FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH: EVIDENCE FROM G20 COUNTRIES

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ABSTRACT

After recurring financial crises that have gripped developed and developing economies alike in the past 20 years, economists, academics and those interested in the overall economic growth process have become increasingly skeptical about the ability of the modern financial system to generate economic growth. Since then, there has been renewed interest in re-examining the nature of the relationship between the development of this system and economic growth, and evaluating such a relationship in many aspects, including the structure of the financial system and its impact on economic growth in short and long-term periods, and the relationship between the components of the financial system itself. Moreover, attention has also been paid to the channels through which the financial system may stimulate and accelerate the process of economic growth. Therefore, this study presents a new analysis that examines these three related aspects in *G20* countries to provide a deeper and more comprehensive understanding of the relationship between financial system development and economic growth. The *G20* countries were selected as a sample for this study to benefit from the presence of developing and developed countries within the sample, therefore, the findings can be generalised, and compared with the results of other similar studies.

In addition to introductory, theoretical and methodology chapters, this study presents three empirical chapters. In the fourth chapter of this thesis the long and short-term influences of financial system development on growth by using ARDL estimation method. Chapter five explores the inter-relation between the banking sector and stock market development. The econometric methodology is based on a Granger causality technique and an *FMOL* estimator. Finally, by developing eleven regressions and using both *GMM* and *2-SLS* estimation approaches, chapter six investigated the role played by financial structure in influencing the relationship between foreign and national investment and the total growth rate.

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LIST OF ABBREVIATIONS

2-SLS	Two-Stage Least Square
ADF	Augmented Dickey-Fuller
AIC	Akaike information criterion
ARDL	Autoregressive Distributed Lag
BIC	Bayesian information criterion
CPI	Customer Price Index
CPS	Credit to Private Sector
FDI	Foreign Direct Investment
FMOLS	Fully Modified Ordinary Least Square
G20	The Group of Twenty Countries
GDP	Gross Domestic Product
GFE	Government Final Expenditure
GFF	Gross Fixed Formation
GMM	Generalized Method of Moments
HC	Human Capital
HQ	Hannan–Quinn information criterion
IMF	International Monetary Fund
INV	Total Investment
Ln	Logarithm
LP	Life Premium Volume
M2	Aggregate Money Supply m2
N-LP	Non-Life Premium volume
PP	Phillips–Perron
SAV	Total Savings
SMC	Stock Market Capitalization
TOR	Turnover Ratio
WDI	World Development Indicato

Chapter One: Introduction

1.1 Introduction

The relationship between financial development and economic growth has become an important debate among economists over three decades. The origins of this subject are attributed to the initial attempts made by (Schumpeter, 1911) who pointed to the role played by the banking sector in the process of the economic growth of countries. He believed that a well-functioning financial structure motivates growth by directing available savings to projects. This view was later endorsed by many thinkers such as (Goldsmith, 1969; Gurley & Shaw, 1955). However, different views later emerged. (Robinson, 1952) for example, argues that financial development is not a cause for economic growth as it was thought, but an inevitable consequence of this growth. According to him, the expansion of industrialisation increases the demand for financial amenities provided by the financial sector and the financial sector will automatically respond to such demands Moreover, other theorists such as Lucas (1988), believed that the connection between financial development and economic growth is not that important. The latter stressed that the role of financial development in the growth process is exaggerated. Furthermore, in his analysis, Stern (1989) did not even debate the importance of financial structure.

The main distinction between empirical studies on the relationship between financial development and economic growth lies in identifying the component of the financial sector that the study focuses on. For example, Azam, Haseeb, Samsi and Raji (2016); Badr (2015); Carp (2012); Matadeen and Seetanah (2015); Naik and Padhi (2015); Ngare, Nyamongo and Misati (2014) focused on the relationship between stock market development and economic growth. However, Ahmed and Bashir (2016); Ho and Odhiambo (2013); Kjosevski (2013); Sami (2013); Tripathy and Pradhan (2014) focused on the relationship between the banking sector and the overall growth rate.

In a recent study that investigates the relationship between stock market development and economic growth, Azam et al. (2016) use ARDL co-integration techniques and annual time series data from four Asian economies. They find a long run co-integration relationship among

stock market capitalisation and economic growth, and the relationship between stock market progress and the total growth rate measured by GDP per capita is positively insignificant in three out of four countries. This may imply that there is a misspecification in their model, since they only use foreign direct investment and inflation as control variables and ignore the use of other important macroeconomic variables such as the investment rate, government expenditure and human capital. Also, a study of 27 emerging economies over the period 1995-2012 by Naik and Padhi (2015) indicates that the development of the stock market leads to growth if stock market development is measured by turnover ratio or trade value, but the development of the stock market does not impact growth in the case of using stock market capitalisation as an indicator. This finding is somewhat opposed; however, the authors avoid the resulting outcome by constructing three different indices to measure the overall development of the stock market by merging indicators. They generalised stock market development as contributing to economic growth. But these findings were not the case at a country level. For instance, Badr (2015) uses a VAR model to evaluate the long run growth rate in the Egyptian economy resulting from developments in the stock market during the 2002-2013 period. The study concludes that long run co-integration does not exist between the stock market and Egyptian economic growth. This result is expected in a growing system such as the Egyptian economy whose financial system is a *''bank-based''* financial system, but it must be taken into account that the time period adopted is econometrically insufficient to obtain reliable results.

Similarly, other studies have empirically investigated banking sector expansion and the growth connection. For instance, by using GMM estimation techniques and a panel data set from 194 developed and developing economies over the 1964-2013 period, Al-Moulani and Alexiou (2017) examined the connection between economic growth and the banking sector in depth. They discovered a non-linear relationship between banking sector development and long-run growth and a positive relationship only exists at certain levels. Although this result contradicts the majority of studies, it was confirmed by using a number of banking sector development measures. However, Ahmed and Bashir (2016) investigated this relationship in the South Asian Association for Regional Cooperation (SAARC) during the years 1980-2013. They employed both domestic credit to private sector by banks and money and quasi money to indicate development in the banking sector. Their outcomes showed that the indicators used positively impact economic growth. Similarly in the Pakistani economy, Saqib (2016) found a long run significant impact of banking sector development on overall growth, over the period 1971-2011. This study is characterised by coverage of a relatively long period of time, but its

shortcomings lie in the use of a single indicator to measure development in the banking sector. To avoid the issue of relying on a single banking sector indicator, Tripathy and Pradhan (2014) used four measures of financial development in order to assess the causal relationship between banking sector development and the growth rate in India, over 1960-2011. They found a bi-directional causality among money and quasi-money to growth; domestic credit to growth and a uni-directional connection from total assets and liabilities to total growth and from private sector credit to total growth. Although some indicators showed that the causal relationship runs in one direction, it is still possible to generalise that development in the banking sector has a positive impact on economic growth.

Another significant aspect regarding the connection between financial system development and economic growth is the effect of the composite term of the main components of financial system on economic growth. Where the banking sector and the stock market are the main descriptors of the financial system, it has been crucial to examine the link between these two and to investigate whether they are complimentary and hence jointly influencing overall growth or if they are substitutes to each other. Several studies have empirically investigated this issue, among them, Cheng (2012) and Hussan and Kalim (2017). Hussan and Kalim (2017) found that there is a significant positive impact on economic growth resulting from the individual interaction of domestic credit to the private sector as a ratio to GDP, with three further indicators of the stock market namely, turnover ratio, traded stocks and stock market capitalisation in 10 low human development economies throughout the1989-2013 period.

Furthermore, the finance-growth literature includes a debate over whether a developed financial system contributes to a technological diffusion process that is related to foreign direct investment. Alfaro, Chanda, Kalemli-Ozcan Sayek (2004) argue that foreign direct investment provides domestic markets with innovative processes and new products hence, local firms can benefit from increased diffusion of modern technologies. Suliman and Elian (2014) contend that an economy with an advanced financial system benefits significantly from foreign direct investment. Subsequently, it is useful to investigate the role played by a developed financial system in improving the positive correlation between foreign direct investment and economic growth on the one hand and domestic investment and economic growth on the other hand. In this vain, Otchere, Soumaré and Yourougou (2016) found that financial market development, foreign direct investment and economic growth are interconnected in Africa over 1996 to 2009. They provide evidence that financial market development eases the inflow of foreign

investment in developing economies and considerably leads to economic growth. Similarly, in an investigation at country level, Suliman and Elian (2014) found financial markets and banks serve as intermediaries among foreign direct investment and economic growth in Jordan between 1980-2009. Similarly, Choong (2012) explored the possible link between foreign direct investment and economic growth in 95 countries from 1983-2006. The study established that financial system development is a precondition for foreign direct investment to have a significant influence on overall growth, and foreign direct investment positively affects economic growth only at a certain level of financial development.

In economic theory the importance of the financial sector is derived from the debate over the relationship between savings and investment. Most economic theories assume that the investment rate relies on the savings rate. According to this, the main role of the financial system is to channel available savings into investment. Therefore, the financial system mediates the deal between savers and investors and this requires reducing the cost of transactions and information for them. A structured financial system influences overall growth by collecting information on the dealers in the economy and economic environment, providing investors with sufficient capital and reducing potential credit risks.

1.2 Research problem

Analysing economic growth and more recent trends of developing and developed countries raises three central issues that have a solid investigative connection. While the first issue is related to the relationship between financial development and economic growth, the second one concentrates on the relationship between the components of the financial system. The last issue is about the channels through which financial development has a positive impact on the growth rate.

The main reason behind these problems is the recurring financial crises have plagued the global economy, especially in the last twenty years. These financial crises have raised substantial questions regarding the ability of the present financial structure in enhancing economic growth. In this area, it seems that the academic literature supports the notion that financial development is positively impacting growth King and Levine, (1993). However, since the financial crises of 2007-2008 a non-linear relationship among the development of financial systems and economic growth has started to appear (Arcand, Berkes and Panizza, 2015; Cecchetti and Kharroubi,

2012; Law and Singh, 2014; Sahay, Čihák, N'Diaye and Barajas, 2015). This provides a motivation to re-examine the relationship between financial development and economic growth from various aspects.

1.3 Research significance

Previous empirical studies on the finance-growth literature have extensively searched for links between financial development and overall growth. However, these empirical studies lack several important elements which are; first, that they do not consider all of the components of financial development while studying the link between financial development and economic growth. While some of these studies focus on banking sector development and ignore stock market development, others focus on the stock market and ignore the banking sector. Furthermore, none of these studies pay attention to the insurance sector as a component of the financial system. Second, most of the empirical studies on the finance-growth link deal with the financial system as one unit and they do not differentiate between the components of the financial system. For example, using an index of the financial system represents the development of all these components. Finally, to the best of our knowledge, there is a lack of research considering this relationship at the *G20* level.

Accordingly, it can be said that there is a paucity of research that discuses different aspects of the problem of the relationship between financial development and economic growth. Although there are many studies on the relationship between financial development and economic growth, there is no single study that takes into account all the major components of the financial sector.

1.4 Research Context Background

The G20 countries were created in 1999 when the representatives of G7 countries decided to expand membership in this informal group. The decision marked the birth of a new group of 19 countries and the European Union later called this the Group of Twenty Countries. The financial crisis that occurred in some developing countries in 1997 was the motivation for creating this international body. This group includes significant developing and developed economies around the world that share about 85% of the world's output and about 2/3 of the world's population. Appendix one (A and B) describes the characteristics of the G20 countries.

In particular the selected graphs show the trends of financial development and economic growth in these countries and those during the investigation period.

1.5 Study Objectives

This study aims to achieve three main objectives. First, to examine the impact of the development of the three main components of the financial system on economic growth, separately. Accordingly, the current study examines the impact of the banking sector on economic growth by developing an econometric model. The suggested model uses two financial indicators which are private sector credit as a ratio to GDP and money supply $m2$ as a ratio to GDP. These indicators represent the development of the banking sector in its efficiency and size respectively. The chosen measures were based on the finance-growth literature. (Ghimire and Giorgioni, 2013; Kazar and Kazar, 2016; Levine, 1997). Kemal et al., (2007), use the credit to private sector ratio as a proxy to indicate the ratio of financial intermediation. Based on their findings the impact of this measure on economic growth is suggested to be positive. (Alkhuzaim, 2014; Anwar and Cooray, 2012) for example, use money supply $m2$ as a proxy for banking efficiency. In addition, the impact of the stock market on the growth rate will be examined by using stock market capitalisation and turnover ratio to measure the development of the stock market. These two financial measures were extensively used in recent studies, for example Mishal (2011); Naik and Padhi (2015). Furthermore, the present study will investigate the impact of another main component of the financial system which is the insurance sector on economic growth. Following Deltuvaitė and Sinevičienė (2014), life and non-life premiums will be used in our model to capture the development of the insurance sector.

