
clear
* Set Data as Panel
xtset Code Quarter, quarterly
* Generating Dummy Variables (2005, 2006, 2010, 2014, & 2015 Stability _
2007-2009 Crisis _ 2011-2013 Arab Spring)
tabulate Dummy, gen(Dummy)
*Generating a new variable to measure deviation of economic grwoth from its
trend using HP filter (Ct=Yt-Tt); where Yt is real GDP growth, Tt is its trend, and
Ct is the deviation or the cyclical component
tsfilter hp EconomicGrowth2 = EconomicGrowth
* Final Model, Accounting for Heteroscedasticity and Autocorrelation in fe
Model
xtreg ROA L.ROA Dummy3 Dummy2 Dummy1 Capitalization CreditRisk
LiquidityRisk2 RevenueDiversification OperationalEfficiency Size
FinancialStructure EconomicGrowth2 Inflation InterestRate
MoneySupplyGrowth, fe cluster(Code)
estimates table, star(.05 .01 .001)
* Displaying R-Squared, and Adjusted R-Squared Respectively
di e(r2),e(r2_a)
* Final Model, Accounting for Heteroscedasticity and Autocorrelation in fe
Model
xtreg ROE L.ROE Dummy3 Dummy2 Dummy1 Capitalization CreditRisk
LiquidityRisk2 RevenueDiversification OperationalEfficiency Size
FinancialStructure EconomicGrowth2 Inflation InterestRate
MoneySupplyGrowth, fe cluster(Code)
estimates table, star(.05 .01 .001)
* Displaying R-Squared, and Adjusted R-Squared Respectively
di e(r2),e(r2_a)
* System GMM 1
xtabond2 ROA L.ROA Dummy3 Dummy2 Dummy1 EconomicGrowth2
Capitalization CreditRisk LiquidityRisk2 RevenueDiversification
OperationalEfficiency Size FinancialStructure Inflation InterestRate
MoneySupplyGrowth, gmmstyle(L.(ROA Capitalization Size), collapse)
ivstyle(Dummy3 Dummy2 Dummy1 OperationalEfficiency CreditRisk
LiquidityRisk2 RevenueDiversification FinancialStructure EconomicGrowth
Inflation InterestRate MoneySupplyGrowth) nodiffsargan orthogonal small
* System GMM 1
xtabond2 ROE L.ROE Dummy3 Dummy2 Dummy1 Capitalization CreditRisk
LiquidityRisk2 RevenueDiversification OperationalEfficiency Size
FinancialStructure EconomicGrowth2 Inflation InterestRate
```

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MoneySupplyGrowth, gmmstyle(L.(ROE Capitalization Size), collapse)
ivstyle(Dummy3 Dummy2 Dummy1 OperationalEfficiency CreditRisk
LiquidityRisk2 RevenueDiversification FinancialStructure EconomicGrowth
Inflation InterestRate MoneySupplyGrowth) nodiffsargan orthogonal small
* Importing Dataset 2
import excel "/Users/Karim/Desktop/Final PhD_Cardiffmet/Karim's
Resubmission/Analysis2_Dataset2_2014Q1_2016Q2_Reuters_Euromonitor_Tr
adingeconomics.xls", sheet("Analysis With Outliers") firstrow clear
* Set Data as Panel
xtset Code Quarter, quarterly
*Generating a new variable to measure deviation of economic grwoth from its
trend using HP filter (Ct=Yt-Tt); where Yt is real GDP growth, Tt is its trend, and
Ct is the deviation or the cyclical component
tsfilter hp EconomicGrowth2 = EconomicGrowth
* System GMM 2
xtabond2 ROA L.ROA RegulatoryCapital CreditRisk LiquidityRisk1
RevenueDiversification OperationalEfficiency Size FinancialStructure
EconomicGrowth2 Inflation InterestRate MoneySupplyGrowth,
gmmstyle(L.(ROA RegulatoryCapital Size), collapse)
ivstyle(OperationalEfficiency CreditRisk LiquidityRisk1 RevenueDiversification
FinancialStructure EconomicGrowth Inflation InterestRate
MoneySupplyGrowth) nodiffsargan orthogonal small
* Closing the Log File
log close
```

Appendix B (Arabic Bank Terminologies)

No.	Measurement	Arabic Term
1	Total Assets	اجمالي الاصول رصيد اخر المدة
2	Total Liabilities	اجمالي الالتزامات
3	Total Equity	اجمالي حقوق الملكية رصيد اخر المدة
4	Total Customer Deposits	ودائع العملاء
5	Interest Expense on Customer Deposits	تكلفة الودائع و التكاليف المشابهة من ودائع و حسابات جارية
6	Total Revenues	اجمالي ايرادات القطاعات الجغرافية
7	Total Costs	اجمالي مصروفات القطاعات الجغرافية
8	Net Income Before Tax	الربح قبل ضرائب الدخل
9	Net Income	صافي ارباح العام
10	Net Interest Income	صافي الدخل من العائد
11	Non-interest Income	الدخل من مصادر اخري "الربح قبل ضرائب الدخل - صافي الدخل من العائد"
12	Net Loans to Customers	صافي القروض للعملاء
13	Net Loans to Banks	صافي القروض للبنوك
14	Net Loans	صافي القروض بعد خصم المخصص "صافي القروض للعملاء + صافي القروض للبنوك"
15	Total Loans	اجمالي القروض "صافي القروض + مخصص القروض"
16	Loan Loss Reserves for Customer Loans	مخصص قروض العملاء "مخصص خسائر الاضمحلال للعملاء"
17	Loan Loss Reserves for Bank Loans	مخصص قروض البنوك "مخصص خسائر الاضمحلال للبنوك"
18	Loan Loss Reserves	إجمالي مخصص القروض "إجمالي مخصص خسائر الاضمحلال"
19	Real GDP Growth (%)	معدل نمو اجمالي الناتج المحلي
20	Consumer Prices (%)	معدل التضخم
21	Money Supply Growth (%)	معدل نمو كمية النقد المتداول
22	Interest Rate (%)	سعر الفائدة
23	Market Cap. (Bank Market Value)	القيمة السوقية للبنك