The second objective of the thesis is to find the relationship between banking sector development and stock market development. Therefore, the relationship between the suggested development indicators of the banking sector and the stock market will be examined, in order to identify the interaction between them during the economic growth process. In addition, the correlation matrix for these indicators will be introduced to identify whether the banking sector and the stock market are complimentary or if they substitute each other during the growth process.

Finally, this study aims to investigate whether the development of the financial system enhances the positive relationship between foreign direct investment and economic growth, on one hand and between domestic investment and economic growth on the other. Accordingly, our analysis relies on using interactive terms in our proposed models. Here, we analyse the time series of foreign direct investment with the time series of the financial system's development indicator in order to examine the role of financial system development in enhancing the positive connection between foreign direct investment and overall growth in recipient economies. Also, domestic investment and financial development proxy time series are compared to investigate the role played by financial system deepening in augmenting the link between local investment and the growth rate. Here, we will employ credit to private sector as a ratio to GDP to capture development in the financial system.

1.6 Research questions

Based on the forgoing research objectives, the current study sets the following questions:

1. What is the impact of the different components of financial system on economic growth in the long and short periods?
2. What is the relationship between banking sector development indicators and stock market development indicators during the economic growth process?
3. What are the most important channels through which financial development influences economic growth?

1.7 Methodology

Based on the finance-growth literature, the thesis applies basic philosophies of economics and adopts a mixture of deductive and inductive methods to analyse and criticise the theoretical and empirical literature on financial development and economic growth. Moreover, this research employs a combination of statistical approaches for example, mean, median, standard deviation and correlation in order to provide a descriptive analysis for financial and macroeconomic datasets from $G20$ countries during the years 1989-2015. Finally, for empirical investigation, the methodology includes a quantitative analysis, which mainly relies on three different econometric techniques. These techniques are; autoregressive Distributed Lag to co-integration ($ARDL$) approach, Fully Modified Ordinary Least Square $FMOLS$ estimation method with an Engle-Granger procedure and panel data Two Stages Ordinary Least Squares estimation along with a GMM estimation approach. The main reason of choosing these methods

is that to deal with endogeneity issue and to avoid a country specific effect. Moreover, the selection of each method was based on its efficiency and the related literature with a consideration of the hypotheses to be tested.

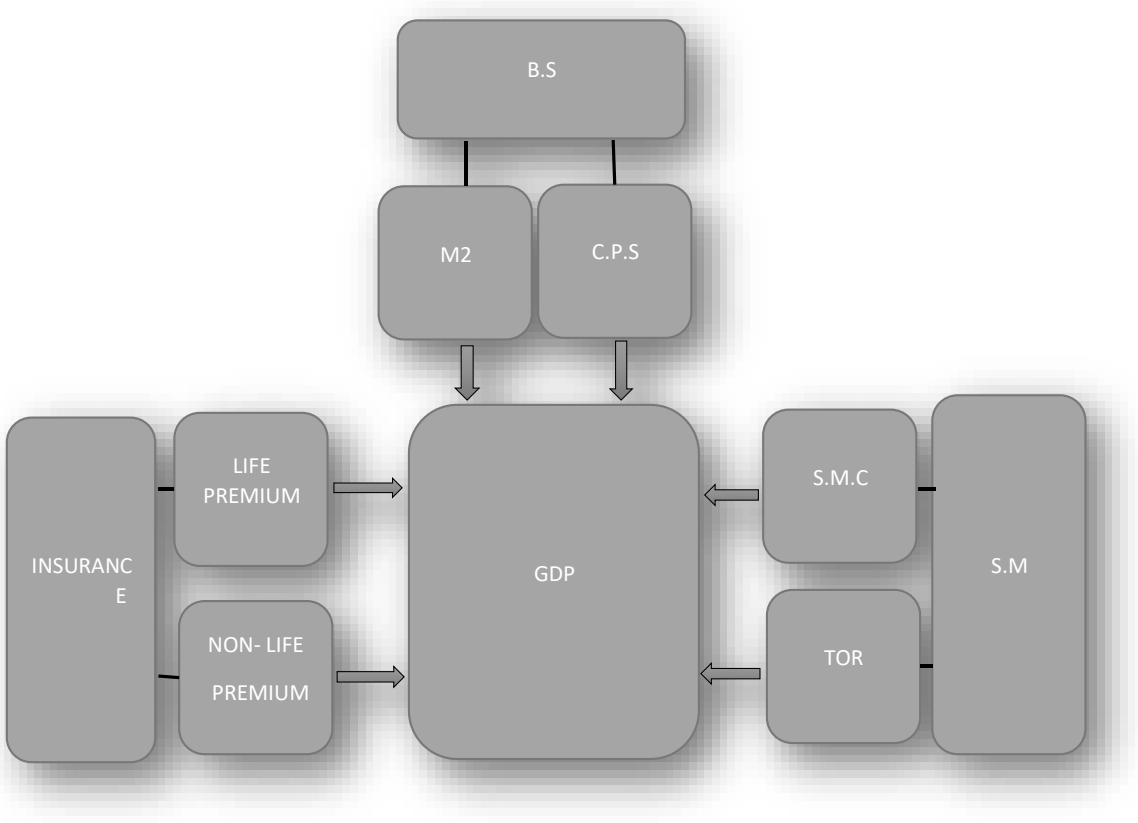
1.8 Theoretical framework

The conceptual framework of this study is drawn from the finance-growth literature and it can be introduced through the following three figures:

Firstly; figure (1.1) shows the individual short and long-run effect resulting from the development of three different components of the financial system on economic growth; First, the short and long run effects of banking sector development on economic growth. Second, the short and long-run effects of stock market development on economic growth. Finally, the short and long-run effects of insurance sector development on economic growth. Figure (1) reveals that the development of each financial component is indicated by two financial development measures. Firstly, credit to private sector as a ratio to GDP, and broad money supply indicate the maturity of the banking sector. Secondly, stock market capitalisation as a ratio to gross domestic product per capita and turnover ratio is used to measure the maturity of the stock market. Lastly, life and non-life premium are used as proxies for the maturity of the insurance sector. It can be realised that figure (1.1) expresses the direct impact of the components of financial system on the overall growth. This issue will be investigated in chapter four of this thesis.

Figure (1. 1)

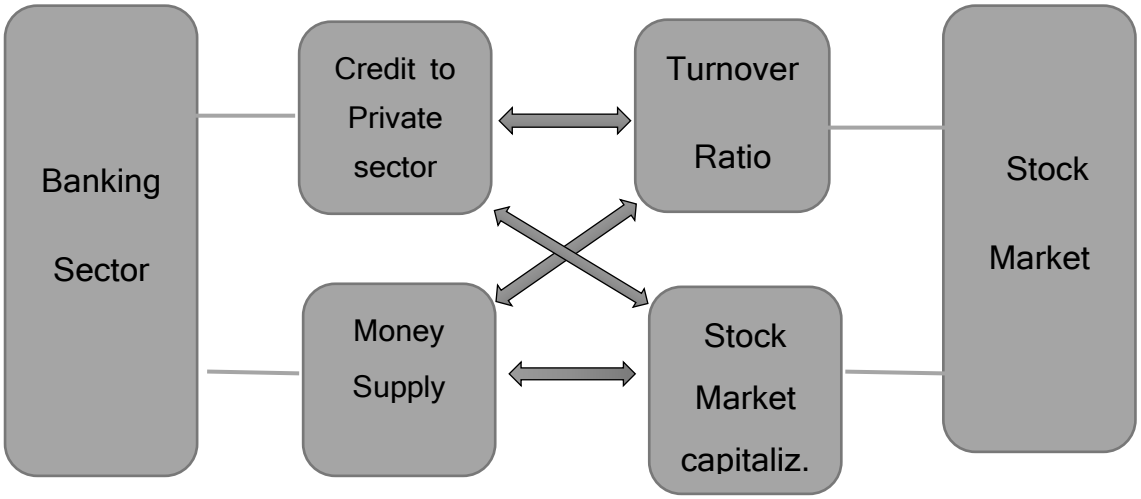
The Impact of Financial Development on Economic Growth



Secondly, figure (1.2) shows how the components of the financial system are interrelated during the growth process. This relationship will be empirically analysed in chapter five.

Figure (1. 2)

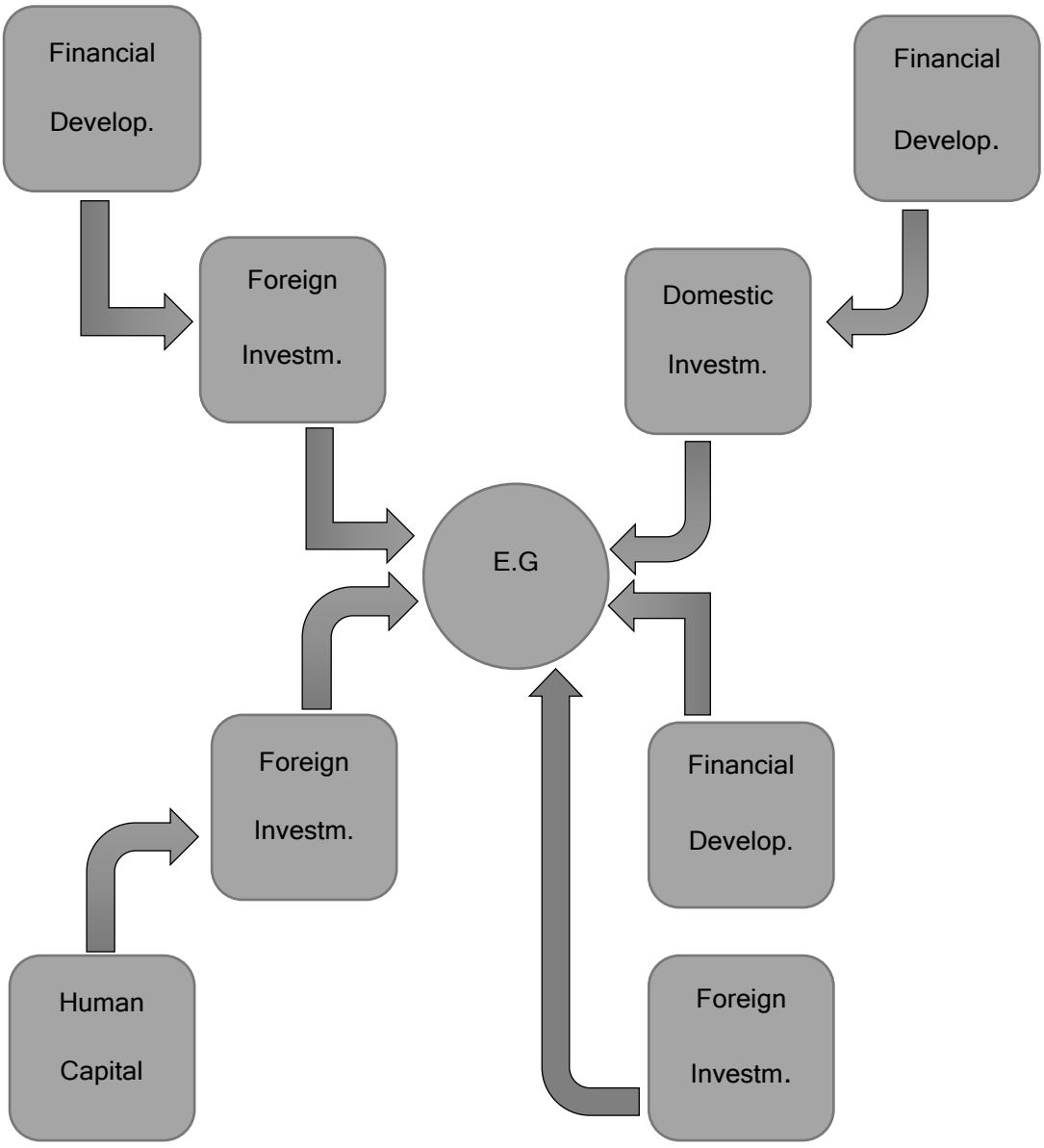
The Relationship between the Banking Sector and the Stock Market



Thirdly, figure (1.3) shows how financial development indirectly influences economic growth via foreign and domestic investment. Furthermore, figure (1.3) reveals how the stock of human capital influences economic growth via foreign direct investment. The third empirical chapter is devoted to exploring this concern.

Figure (1. 3)

Financial development, domestic investment, foreign direct investment and economic growth



1.9 Organisation of thesis

Generally, the thesis adopts the following components; First of all, it considers the overall issue regarding the relationship between financial system development and economic growth. Subsequently, it considers this issue from three different aspects; the effect of the development of each component of the three main components of the financial system on overall growth, the interaction between the two main components of the financial system during the process of economic growth and the channels through which the financial system influences economic development. Studying these related themes provides the finance growth literature with a new conceptual contribution on how the development of the financial system affects growth.

The thesis contains seven chapters which are; an introductory chapter, theoretical literature, methodology, three empirical chapters, and the conclusion.

Chapter one is for the introduction of the study and presents an abridgement of the origins of the relationship between financial system development and overall growth, in the history of economic thought. This chapter includes the statement of the issue, the motivation of the study, background on the research context, the objectives of the study, the research questions and sub-questions, the hypotheses to be examined, the followed methodologies, the theoretical framework, and the research design.

Chapter two provides a theoretical framework of the link between financial development and the growth rate. This chapter presents the emerging directions in the theoretical literature on the finance-growth nexus by outlining a general background of the topic, showing the functions of the financial system and presenting a number of economic theories and growth models that were established by various schools of thought, for example the Classical, Keynesian, Neo-structuralist and Post-Keynesian schools. Moreover, this chapter considers the development of financial structure in endogenous growth theories. Lastly, it reviews theoretical perspectives on the connection between foreign direct investment and economic growth.

Chapter three, in detail, presents the research methodology. This chapter comprises the data and its source, the specification of the proposed models, and the implemented econometric methods.

Chapter four, five and six were intended for empirical investigation and to examine the suggested hypotheses and therefore it can be considered as the essence of the thesis. These chapters address the relationship between financial development and economic growth from

various aspects. Briefly, chapter four examines the separate impact of banking, financial stock markets and the insurance sector on economic growth by employing an Autoregressive Distributed Lag co-integration *ARDL* econometric procedure.

Then, to extend the empirical analysis, chapter five studies the interaction among the indicators of financial stock market development and indicators of bank development during the process of growth. Specifically, the second empirical chapter investigates the casual relationship between turnover ratio, stock market capitalisation, credit to private sector as a ratio to GDP, money supply $m2$ as a ratio to GDP and estimates their effects on each other. This is done by employing an Engle-Granger causality method and Fully Modified Ordinary Least Squares estimation ($FMOLS$).

Chapter six concentrates on the channels through which financial structure promotes economic growth. This chapter involves investigations of whether there exist significant roles for advanced financial organisation in influencing the relationship between local investment, foreign direct investment and economic growth. This was based on the interactive terms of the financial system proxy, credit to private sector as percentage of GDP, with the variables being foreign direct investment and domestic investment. Due to assumptions about the presence of endogeneity among the included variables, this chapter uses Two Stages Ordinary Least Square estimators and *GMM* estimation methods.

Finally, chapter seven concludes the current study by summarising the key findings, providing some policy implications and a few recommendations for further research in this area.

Chapter Two: Theoretical Framework

2.1 Introduction

This chapter presents a theoretical framework of the finance and growth nexus in the macroeconomic literature. It includes the most important schools of thought and covers a time period including Schumpeter (1911) which aims to explore whether the financial sector impacts growth and includes more recent studies in this area. Different theories and views are considered. Subsequent to this investigation, this chapter debates the theoretical literature relevant to the role of financial development in promoting a connection between foreign direct investment and output, in order to show the importance of financial system deepening in the growth process on one hand and to show how financial development augments overall growth on the other.

The predominant view suggests that investment generally depends on the amount of savings when economies are at full employment. Accordingly, the financial system is highly efficient in allocating natural resources and its main function is to direct savings into investment. Based on this belief, neo-classical theories assume the economic growth rate is an exogenous variable and that saving is the basis of investment. Therefore, saving impacts the ratio between capital and the labour force rather than the growth rate.

However, Keynesian theory assumes that investment is the basis of saving. It emphasises the role of effective demand in determining economic growth. Keynesian economists argue that investment increases growth and consequently savings increase. Based on these assumptions, they suggest that the primary role of financial institutions is to generate credit.

In this vain the post-Keynesian school focuses on money and its significant role in funding investment. Therefore, credit generation is essential to stimulate aggregate demand and investment, and this leads to an increase in the overall growth rate.

Contrary to neo-Classical models, endogenous models suggest that the growth rate is an endogenous variable. The proponents of endogenous growth theory argue that technical advancement, human capital and the structure of the financial system are all combined or independently effect economic growth. Therefore, financial system development affects

economic growth directly through funding investment and/or indirectly through technological development.

This chapter attempts to set a clear agenda to review the strongest arguments in the macroeconomic literature. In particular, it gives primary significance to the proxies of financial development in growth models. This chapter concentrates on monetary theories and finance-growth models that emphasis the importance of money and financial system development and their effects on growth variables. More precisely, this chapter considers the economic theories and growth models that have been introduced by different schools of thought such as the Classicals, Keynesians, post-Keynesians and the neo-Structuralists. Additionally, more recent endogenous growth models and FDI-growth theories are considered.

Based on the abovementioned discussion, the central objectives of the current chapter are to set the direction of discussion in this area, by presenting different macroeconomic perspectives and ideas about the association between financial development and economic growth on one hand and the relationship between foreign direct investment, financial development and economic growth on the other. To achieve that, the current chapter is structured as follows. The subsequent section presents a general background on the relationship between financial development and economic growth. Section three addresses the issue of why there is a need for a sophisticated financial system. Section four presents the function of the financial system and its significance in facilitating market transactions. In addition, section five provides discussion and criticism of the role of money in economies from the standpoint of classical theory. Then, in section six, the Keynesian approach is presented. Section seven reviews the issue of finance and growth in neo-classic theory. Moreover, section eight argues for the financial liberalisation hypothesis. While section nine discusses the post-Keynesian view regarding the link between financial advancement and the growth rate, section ten deals with neo-structuralist views. Likewise, section eleven debates the subject of financial system structure and total growth. Furthermore, section twelve presents a theoretical review of financial development in endogenous growth models. Finally, section thirteen reviews the theoretical literature on the link between foreign direct investment, financial development and economic growth.

2.2 Financial development and economic growth background

The role of financial system development in promoting economic growth has been debated in the academic literature for many decades (Goldsmith, 1969; Schumpeter, 1911; Shaw, 1973). They believed that financial system development is the main factor exerting a positive impact on economic growth. However, others have different views and include Robinson (1952) who argued that high levels of economic growth cannot be attained by an innovative financial system. Instead, the demand for financial services increases as economic growth increases and this improves the financial system. Gerschenkron (1962) argued that the function of the banking sector in a specific country is determined by its degree of growth at the early stages of industrialisation. This stress the impact of economic growth on financial development and not vice versa.

Patrick (1966) went further by focusing on the bi-directional relationship between financial development and economic growth. Patrick (1966) introduced two theories that he called demand following and supply leading. He attributed these two theories to specific phases of the growth process. Demand following suggests that the process of economic growth is accompanied by an increase in the demand for financial services and this leads to successive development of the financial system. Therefore, the financial system relies on economic growth to develop and the casual relationship runs from economic growth to financial development. On the other hand, supply leading theory suggests that the banking sector influences economic growth by directing savings to more profitable investment. This implies that the causal relationship runs from financial development to economic growth. According to Patrick (1966), the supply leading pattern takes place in the primary stages of the growth process. However, during successive stages of economic growth, the demand following pattern dominates.

Lucas (1988) argued that financial system development has a minor effect on economic growth. Stern (1989) totally disregarded the role of financial deepening in the economic growth process.

Schumpeter (1911) underlined the significance of the services provided by the financial sector. He argued that banks and financial markets are highly efficient in mobilising savings and easing transactions and these services lead to economic growth. Furthermore, he highlighted the role of banks in generating financial activity by providing highly secure credit for investors. Goldsmith (1969) argued that the financial system influences economic growth through the channel of capital accumulation. The financial system provides funds that are necessary for

investment and facilitates the transfer of technology and this accelerates growth. Also, he found that the financial system is positively related to overall growth.

Although pioneers such as Schumpeter (1911) and Goldsmith (1969) found a strong connection between financial deepening and output, they did not provide a general theoretical framework in this regard. McKinnon and Shaw (1973) introduced a theoretical model that attempted to explain the influences of financial liberalisation on growth. They suggested that the financial system increases the quantity of savings on one hand and the quantity and quality of investment on the other. Based on McKinnon and Shaw (1973) the liberalised financial system contributes to growth. Financial liberalisation limits the consequences that can result from financial decline. McKinnon (1973) argued that financial decline leads to bank deficiencies because at low levels of interest, savers obtain low rates of return on their deposits and this discourages the savings process and eventually negatively affects economic growth.

Since the 1980s studies of growth have considered endogenous models. These specifications treat economic growth as an endogenous rather than exogenous variable. The neo-classic growth model approach developed by Solow (1956) is based on the exogenous growth model of Harrod-Domar. Solow (1956) highlights the accumulation of capital in the process of growth. This model suggests that economic growth is determined exogenously, as it depends on exogenous variables such as technological development. Therefore, the investment achieved by financial system development impacts economic growth in the short run but does not in the long run.

However, endogenous growth models focus on an accumulation of knowledge and scale effect. Therefore, economic growth can be endogenously determined within the model in the long run.

Drawing from the classical view of economic growth, Greenwood and Jovanovic (1990) developed an endogenous growth model linking financial development to economic growth. Their model emphasises the causal relationship between financial development and economic growth, since the financial system and efficient investment increases the return on physical capital. While economic growth influences financial structure through investment, financial development influences growth through information for investment and efficient financial transactions. Greenwood and Jovanovic (1990) divided the economic growth process into two stages. In the first stage, the financial structure is still under development and this slows the process of growth. In the second stage of the growth process, financial structure is expected to

be more organised due to the increasing income levels at this stage and this improves the process of economic growth. In the first stage, income equality across individuals disappears because of weakness in the financial structure. However, in the advanced stage of growth, financial structure becomes more efficient in distributing income across individuals (Greenwood and Jovanovic, 1990).

Romer (1990) developed a one-sector neo-classic endogenous growth model which includes an index of the technological level and human capital as inputs, in addition to labor and physical capital that were used in the Solow (1956) model. The model suggests that technological change is an efficient channel through which financial development enhances economic growth and it observed that economies grow faster with a higher stock of human capital. Romer's (1990) endogenous growth model undoubtedly has identified technological change as a suitable channel for financial system in stimulating growth. However, the model is based on the assumptions that the population and labor are constant and that the ratio of the human capital stock to the total population is fixed. Such assumptions weaken the dynamic analysis.

Pagano (1993) argues that financial intermediation impacts economic growth through the rate of saving, the part of saving directed to investment and through the marginal productivity of investment. Greenwood and Smith(1997) developed two models with an endogenous market variable to analyse the relationship between financial markets and growth. Their models employ Diamond and Dybvig's (1983) model and Townsend's (1978) approach to illustrate how market formation is endogenous and enhances economic growth. The first model demonstrates how intermediation emerges under unsteady conditions. However, the second model demonstrates the results from perfect competition that occur under market formation and intermediaries are able to decrease the constant cost of exchange, therefore, they emerge endogenously.

While McKinnon and Shaw's (1973) model stresses the role of financial deregulation in improving saving levels and boosting investment, endogenous growth models emphasise the role of the financial system in generating highly efficient investment.

In addition to the question of the relationship between financial system development and economic growth, the finance-growth literature has raised the issue of bank-based or market-based views and which financial system is superior in terms of performance (Allen and Gale, 1999; Levine, 2005). In a bank-based financial system, investors rely on banks to finance their

investment. However, they rely on financial markets rather than banks in a market-based financial system. Financial markets are less important in a bank-based financial system. However, in well-developed economies financial markets are also becoming efficient in allocating resources to boost economic growth.

2.3 The need for a developed financial system

The need for a sophisticated financial system emerged as a result of the costs of transactions and information. In many countries, while some firms can easily get enough money to finance their investments, many entrepreneurs cannot continue their business due to the lack of adequate funding. The absence of a sophisticated banking system prompts companies to deal with individuals in financing their investments. This may involve risks to both parties (lenders and borrows), which include; risks of wasting time as it is not easy for firms to find these individuals to borrow from them and not easy for individuals to find firms to lend to them. Secondly, the lack of a developed financial system involves the risk of high costs, since lenders and borrowers have very little information about each other.

Furthermore, financial contracts may involve extra costs when the two parties do not exchange mutual information (Williamson, 1986). Although entrepreneurs usually have adequate internal information about their business, they are not motivated to reveal this information. Using a third party to provide more information often means additional costs. The lack of adequate information about lenders and borrowers limits the volume of loans generated by the financial market. Thus, the performance of the market will be poor due to the difficulty of distinguishing between lenders who are able to repay loans and interest from others who are unable to meet their obligations. This results in loans being given to undeserving borrowers whilst excluding deserving borrowers. King and Levine (1993c) argue that a well-functioning banking sector and financial market ensure the efficient distribution of resources. Banks and stock markets can reduce the cost of transactions through economies of scope and economies of scale (Ang, 2008). Reducing financial market frictions improves the allocation of resources and thus improves long-run economic growth (King and Levine, 1993c).

2.4 Financial system functions

Finance-growth literature identifies two different channels through which financial system development may enhance economic growth; these are capital accumulation and total factor productivity. The capital accumulation channel focuses on the abilities of the financial system to overcome any indivisibility through the process of mobilising savings. These savings are

channeled into productive projects, thereby leading to an accumulation of physical capital and a higher growth rate. However, the total factor productivity channel focuses on technological innovations and their role in minimising informational asymmetry that causes an inefficient allocation of available resources (Greenwood and Jovanovic, 1990). These effects are directly linked to the main functions of a financial system, which are the basis of any understanding about the relationship between financial development and economic growth. Levine (1997) presented five functions of a financial system, which are:

2.4.1 Resource allocation.

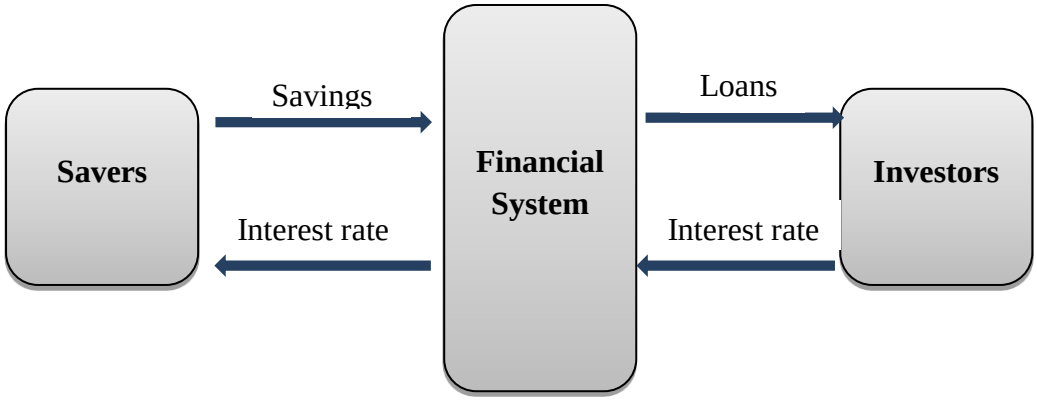
A developed financial system allocates resources efficiently. Financial intermediaries are highly efficient in studying and evaluating investment projects. Financial intermediaries provide low cost loans for an appropriate period of time to allow firms to invest in profitable projects and this encourages them to increase their investment. Financial intermediaries have a tendency to assess different investment projects and estimate the related risks, so that direct funds to the projects involve low degrees of risk and avoid lending to those involved with high degrees of risk. This only encourages high quality investments and those may have a positive effect on economic growth. In addition, financial markets are more efficient than financial intermediaries in funding new businesses as the information on firms can be acquired easily and more quickly (Ang, 2008).

2.4.2 Savings mobilising

The major role of banks and financial markets is to co-ordinate the decisions of savings and investment. Households save money to benefit from interest on their savings whilst firms seek to borrow from households to invest in profitable projects. However, there may be insufficient savings to finance projects. Here, financial intermediaries prompt a mobilisation of savings by attracting more savings from households and this increases bank deposits and provides more loanable funds, see figure (2.1).

Figure (2. 1)

Mobilising of Savings



2.4.3 Reducing Risk

In the presence of a financial system, illiquid assets can undoubtedly and quickly be transformed into liquid liabilities. Effective financial markets enable savers to hold illiquid assets such as bonds and equities, and these assets can be easily converted into cash if their holders need them in very short period of time. The financial system encourages investors to invest in lucrative business and this enables them to sell their investments and gain access to cash when required. Also, since the financial system provides long run loans, investors can maintain their savings in the form of liquid assets that can be used when needed and this avoids liquidity risk. Therefore, a financial system ameliorates liquidity risks and allow its clients to hedge against expected risks.

2.4.4 Facilitating and easing business transactions

A financial system offers advanced and highly secure payment methods, and this facilitates and eases business transactions. One of the most important functions of a financial system is to change securities from primary into indirect instruments (Gurley and Shaw, 1960). This

enables a financial system to exploit economies scale in the process of borrowing, lending and making profit during this process. In addition, individual savers incur additional costs to evaluate the quality and the financial positions of borrowers and how they invest acquired capital. These costs decrease the returns on savings and are called information costs. A financial system effectively matches lenders and borrowers and can facilitate transactions through its efficiency in reducing information costs.

2.5 Finance and economic growth literature

2.5.1 Money in classical theory

The quantity theory of money developed by Fischer (1922) was a core concern of traditional economics. It states that the aggregate price level is proportionally related to changes in the money supply level. This theory suggests that money is neutral and a medium in the exchange process. This implies that the stock of money has no effect on real variables.

Fischer's equation is written as follows:

$$MV = PT \quad \text{.....(2.1)}$$

Where:

M Represents the stock of money in the economy.

V Represents the velocity of money in circulation, which represents the total number of times a unit of money is used during a specific time period.

P Represents the level of aggregate price.

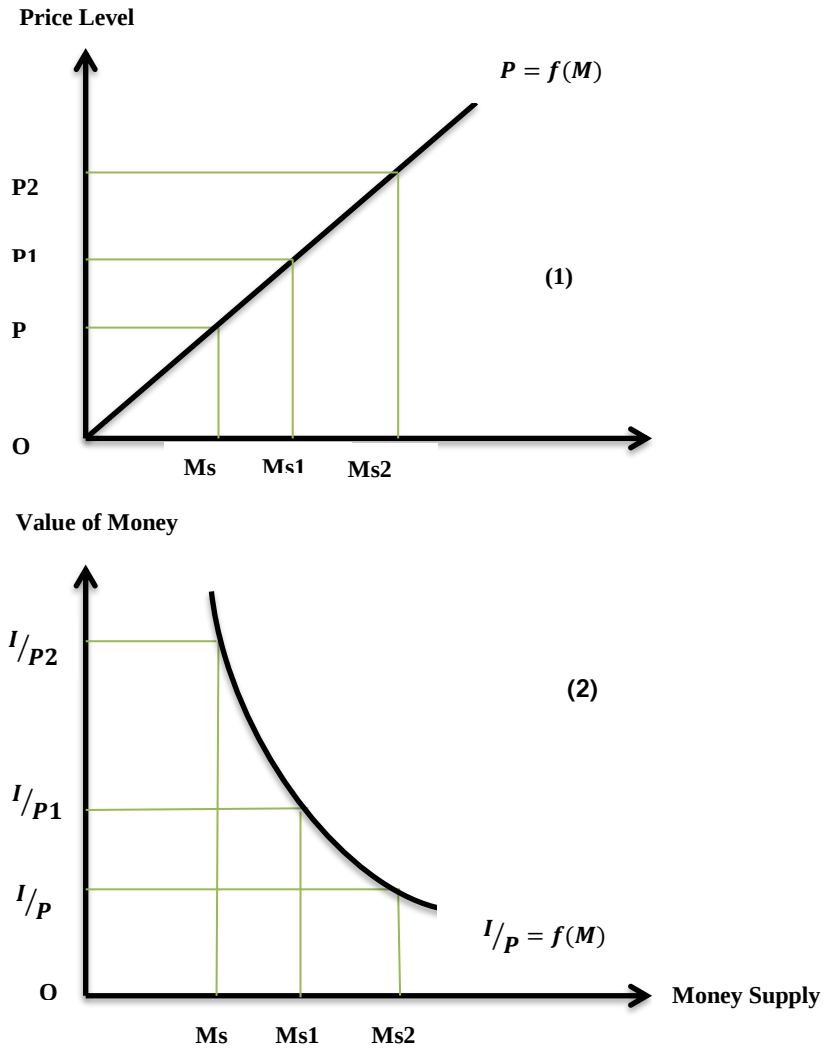
T Represents real output.

Following Say's Law *"Supply produces demand"* (Sowell, 2015), the quantity theory of money assumes that money circulation velocity V and real output T are both constant in the short run. Because on one hand, V relies on the stock of money and on the other T is mainly determined in the actual sector by actual factors such as capital K and labor L. Also, the model assumes that the economy is at full employment, the analysis works in the long term and that output does not affect the supply of money. Under these assumptions, there will exist uni-directional relationships that run only from money supply to output. However, money supply does not

react to output changes because it is exogenous. Essentially, money supply M impacts nominal output but not vice versa. And the reason is that it is difficult to increase the money supply in the traditional model due to exhaustive gold reserves. Thus, variations in nominal output cannot impact the supply of money M. Fischer's equation can be also geometrically explained by using the following figure:

Figure (2. 2)

Quantity of Money



Panel (1) of figure (2.2) explains the relationship between money supply and the aggregate price level, where the x axis measures money supply M_s and the y axis measures the level of general prices P. Panel (1) of the figure shows that the relationship between the two variables

is positive and expressed by a positive sloping upward vector which starts from the origin point at an angle of 45°. It can be seen that an increase of money supply from M_{s1} to M_{s2} is followed by an increase in the aggregate price level from P_1 to P_2 . The important mechanism in the relationship between money supply and the general price level is that the percentage change in both variables is equal.

On the other hand, panel (2) of figure (2.2) demonstrates the negative relationship between money supply and money value (the purchasing power of money), where money supply is measured on the horizontal axis and money supply is measured on the upright axis. The negative relationship between money supply and money value is expressed by a negative sloping curve sloping downward to the right. Panel (2) shows that when the supply of money increases from M_{s1} to M_{s2} the value of money falls from $1/P_2$ to $1/P_1$ and the percentage of decline in the value of money is equivalent to the percentage of increase in money supply M_s .

2.5.1.1 Criticism of quantity theory of money

Although the quantity theory of money was the basis of subsequent monetary theories, it has been strongly criticised by many economists including Keynes. According to Keynes this theory is a *"truism''* because the quantity theory of money assumes that the amount of money used for purchasing goods and services is equivalent to their value. However, it is not recognised nowadays that a specific percentage variation in the money supply will result in an equal percentage variation in the level of aggregate price. Furthermore, Keynes criticised the assumption of Fischer that the velocity of money in circulation is constant and the supply of money is exogenous (Keynes, 1936). He pointed out that when the equilibrium is under full employment, the stock of money would seriously affect the stability of the velocity of money in circulation.

Another deficiency of the quantity of money theory is that it identified a single function for money, which is a medium of exchange and ignored the fact that money can also be a store of value. In other words, it focused on the supply side and neglected the demand side. Therefore, the theory is a single-sided theory, and this is one aspect of its weakness.

According to Halm (1946), the money supply relates to a definite point of time, hence it has a static character. However, the velocity of money circulation relates to a specific time period, hence it has a dynamic character. Therefore, they cannot be comparable, and it is theoretically inconsistent to multiply two non-analogous elements.

Finally, Crowther (1946) criticised the quantity theory of money by identifying several weaknesses; here we review the most important points: *(i)* The quantity theory of money pays less attention to the changes in the general price level. *(ii)* The theory does not provide a clear explanation regarding the instability in the level of general prices in the period of the short run. *(iii)* it attributed the changes in the general level of prices to changes in money supply. However, on one hand the level of general prices may not increase as a result of increases in money supply, especially during periods of economic decline. On the other hand, the general price level may not fall due to the decrease of the money supply during economic boom periods.

2.5.2 Finance and Growth in Keynesian Theory

This section aims to consider the role of money in economic growth. Keynes (1936) rejected the comprehension of money that was prevailing in classical theory and joined the monetary sector with the real sector in the economy. He introduced a different perspective of money functions and the demand for money, in order to test the famed classical dichotomy that actual factors determine actual variables and monetary factors determine money variables (Keynes, 1936).

Keynes (1936) investigated the influence of money on various aspects of economic activity. This investigation was not limited to explaining the value of money and the factors that impact the price level. However, it reflects another important phenomenon which is the level of effective demand as he investigated the level of employment and the level of national income (Keynes, 1936).

Keynes (1937) identified three main reasons why individuals hold money; first, the transactions motive whereby individuals keep a part of their assets in a cash form to finance their daily transactions and the reason behind this behavior is the existence of a time gap between gaining and spending their income. If this gap is small, individuals will hold less cash and vice versa. Second, the precautionary motive whereby individuals and institutions hold more cash balances than their daily needs in order to meet any unexpected spending. Finally, the speculative motive which refers to an individual’s preference between keeping money or investing in purchasing government bonds. Here, the decision is dependent on government bond prices and the rate of interest on these and the opportunity cost of keeping money. Keynes (1937) argues that there is an inverse relationship between the bond's market price and the current market rate of interest. Keynes assumed that there is a certain level of interest called the normal interest rate,

if the current market rate of interest is lower than the normal interest rate, individuals expect it to rise and vice versa (Keynes, 1936).

According to him there are three cases which determine an individual's decisions regarding purchasing bonds or holding money. First, if the current market rate of interest is higher than the normal level, individuals expect it to fall. Then, they will purchase government bonds and sell them as their prices become higher. Thus, individuals prefer to hold bonds rather than holding money. Second, if the current market rate is lower than the normal level of interest, individuals expect it to rise in the future, this implies that individuals will lose if they buy bonds. Then, they will sell bonds. Thus, individuals prefer to hold money rather than holding bonds. Third, if the current market rate of interest is equal to normal rate of interest then it is similar to individuals wanting to hold money or bonds.

Keynes presented the function of money demand as follows:

$$[M/P]^d = a_0 + \frac{b_0}{r_0 - \omega_0} \; ; \; a_0, b_0 > 0 \quad \text{.....(2.2)}$$

Where:

r_0 = market interest rate.

ω_0 = liquidity trap interest rate

Here, Keynes assumes that the market interest rate is higher than the liquidity trap interest rate and the market interest rate is negatively related to the demand for real balances. The liquidity trap is defined as the lowest level of interest that can be reached at which speculators would prefer holding money in the form of cash balances rather than holding them in the form of bank deposits or purchasing government bounds. According to Keynes, the result in this situation is that ineffectiveness of monetary policies that is it becomes impossible to increase national output when the interest rate falls to its lowest level. Here, Keynes recommends applying fiscal policies to increase output and get rid of economic recession (Keynes, 1936).

2.5.3 Finance and Growth in Neoclassical Theory

Gurley and Shaw (1960) believed that the Keynesian model overstated the significance of money and the performance of commercial banks. According to them money is just one of several financial assets and commercial banks are one of many financial intermediaries. The authors contended that the analysis of the quantity theory of money must be extended to include more financial intermediaries and financial assets. Financial intermediaries are those institutions which work as middlemen among savers and investors. However, some other financial organisations such as common saving banks, insurance corporations and credit unions, also receive deposits and lend loans. These financial organisations provide services to both savers and investors. The researchers noticed that the assets of non-bank financial intermediaries are growing at a rapid pace over the assets of commercial banks. Thus, this trend with financial intermediaries has blocked monetary policies of commercial banks to control the money supply. They claimed that there is a manifest increase in the number of commercial banks and financial institutions in the economic growth process. They insisted that this fact will play a role in developing a monetary analysis. Therefore, they developed new technical, theoretical model.

The basic assumption of this model regarding the role of the financial system in the economic growth process was that savings make investments and there is a smooth flow from savings to investment and economic growth. This was adopted from Say's Law in that supply creates demand. This implies that financial markets work to a high degree of efficiency to channel savings to capital formation and implies an efficient capital allocation. Accordingly, it is worthy here to review the relationship between savings and investment.

2.5.4 Finance and growth and the relationship between savings and investment

A review of the macroeconomic literature shows that there is a controversy among economists regarding the economic relationship between savings and investment. Generally, economists before Keynes believed that saving is not equal to investment, but only under the equilibrium assumption that savings and investment are equal, and the equality between them is carried by changes in interest rates. Keynes developed the view that there is always equivalence between saving and investment.

These different views raise a disagreement in economics over whether there is equality among investment and savings or not. Now, this issue has been perceived and there is almost a

consensus among economists regarding the precise connection among investment and savings. Pre-Keynesians justified their view that investors are not savers. In other words, while individuals save money, entrepreneurs invest money. Also, investors and savers seek to achieve different motives and goals. Moreover, investment and savings rely on separate factors. Thus, it is not necessary that saving is equal to investment. Pre-Keynesians suggest that the quantity of investment is more than the quantity of saving due to bank tendency to create additional new loans. However, the Keynesian view was totally different, under any conditions the parity among savings and investment is always achieved.

Moreover, Tobin (1965) developed a model to emphasise the connection between money and economic progress. This model considers money as a durable asset producing services to its holders. Individuals face two possible choices; keeping money or investing it. If the return on capital is higher relative to keeping money, their decision will be in favour of holding assets rather than money. According to Solow's (1956) growth model this shift in their portfolios will maximise the accumulation of capital. This would impact the level of economic growth during the process of change from low to high capital-labour ratio. In other words, reducing the return on holding money will stimulate economic growth (Fry, 1988; Tobin, 1965). This model has the impact of reducing bank deposit interest rates. For example, the return on holding money on economic growth depends on the decision of holding.

2.5.5 Liberalised financial system and economic growth theory

This section presents various models from the finance-growth literature that attempted to explain the relationship between financial development and economic growth.

2.5.5.1 McKinnon and Shaw (1973) Model

McKinnon and Shaw (1973) presented a thesis of financial liberalisation which argued that government intervention in the financial system mechanism impacts the volume of investment. Liberalising the financial system lifts financial downturns which refers to the regulating of financial systems in a country by the government and the central bank, especially the intervention to adjust interest rate levels and credit allocation. The core of the argument was that at lower levels, under the stock market, interest rates decrease savings and constrain economic growth. This was built on the notion that the quantities of savings are sensitive to changes in interest rates and the relationship between these two variables is positive. McKinnon and Shaw (1973) claimed that the quantity of savings was negatively affected in

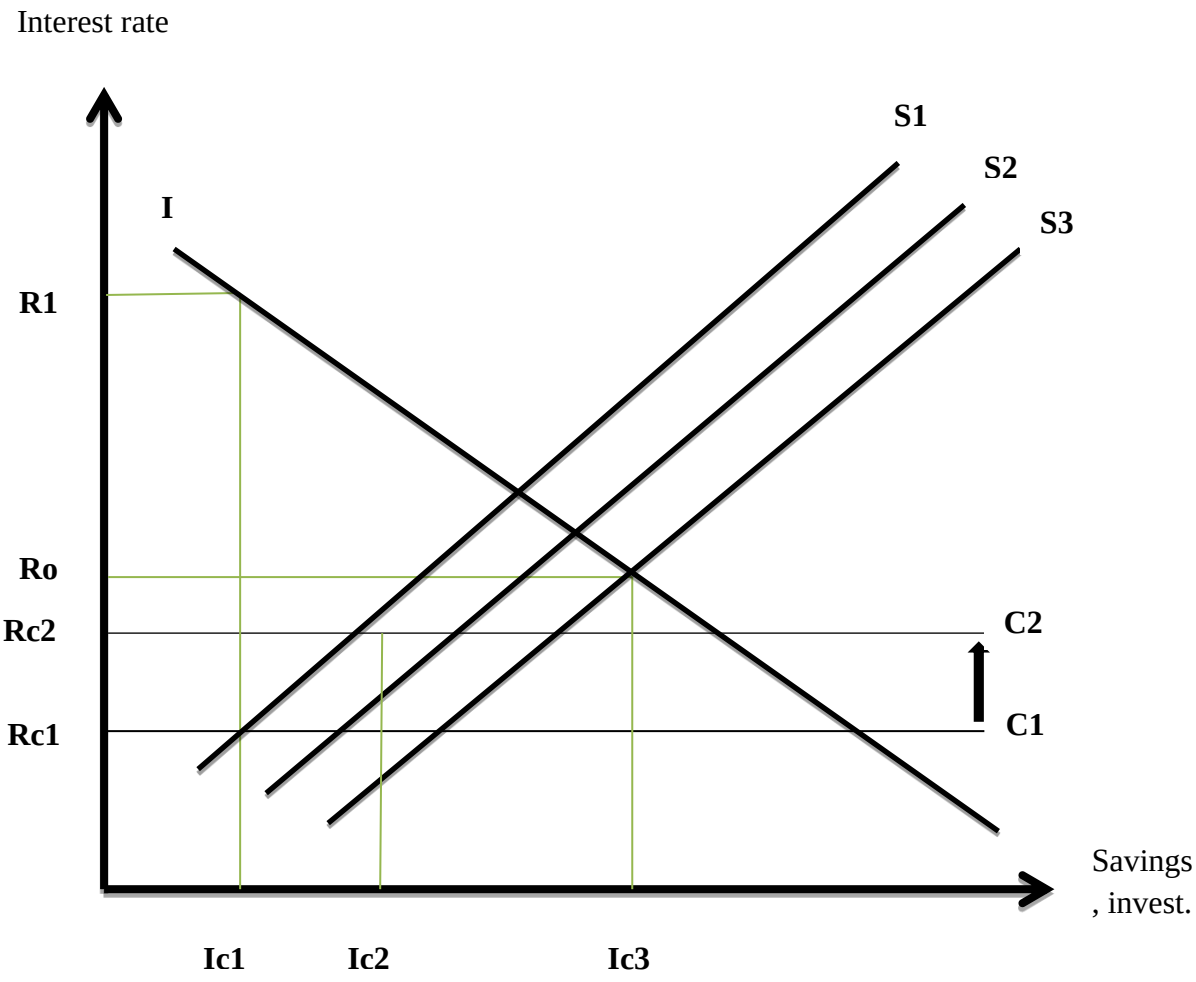
the 1960's and 1970's, by the high degree of government intervention in regulating the financial system and the result was deficiencies of stock markets which had adverse impacts on economic growth. The proponents of financial liberalisation recommend the removal of ceilings on the levels of interest rates and to eliminate the strategies of credit allocation.

Although McKinnon and Shaw (1973) were completely agreed that there is a positive relationship between financial liberalisation and macroeconomic performance through the channels of savings and investment, they introduced two distinct models for financial liberalisation stressing the role of financial system development in stimulating economic growth. Both models comprise two diverse perspectives regarding the mechanism of the financial system. The researchers held different views regarding the relationship among money and physical capital. McKinnon assumes that there is complementarity between the two. This assumption is based on the outside money model. This model promotes the significant role of deposits at banks and other financial institutions in financing projects. This means that there is an accumulation of savings in the form of bank deposits prior to investment. However Shaw (1973) assumes that money and physical capital substitute each other. This assumption is based on the inside money model. Shaw (1973) emphasises the significance of an effective and well organised financial system. He suggests that a high interest rate increases savings and improves financial intermediaries' role in distributing funds between deficient and surplus units. Financial system development thus increases motivations to save more and increases the quantity and quality of investments, thereby accelerating economic growth. These benefits arise because financial institutions are able to increase the returns from deposits by accepting liquidity and minimising the cost of information.

McKinnon and Shaw (1973) subsequently decried adopting suppressive financial strategies via actions, for example, upward ceilings of deposit rate levels and credit increases, policies of selected credit or entry limitation into the banking sector. They contended that such strategies reduce savings and expand investment in unproductive ventures and this may causes damage to economies, particularly economies of less developed countries (Francis and Waithe, 2013). The main idea for their paradigm can be explained by using a dynamic model introduced by Fry (1988) as shown in the following figure:

Figure (2. 3)

Savings and Investment in case of financial repression



Source: ***Elsayed, (2013, PP20)***

Assume the x-axis measures the quantity of savings and investment at a certain level of income and the y-axis measures the level of interest rates before and after government intervention. Also, let the curves S1, S2, and S3 represent three different levels of savings at three different levels of income. The positive slope of these curves reflects the positive relationship between savings and interest rate. However, the slope of the investment curve is negative, this reveals the negative relationship between investment and the real interest rate (McKinnon, 1973). The equilibrium position is obtained when savings equal investment at an equilibrium level of

interest rate (R0). It is supposed that at this position there is no government intervention to adjust the interest rate level.

Let's assume that the government decided to reduce the level of interest rates on bank deposits, for example, to (R1), which is lower than the equilibrium level of interest rates (R0). Such an intervention would lead to economic distortion in the following ways (Fry, 1997).

First, reducing real interest rate levels impacts individual current and future consumption. Therefore, the savings level is expected to fall under optimum levels and this reduces investment from (I) to (Ic1). Second, lenders may prefer to invest their savings in low-yielding projects rather than depositing them in banks and get lower returns. Third, at a lower level of interest rates, low cost loans can be easily obtained, and this may encourage investors to allocate funds in capital-intensive ventures. Fourth, some entrepreneurs have a low propensity to borrow at a high level of interest due to the nature of their investment, as it may involve low returns on projects. Moreover, if the level of real interest rates dropped due to monetary policy intervention to adjust the level of nominal interest rates or to high level of inflation, individuals would prefer to hold physical assets rather than keeping bank deposits in order to avoid diminishing their wealth as a result of high inflation. Holding physical assets during inflation increases individual wealth ratios as the price of their assets becomes higher than before. This induces them to maximise their consumption and minimise their savings (Elsayed, 2013).

Furthermore, the intervention of governments in directing a specific ratio of credit to some nominated sectors, such as the housing sector, may expose the financial institutions providing this credit to the risk of loan repayment delays. This influences the available amount of credit to finance new projects and increases the fragility of the banking sector.

If the government decided to intervene in economic activity by raising the level of real interest rates from Rc1 to Rc2, then the quantity of savings and investment is expected to increase by (Ic1 – Ic2). Also, investment efficiency would be improved because capitalists become more reluctant to invest in less profitable projects and this has a positive impact on the marginal productivity of capital.

This model highlights the importance of raising the real interest rate in increasing the amount of investment on one hand and improving its efficiency on the other. Such improvements in the level of investment lead to improvements in the level of savings and economic growth.

This model suggests that upward changes in the level of interest rates in the financial liberalisation process promotes savings and increases the amount of loanable founds and this increases economic growth. Thus, a positive real interest rate is essential to motivate agents to accumulate savings, develop the financial system and consolidate financial markets thereby guaranteeing an efficient allocation of available resources for growth. Accordingly, the model supposed that an increase in savings leads to an increase in accumulated deposits at financial institutions and then these deposits are used as loans to investors. This implies that deposits generate loans or savings create investment and this is the logic of Say's Law.

2.5.5.2 McKinnon's Model

Keynesian and neoclassical theory assume that financial markets operate competitively and perfectly with applying a single interest rate. McKinnon (1973) contended that this view cannot obviously explain the reality of financial markets in poorer economies because those markets were less developed, and fragmented. McKinnon (1973) argued that there was a positive relationship between financial development and output. He presented the complementarity hypothesis to explain this relationship. The hypothesis states that there is a complementarity between money and capital accumulation in less developing countries due to self-financing investment, so that the real interest rate is the main factor that determines capital formation in less developing countries. There are two functions of a high interest rate. First, discouraging agents from investing in low-return ventures which are alternatives to high-return ventures as noticed by McKinnon (1973). Second, increasing saver income to be used to finance high-return ventures and therefore, this facilitates the process of accumulation. McKinnon's complimentary hypothesis can be presented by using the two equations (2.3) and (2.5) as below:

First, the long-run real money demand function which suggests that the demand for real money balances is positively related to *(i)* real income. *(ii)* investment as a ratio to real income. *(iii)* real interest rates on bank deposits which are calculated by subtracting the anticipated inflation rate from nominal interest rates on bank deposits. This function can be presented in the following formula:

$$Md/_P = \varphi\{Y,\ I/_Y\ , R_i\} \qquad \varphi Y > 0, \varphi I/_Y > 0,\ \varphi R_i > 0 \ldots\ldots\ldots\ldots (2.3)$$

$$R_i = (n_i - \pi^a),,,,,,,,,,,,,,,,,,,,,(2.4)$$

Where:

$Md/_P$ Represents demand for real balances.

$I/_Y$ Represents investment as a ratio to real income.

N_i Represents the nominal interest rate on bank deposits.

π^α Represents the rate of inflation.

R_i Represents the real interest rate on bank deposits.

As complementarity possibly works in the opposite direction, the investment function can be obtained from the McKinnon hypothesis as follows:

$$I/_Y = \varphi\{C_r, R_i\} \quad C_r, R_i > 0 \ldots\ldots\ldots\ldots\ldots\ldots(2.5)$$

$$R_i = (n_i - \pi^a),,,,,,,,,,,,,,,,,,,,,(2.6)$$

Where:

C_r : Represents the real return on physical capital.

The above investment function suggests that the there is a constructive link between domestic investment and real returns on physical capital on one hand and between investment and the real interest rate on bank deposits on the other.

According to the above standard long run real money demand function and investment function the results from the following first order partial derivatives are suggested to be more than zero:

$$\frac{\partial(Md/P)}{\partial(Y)} > 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.7)$$

$$\frac{\partial(Md/P)}{\partial I/Y} > 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.8)$$

$$\frac{\partial(Md/P)}{\partial(N_i - \pi^{\alpha})} > 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.9)$$

$$\frac{\partial(I/Y)}{\partial(C_r)} > 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.10)$$

$$\frac{\partial(I/Y)}{\partial(N_i - \pi^{\alpha})} > 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.11)$$

Thus, McKinnon's complimentary hypothesis can be found in the two following first order partial derivatives:

$$\frac{\partial(Md/P)}{\partial(I/Y)} > 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.12)$$

$$\frac{\partial(I/Y)}{\partial(N_i - \pi^{\alpha})} > 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.13)$$

The last two first order partial derivatives (2.12) and (2.13) suggest finance availability constrains investments, but not capital costs during the application of financial policies. As the level of the real interest rate increases, investment increases due to the relaxation of financial restrictions. However, this discussion is contrary to the traditional theory which suggests that a rise in the level of interest rates leads to an investment reduction.

2.5.5.3 Shaw's (1973) Monetary Model

McKinnon's complimentary hypothesis is based on two main assumptions. First, the units in the economy are restricted to self-finance. Second, there is a significant indivisibility in investments (Eschenbach, 2004). This implies that there is no difference among investors and savers. In other words, investors need to accumulate financial assets or bank deposits before making their investment. So, there is complementarity among physical capital and bank deposits. Since borrowing money is not available for investors to finance their projects, McKinnon's model is considered a model of outside money. However, in Shaw's model, such complementarity between bank deposits and physical capital is not necessary, as investors are not only constrained by self-finance. Instead his model is based on inside money. Shaw (1973) argued that the link between financial development and growth is positive. He argued that financial liberalisation and removal of ceilings on nominal interest rates are essential to attract savings. Financial institutions increase investment and enhance economic growth through borrowing money from savers and lending them to investors. Therefore, financial intermediaries have a significant role in capital accumulation and improved resources allocation. Shaw's Debt-Intermediation Model can be presented as follows:

$$Md/p = \varphi\{Y, \quad R_i, \omega^{\circ}, T^{\circ}\} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.14)$$

$$R_i = \{N_i - \pi^{\alpha}\} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.15)$$

Where:

ω° Represents a real opportunity cost of holding money.

T° Represents a technological development in the financial system.

According to the above function (2.14) the results from the following first order partial derivatives are suggested to be positive:

$$\frac{\partial(Md/_P)}{\partial Y} > 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.16)$$

$$\frac{\partial(Md/_P)}{\partial(N_i - \pi^{\alpha})} > 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.17)$$

$$\frac{\partial(Md/_P)}{\partial(T^{\circ})} > 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.18)$$

However, the result from the following first order partial derivative is suggested to be negative:

$$\frac{\partial(Md/_P)}{\partial(\omega^{\circ})} < 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.19)$$

According to the above function real income, real interest rate and technological development in the financial system have positive impacts on the demand for real balances. However, the opportunity cost of holding money in negatively impacts the demand for real balances.

2.5.5.4 Kapur's (1976) Model

Kapur (1976) employed McKinnon and Shaw's model to mathematically develop a growth model. This model uses the production function to explain transmission mechanism in a liberalised financial system. Kapur (1976) suggests that in the short-run, government

intervention to stabilize the economy through raising the level of interest rates on bank deposits is more effective than its intervention via following the policy of money supply reduction. This model is based on the following assumptions: *(i)* Financial liberalisation impacts economic growth through the channel of working capital. *(ii)* the ratio of economic growth to output is constant. *(iii)* It assumes that there are two basic sources contributing to the formation of working capital, the first part of working capital can be covered by bank credits, whilst the other part is covered by self-financing. Moreover, bank credit can be divided into two channels. First, it funds any expansion in real working capital. Second, to fund any replacement of depleted capital due to inflation. *(iv)* Individuals hold only their money in the form of bank deposits, thus there is no money in circulation. The Kapur (1976) model can be presented by the following formula:

$$\frac{\Delta Y}{Y} = \frac{\Delta M}{M}\left(\frac{M}{P * Y}\right) * \frac{\rho q}{(1-\sigma)} - \pi\theta \ldots\ldots\ldots\ldots\ldots\ldots (2.20)$$

Where:

$\frac{\Delta Y}{Y}$ Represents the economic growth rate.

$\frac{\Delta M}{M}$ Represents the monetary growth rate.

M Represents the stock of money.

$\frac{M}{P*Y}$ Represents the converse of income velocity of money.

ρ Represents the ratio of output to capital.

q Represents the ratio of bank loans to the stock of money.

$(1-\sigma)$ Represents the proportion of working capital to used capital.

π Represents the inflation rate.

θ Represents the fraction of working capital financed by bank credit.

The above equation suggests a positive link between the economic growth rate $\frac{\Delta Y}{Y}$ and the monetary growth rate $\frac{\Delta M}{M}$; the output to capital ratio ρ ; the ratio of bank loans to the stock of money q ; the ratio of fixed capital to used capital σ , and the ratio of fixed capital to working capital. However, economic growth in this model is suggested to be negatively correlated to changes in the income velocity of money circulation $\frac{GDP}{M}$ and the inflation rate π .

Based on Cagan's (1956) model regarding the demand for real balances, Kapur (1976) developed a function for the demand for real money. This function can be presented as follows:

$$Md/_{p} = Y * e^{\alpha(N_i - \pi^x)} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (2.21)$$

Where:

$Md/_{P}$ Represents the demand for real money.

N_i Represents nominal interest rates on bank deposits.

π^x Represents the expected rate of inflation.

By dividing the above equation by Y, the following equation will be obtained:

$$\frac{Md}{P * Y} = e^{\alpha(N_i - \pi^x)} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (2.22)$$

If we adjust the above equation and Kapur's model, then the following equation will be obtained:

$$\frac{\Delta Y}{Y} = \frac{\Delta M}{M} * e^{\alpha(N_i - \pi^x)} * \frac{\rho q}{(1-\sigma)} - \pi\theta \dots\dots\dots\dots\dots (2.23)$$

Which can be re-written as follows:

$$\frac{\Delta Y}{Y} = \frac{\Delta M \ \rho \ q \ e^{\alpha(N_i - \pi^{\mathcal{X}})}}{M(1-\sigma)} - \pi\theta \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.24)$$

According to this model increasing the nominal interest rate on bank deposits N_i towards the market equilibrium level would positively affect the demand for real balances Md/p and, henceforth available bank loans. Consequently, this would improve the process of capital accumulation and stimulate the economic growth rate. Under the assumption of a fixed bank deposit interest rate, there will be only one level of money growth $\frac{\Delta M}{M}$ to maximise economic growth $\frac{\Delta Y}{Y}$. Furthermore, the model demonstrates that there is not a specific impact of a high money growth rate $\frac{\Delta M}{M}$ on the rate of economic growth $\frac{\Delta Y}{Y}$. In other words, a high money growth rate positively impacts economic growth by increasing the bank credit supply. A high rate of money growth $\frac{\Delta M}{M}$ has a negative impact on growth, since a high level of the money growth rate decelerates the velocity of money circulating in the economy and this results in consecutive rises in the inflation rate, thereby adversely impacting the growth rate $\frac{\Delta Y}{Y}$.

2.5.5.5 Galbis's (1977) Model

Galbis (1977) introduced a resource transfer model which involved two sectors of the economy. Both sectors are similar in terms of production type, quality, and price. Nevertheless, they are different in terms of modernity. The modern sector S_B uses modern and advanced production technology, which positively affects the cost of production and therefore the rate of return on invested capital. On the other hand, a backward sector S_A uses traditional and modest production technology, such that less advanced technology may negatively impact production costs and thereby lessen the returns to capital. This model assumes that saving is a function of

income and represents a constant ratio of this income in both sectors, investment is a function of bank deposits in the traditional sector and investment is a function of the cost of loans. This model assumes that the intervention of the monetary authorities in the financial system by identifying and imposing the interest rate at low levels could lead to a duplication of standards in the national economy by promoting investment in ventures with average rates of return. This may lead to competition and crowding out of existing ventures with a greater rate of return. Thus, following liberal fiscal policies would lead to economic growth by increasing the superiority and efficiency of investment. Galbis (1977) argued that capital and labour are only the two production factors in both suggested sectors. This model can be presented as follows:

$$Y_A = \alpha_A K_A + \beta_A L_A \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.25)$$

$$Y_B = \alpha_B K_B + \beta_B L_B \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.26)$$

$$\alpha_B > \alpha_A$$

$$Y = Y_A + Y_B \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.27)$$

Where:

Y Represents income.

K Represents capital.

L Represents labour.

α Represents the real rate of return on capital.

β Represents the real rate of return on labour.

A, B Represents the traditional and modern sectors, respectively.

The above model (2.26) assumes that capital is constant and completely employed and that there is a redistribution of capital between the two sectors in favour of the modern sector. Under such assumptions any increase in capital of the modern sector *K2*, at the expense of capital in the traditional sector *K1*, would raise average capital productivity, since the rate of return on capital of the modern sector is greater than the rate of return on capital in the traditional sector:

$$\alpha_B > \alpha_A$$

Moreover, under the assumption that the backward sector is completely self-financed, the achieved surplus of income will be directed into two channels, which are savings in form of bank deposits $\Delta(^{M_A}/_{P})$ and investment.

$$S_A = I_A + \Delta\left(^{M_A}/_{P}\right) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (2.28)$$

Where:

S_A Represents the traditional sector.

I_A Represents investment of the traditional sector.

Thus, the investment of the traditional sector is a function of the real interest rate on bank deposits and the real rate of return on new investment of the traditional sector.

$$I_A = \varphi\,(R_i, C_r) \quad \varphi(R_i) < 0\,, \varphi(C_r) > 0 \dots (2.29)$$

$$R_i = (N_i - \pi^{\alpha}) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (2.30)$$

$$I_A = \varphi\,(N_i - \pi^{\alpha}, C_r) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.31)$$

Where:

R_i Represents the real interest rate on bank deposits.

C_r Represents the real rate of return of physical capital.

N_i Represents the nominal interest rate on bank deposits.

π^{α} Represents the inflation rate.

According to the above investment function the result from the first order partial derivative of the real return on bank deposits is negative. Conversely, the first order partial derivative of the real return on physical capital is positive as follows:

$$\frac{\partial\,(I_A)}{\partial\,(N_i - \pi^{\alpha})} < 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.32)$$

$$\frac{\partial\,(I_A)}{\partial\,(C_r)} > 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.33)$$

This result suggests that on one hand, an increase in the interest rate on bank deposits would decrease investment by the traditional sector. On the other hand, an increase in the real rate of return on physical capital, would increase investment by the traditional sector.

However, the modern sector in Galbis's (1993) model includes investment as a function of the real rate of interest on commercial bank loans and the real rate of return on investment. The investment function of the modern sector can be written as follows:

$$I_B = \varphi\,(C_r\,, R_L)\quad , \qquad \varphi(C_r) > 0\,, \qquad \varphi(R_L) < 0 \ldots\ldots\ldots\ldots\ldots (2.34)$$

Where:

R_L Represents the real rate of interest on bank loans.

This model suggests that the modern sector would not hold real balances in the form of bank deposits at commercial banks because the real rate of interest on bank loans is less than the real return on investment. Instead, the modern sector would prefer to invest its surplus income, in addition to saving those transferred from the traditional sector. According to this model setting the interest rate under the market equilibrium level will negatively affect savings of the traditional sector and this reduces loan supply to be invested by the modern sector. However, financial system liberalisation, in particular freeing the interest rate and enhances the traditional sector to increase savings/bank deposits and therefore make more loans available to the advanced sector.

2.5.5.6 Fry's Model

Fry) (1982) in an empirical study investigates the role of financial liberalisation in motivating economic growth and the interaction among investment, savings and the overall growth rate. He argues that adopting a financial liberalisation strategy encourages individuals to save, motivate enterprises to invest and improve the efficiency of physical capital via the mechanism of bank loan availability.

Fry (1982) categorises the savings rate into national or domestic savings and external or foreign savings. Fry's model assumes that the actual domestic saving rate $\frac{S_d}{Y}$ is a function of five macroeconomic variables, namely; (i) the economic growth rate Y. (ii) a one period lag of the domestic savings rate $\frac{S_d}{Y}\ (-1)$. (iii) the external savings rate $\frac{S_F}{Y}$. (iv) the actual rate of return

on physical capital C_r and (v) the actual interest rate on bank deposits $(N_i - \pi^{\alpha})$. Accordingly, Fry's domestic savings model can be written as follows:

$$\frac{S_d}{Y} = \varphi \left\{ Y, \frac{S_d}{Y}(-1), \frac{S_f}{Y}, C_r, (N_i - \pi^{\alpha}) \right\} \dots\dots\dots\dots\dots\dots (2.35)$$

Where the positive change of the following macroeconomic variables; (i) economic growth rate Y. (ii) one period lag of the domestic savings rate $\frac{S_d}{Y}(-1)$. (iii) actual rate of return on physical capital C_r and (v) actual interest rate on bank deposits $(N_i - \pi^{\alpha})$ would have a positive effect The positive relationship between the rate of domestic saving and these variables can be mathematically identified by taking the first order partial derivatives for these variables in relation to the rate of domestic saving. The obtained result is more than zero as below:

$$\frac{\partial(S_d/Y)}{\partial(Y)} > 0 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (2.36)$$

$$\frac{\partial(S_d/Y)}{\partial(S_d/Y\,(-1))} > 0 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (2.37)$$

$$\frac{\partial(S_d/Y)}{\partial(C_r)} > 0 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (2.38)$$

$$\frac{\partial(S_d/Y)}{\partial(N_i - \pi^{\alpha})} > 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.39)$$

However, positive changes in the external saving rate would inversely impact the rate of domestic saving because the foreign saving rate is substituted for the domestic saving rate. Hence, an increase in the flow of savings from abroad motivates savers to increase their present and upcoming expenses and reduce savings. Since the negative relationship between domestic and foreign saving rates can be mathematically checked through the obtained result from the first order derivative of the foreign saving rate in relation to the domestic saving rate as below:

$$\frac{\partial(S_d/Y)}{\partial(S_f/Y)} < 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.40)$$

Besides the savings equation, Fry's model introduces the investment ratio equation. This model assumes that the investment ratio depends on the projected actual return rate on physical capital $C_r$on one hand and on the actual interest rate on bank credit $(l_i - \pi^{\alpha})$ on the other. Thus, Fry's second model can be presented in following mathematical formula:

$$\frac{I}{Y} = \varphi\{C_r, (l_i - \pi^{\alpha}) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.41)$$

The inclusion of nominal interest rates on bank credit l_i in the above equation satisfies the equality between savings and investment levels.

$$\frac{S}{Y} = \frac{I}{Y} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..(2.42)$$

Hence, total saving includes domestic and external savings as follows:

$$\frac{S}{Y} = \frac{S_d}{Y} + \frac{S_f}{Y} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..(2.43)$$

Then:

$$\frac{I}{Y} = \frac{S_d}{Y} + \frac{S_f}{Y} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.\ldots\ldots\ldots\ldots.(2.44)$$

Substituting equation (2.44) into equation (2.41) gives the following equation:

$$\frac{I}{Y} = \varphi \left\{ Y, \frac{S_d}{Y} (-1), \frac{S_f}{Y}, C_r, (N_i - \pi^{\alpha}) \right\} + \frac{S_f}{Y} \ldots..(2.45)$$

Also, investment efficiency is a function of the lagged actual interest rate on bank deposits as below:

$$\sigma = \varphi \left\{ (N_i - \pi^{\alpha})_{(t-1)} \right\} \ldots\ldots\ldots\ldots\ldots\ldots.\ldots\ldots\ldots..(2.46)$$

Where:

σ Represents investment efficiency, which is expressed by the ratio of output to physical capital.

N_i Represents the nominal interest rate on bank deposits.

The above equation (2.46) assumes that an increase in the actual interest rate on bank deposits during the last period would increase efficiency of investment in the present period. Therefore, the obtained result from the first order partial derivatives of the lagged actual interest rate on bank deposits is greater than zero as follows:

$$\frac{\partial(N_i - \pi^{\alpha})_{(t-1)}}{\partial(\sigma)} > 0 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.47)$$

Lastly, Fry's model suggests that both the average of investment efficiency and the rate of investment in the last period determine the rate of economic growth in the long run period. Therefore, this statement can be represented by the following algebraic equation:

$$Y_t = \frac{I}{Y}(t-1) * (\sigma) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.48)$$

If we substitute equations (2.46), and (2.47) in equation (2.48) the following formula will be obtained:

$$Y_t = \varphi\left\{Y, \frac{S_d}{Y}(-1), \frac{S_f}{Y}, C_r, (N_i - \pi^{\alpha})\right\}(-1) + \frac{S_f}{Y}(-1) * \varphi\left\{(N_i - \pi^{\alpha})_{(t-1)}\right\}$$

……..(2.49)

Equation (2.49), also can be written in the following manner:

$$Y_t = \frac{\varphi\left\{Y, \frac{S_d}{Y}(-1), \frac{S_f}{Y}, C_r, (N_i - \pi^{\alpha})\right\}(-1) + \frac{S_f}{Y}(-1)}{1/\varphi\left\{(N_i - \pi^{\alpha})_{(t-1)}\right\}} \ldots\ldots\ldots\ldots (2.50)$$

The above model involves McKinnon's (1973) complementary hypothesis:

$$I/Y = \varphi \{ C_r , (N_i - \pi^{\alpha}) \} \dots \dots \dots \dots \dots \dots \dots \dots \dots . (2.51)$$

Furthermore, it involves Shaw's (1973) monetary view:

$$Md/p = \varphi \{ Y , (N_i - \pi^{\alpha}) , \omega^{\circ}, T^{\circ} \} \dots \dots \dots \dots \dots . (2.52)$$

In summary, Fry (1982) suggests that financial liberalisation strategies enhance the demand for actual money balances and bank loan supply through high levels of actual interest rates on bank deposits. Fry (1978) suggests that higher levels of bank credit improve the process of the accumulation of capital in working and fixed investments. Finally, including the actual interest rate on bank deposits $(N_i - \pi^{\alpha})$ in Fry's model reflects the impact of actual credit availability mechanisms on economic growth, through investment.

2.5.6 Finance and Growth in Post-Keynesian Theory

The post-Keynesian theories of finance-growth suggest that financial liberalisation in terms of freeing the level of interest rates will minimise aggregate demand and consequently profits. This will lead to a reduction in saving, investment and overall growth. This view, therefore contrasts with the views of McKinnon and Shaw (Gibson and Tsakalotos, 1994).

B. Paul and Dutt (1991) investigated the liberalisation implications in a closed economy. There are two opposite impacts resulting from financial liberalisation, in particular, increasing the interest rate on bank deposits. First, the positive impact is that an increase in the interest rate on bank deposits encourages agents in the economy to increase their savings/deposits and this increases the supply of loans, investment and enhances overall growth. Second, the negative impact is that an increase in savings due to the high deposit bank interest rate negatively influences aggregate demand and profits and this causes a decline in savings, investment and economic growth. Moreover, the decline in the rate of current profits makes firms more

pessimistic regarding their profits in the future and these firms will reduce investment. Under such conditions, the negative effect resulting from rising deposit interest rates will outweigh the positive effect.

B. Paul and Dutt (1991) was distinct from McKinnon and Shaw's model. According to McKinnon and Shaw's model, financial liberalisation leads to saving increases and enhances investment and economic growth. However, in B. Paul and Dutt's (1991) model, the decline in output and profits causes a decline in savings and investment and this reduces investment to a level under its level before implementation of financial liberalisation.

Dutt (1990) developed a growth model by including an investment accelerator effect and considering the long run effect of financial liberalisation rather than concentrating on short run effects of financial liberalisation. The impact of financial liberalisation in the long run is more diverse from its impact in the short run. The increase in interest rates increases the cost of loans, which increases production costs, this leads to an increase in prices. Moreover, considering an economy at full capacity, the results of Dutt (1990) are similar to the results of McKinnon and Shaw's (1973) model where investment increases as savings increase. The increase in prices negatively impacts aggregate demand and output. Thus, capital formation will decline in the long run (Gibson and Tsakalotos, 1994).

In conclusion, post-Keynesian models suggest that an increase in the propensity to save has adverse impacts on effective demand. Dutt (1990) asserted that in an open economy financial liberalisation may lead to over-evaluation of the exchange rate and this leads to a squeezing in the trade sector and a further decline in aggregate demand. Finally, it can be said that these models pointed to the issue of financial instability resulting from financial liberalisation.

2.5.7 Finance and Growth in Neo-Structuralist Thought

The neo-structuralist school has emerged due to the mixed results obtained from implementing the policies of financial liberalisation in different developing countries. From a macroeconomic perspective, this school broadly criticises the financial liberalisation notion. The neo-structuralist school criticises the McKinnon (1973) and Shaw (1973) models for ignoring the curb markets. Neo-structuralists argue that curb markets are highly significant in developing countries, as the investors in these countries are relying on curb markets to finance their business. Since, it is not easy for them to obtain loans from official financial institutions due the complexity of the requirements for obtaining these loans Ghatak and Sánchez-Fung)

(2007). On the other hand, investors can easily get loans from curb markets. Accordingly, the borrowing procedures from unorganised markets are less complicated than organised financial markets.

Van Wijnbergen (1982) asserted that there is a financial dichotomy in the financial system of developing countries because of the diversity of financial institutions operating in the economy. He classified financial institutions in developing countries into organised and unorganised financial markets, where the organised market involves the banking sector. However, the unorganised sector involves the curb market. In the organised market, savers indirectly deal with investors, where the savers keep their savings in the form of time deposits with banks and banks for their part, lend these savings to investors to finance their business. On the other hand, in curb markets savers can directly deal with investors without the need for an intermediary.

Neo-structuralist models, for example, Taylor (1983) and Buffie (1984) are based on new assumptions which are entirely different from those adopted by previous financial liberalisation models. The most important characteristic of these models is that both models focus on the curb market in terms of competition and efficiency. Neo-structuralist models assume that individuals hold their assets in three different forms, which are gold, deposits at banks and curb market credit. These forms of assets are supposed to support each other. The pioneers of this school argue that curb markets are more efficient than commercial banks in channeling savings into investment. An augmentation in the real interest rate on deposits shifts the assets from unorganised markets to organised, resulting in a decrease in the supply of loans. This negatively affects investment and consequently leads to a decline in the growth rate. Therefore, neo-structuralists suggest that in the presence of effective organised markets, financial deregulation may have a negative influence on investment and then, on economic growth. However, Owen and Solis-Fallas (1989) argue that it is unrealistic to assume that curb markets operate efficiently. Furthermore, Fry (1988) argues that it is not essential that curb markets are more competitive than the banking sector.

2.5.8 Financial Structure and Economic Growth Theory

Both the banking sector and financial markets provide convenient financial services. However, there is a significant difference in the provided services in terms of type, quality and quantity.

These differences generate a significant friction between banks and financial markets and give more attention to the issue of financial structure in the long run growth process. The finance-growth literature considered the issue of financial structure and long-run growth a long time ago. According to the existing literature there are two main structures in any financial system. First, a bank dominated financial system. Second, a financial market dominated financial system. Levine said that *"For over a century economists and policymakers have debated the relative merits of bank-based versus market-based financial systems"* (Levine, 2002, p. 398). In economies with bank-based financial systems, banks are the main provider for long-term funds, while in market-based financial systems equities and bonds have a considerable role in the long-term financing process.

The best examples for bank-based financial systems are Japan and Germany, where the banking sector in these countries dominates the processes of mobilising saving and provides risk management vehicles. However, the best examples for market-based systems are the UK and USA, where the financial markets in these countries have a considerable role in the banking sector, linking savers and investors (Sawyer, 2014). An overview of both financial structures is provided below:

2.5.8.1 Bank-Based View

The bank-based view is based on the notion that an expansion in the financial system, especially the banking sector, increases savings, provides loanable assets and increases lucrative investment. The bank-based view proposes that banks have the capacity to determine profitable investment and mobilise and locate resources, and that they have the ability to manage current and potential financial risks. It is also suggested that banks are very efficient in classifying borrowers in terms of their ability to repay loans. Furthermore, the advocates of this view argue that an enlargement in financial associations and their accomplishments would have a great role in channeling savings into more effective and productive investment and thereby, will enhance overall economic growth.

One of the first pioneers of this thought was Alexander Gerschenkron (1962) who attributed the development of iron production in France to the advancement of the banking industry. In addition, he pointed to role of banks in infrastructure construction and the development of cities *"the immediate effects of creating financial organisations designed to build thousands of miles of railroads, drill mines, erect factors,… and modernising cities "* (Gerschenkron, 1962, p. 12).

Furthermore, he emphasised the positive effect of banks on organisational structure; "*the effects were not confined to the productive structure of industry. They extend to its organisational structure* " (Gerschenkron, 1962, p. 15).

Economists emphasised the leading role of the banking sector in the growth process. For example, Levine (2002) pointed to the positive advantage of a bank-based financial system structure in enhancing economic growth, since banks efficiently improve the allocation of capital through the collection of information from investors and firms, and assess their financial status and ability to repay loans. Furthermore, banks are efficient in tackling asymmetric information (Arestis and Demetriades, 1996). Boot and Thakor (1997) stress the critical role played by banks in easing information asymmetries and this ameliorates capital allocation.

Some economists argue that a bank-based financial system is better than a market-based financial system. Goldsmith (1969) for example, realised that the bank-based financial system in Germany ameliorates the relationship between banks and firms in the economy. Porter (1992) mentioned that the close link between banks and firms in Japan increases loanable funds to firms and thereby enhances growth. Soskice and Hall (2001) contend that a bank-based financial system is more prominent in corporate governance than stock market-based financial systems. Sawyer (2014) argues that it is not easy to anticipate a financial system without a banking sector as a provider of credit, however, it is not difficult to anticipate one without a financial market. The banking sector refers to central banks as issuers of domestic currencies and commercial banks. The latter continued by arguing that a bank-based financial system is not required to include a financial market, but a market-based financial system requires a banking sector. Sawyer (2014) suggests that the banking sector is involved in financial market processes, while the banking sector is not part of a financial market process. Proponents of a bank-based financial system stress the limitations of financial market-based systems. Boot, Greenbaum and Thakor (1993) for example, argue that advanced financial markets immediately reveal information, which minimises the motivation for firms to acquire financial information. However, this problem is mitigated in bank-based financial systems, since banks gradually reveal information in financial markets (Levine, 2002). Moreover, investors prefer credit to finance their projects rather than bonds, since banks are the main providers of credit. This creates advantages for bank-based-systems over market-based systems (Chowdhury and Islam, 1993).

2.5.8.2 Market-based View

A financial system can be classified as financial market-based if investors mainly rely on market securities in funding their long-run investment.

The advocates of market-based financial systems assume that financial market allocations minimise liquidity risk, ease information processes and decision making, and permit better portfolio variation. Diamond (1984) argues that financial markets are better than banks in terms of dissemination of financial information. Stiglitz (1985) stressed that advanced financial markets have a tendency to reveal information more quickly, which minimises incentives for investors to obtain information. Moreover, in the presence of the issue of diversity of opinion between investors, a financial market-based system is better than a bank-based system in providing funds for investment (Allen and Gale, 1999).

2.5.9 Causal Relationship between Financial Development and Economic Growth

The prevailing impression in the finance-growth nexus about the relationship between financial system development and economic growth is that financial development positively influences economic growth (Fry, 1988). However, the issue of causality between them was an important subject of debate among economists, since the nineteenth century (Nyasha and Odhiambo, 2014).

Patrick (1966) has identified three possible hypotheses of the causal relationship between the development of a financial system and economic growth, which are "supply-leading hypothesis", "demand-following hypothesis", and "bidirectional hypothesis".

The supply-leading hypothesis suggests that financial system deepening is important and causes economic growth, therefore, a rise in financial institutions and their financial services supply would motivate the growth rate. This hypothesis has recently been promoted by other economists, for example, Levine (2003); McKinnon (1973); Shaw (1973). According to Patrick (1966) the supply-leading pattern generates two functions; First, it facilitates the flow of resources from lower growth sectors to higher growth sectors. Second, this pattern improves the structure of the existing capital stock and creates incentives that increases the rate of savings and investment, all that lead to an increase in capital formation. Thus, the supply-leading pattern suggests that economic growth is promoted through channeling savings into profitable

investment. Therefore, financial development causes real sector growth and the causality flows from financial system development into economic growth.

However, demand-following hypotheses suggest that advancement in the financial system occurs as a result of economic growth. Keynesian theory attributes the development of the financial system to the expansion in government expense (Karimo and Ogbonna, 2017). McKinnon's (1973) model shows that an enlargement in government expenses increases aggregate demand and the demand for money. Robinson (1952), argues that the growth of the real sector is accompanied by an increase in demand for financial services provided by the financial system, and this result is an advancement in the financial system. Therefore, economic growth causes financial development and the causality flows from economic growth towards financial development (Goldsmith, 1969; Lucas, 1988; Ndlovu, 2013; Robinson, 1952).

Karimo and Ogbonna (2017) argue that there are two hypotheses in between Patrick's (1966) hypotheses, which are the feedback hypothesis and the neutral hypothesis.

The feedback hypothesis proposes that the relationship between financial development and economic growth is mutual. This implies that there is a bidirectional causal relationship between them running in both directions.

While the exogenous growth models developed by McKinnon (1973) and Shaw (1973) support the supply-leading hypothesis by Patrick (1966), the endogenous growth models developed by Greenwood and Jovanovic (1990); Greenwood and Smith (1997 and King and Levine (1993a) support the feedback hypothesis. Endogenous growth theory suggests that as a financial system is developing, information decreases, and the available resources can be allocated more efficiently and in turn, this improves the accumulation of capital and enhances the growth rate. On the other hand, as economic growth increases, the demand for financial services increases and this leads to an advancement in the financial sector.

Finally, while the feedback hypothesis suggests that there is a continuous causal relationship between financial sector development and the level of the growth rate, the neutral hypothesis proposes that this relation does not exist between them, and neither do they have a significant impact on each other (Ram, 1999). The pioneers of the feedback hypothesis argue that both financial development and economic growth are determined by another economic factor. Moreover, some economists underestimated the significance of financial development in the

overall growth process. Lucas (1988) argues that the significance of financial development is over-stressed.

From the above discussion, it can be concluded that the causality direction among financial system development and growth depends on the phases of growth. The supply-leading hypothesis is supposed to exist in the early phases of the growth process. Both savers and investors benefit from the newly produced financial services and capital accumulation increases during this phase. However, in the later phases of economic growth the supply-leading hypothesis shrinks, and the demand-following hypothesis starts to exist. In the next phase of growth, the demand for financial services increases because of a mature real sector and this stimulates the financial sector to develop. In other words, the supply-leading hypothesis prevails in the early stages of economic growth, whereas, the demand-following hypothesis prevails in the later phases of economic growth.

2.5.10 Financial Development in Endogenous Growth Theory

This section attempts to review the theoretical framework on endogenous growth theories.

Reviewing the economic growth literature shows that Romer (1990) offered a starting point of what is now called the theory of endogenous growth. Endogenous growth theory argues that the financial system permits investors and firms to engage in innovative business, which positively influences the growth rate. In contrast to the Neoclassical approach of earlier models, endogenous growth theory introduces the view of having models achieving steady-state economic growth.

Since the 1990s many studies have attempted to include the indicators of financial system development in endogenous growth models. Greenwood and Jovanovic (1990) developed endogenous growth models and employed these approaches in identifying the channels through which the financial system impacts the growth rate. This model argues that the financial system provides liquidity, minimises investment risk, mobilises savings into lucrative investment and this improves the growth rate.

The pioneers of endogenous growth theory in general, and Dutt (1990) in particular argue that the changes in the rate of technology would have a positive effect on investment. They believe that companies need to use modern machines with new technology and to adopt innovative

production processes in order to create different products. Also, the changes in technological rates lead to a reduction in the savings rate due to the increase in the demand for newly produced goods and this increases capacity utilisation and economic growth in the long-run period. Finally, changes in technology rates affect the rate of mark-up charged by companies, thereby boosting capacity utilisation and the growth rate.

King and Levine (1993b) have developed another endogenous growth model to identify the transmission channel among financial deepening and economic growth. This model is based on the fact that technical innovation is the engine of economic growth. The financial system allocates resources efficiently through an evaluation process for existing and potential projects and thus supports and finances the most profitable projects. Therefore, a well-functioning financial system leads to a greater economic growth (Demetriades and Hussein, 1996).

Also, endogenous growth models focus on the role of advanced financial sectors in reducing information asymmetries and other financial market deficiencies, which promote the efficiency of capital resources, since this promotes the growth rate. Moreover, an increase in economic growth increases the demand for financial services, subsequently, this improves the efficiency of the financial system. According to neo-classic growth theories, there is a constant equivalence between savings and investment. Therefore, financial resources are automatically and more efficiently allocated to productive projects. Since the financial system has direct impacts on the rate of deposits and loans, the improvement in this system can lead to higher levels of investment. However, this is true in the short-run period, but it is not in the long run, as economic growth in neo-classical models is only subject to exogenous technological advancement.

Moreover, the modern growth models highlight the importance of the scale effect, the accumulation of information and knowledge and scientific innovations in increasing the growth rate in the long-run period. These new models suggested that the growth rate can be determined endogenously within the model and showed that long-run economic growth can be affected by endogenous factors such as income distribution and modern technology, but not exogenously. Therefore, such models provide theoretical reinforcement to investigate the linkage between financial development and economic growth in the long-run period.

Based on Goldsmith (1969) and McKinnon and Shaw (1973) models, Greenwood and Jovanovic (1990) develop an endogenous growth model to investigate the long-run association

between financial deepening and aggregate growth. Their model formalises the mutual relationship between finance and growth. On the one hand, growth stimulates investments, particularly investment in the financial sector, which leads to its growth and development. On the other hand, the financial sector contributes to increasing growth rates through providing useful information to investors and optimising the use of financial resources. In the initial economic growth stages, the growth rate increases slowly to some extent because the financial system is still weak. As the financial system grows and develops, it becomes more efficient and more able to enhance economic growth.

Based on the view of Diamond and Dybvig (1983) regarding bank runs and liquidity, and the Prescott and Boyd (1987) endogenous growth model, Bencivenga and Smith (1991) developed an endogenous growth model which involves several financial assets. This model suggests that financial intermediaries are the main source of liquidity. Bencivenga and Smith (1991) argue that financial intermediaries impact the amount and composition of savings in favour of capital accumulation, therefore, they promote economic growth. The researchers suggest that financial intermediaries encourage savers to reduce their non-productive assets, and permit economies to avoid misallocation of available capital due to an increase in demand for liquid assets. According to Bencivenga and Smith (1991), saver behavior impacts the equilibrium rates of economic growth. Particularly, to the extent that financial intermediaries would augment investment and increase aggregate growth. Their model implies that advancement in the financial intermediation industry will promote real economic growth through the more efficient use of savings.

2.6 Foreign Direct Investment, Financial Development and Economic Growth Theory

Both foreign direct investment and financial institutions are the main sources of funds for domestic firms and investors. Next to financial development, the finance-growth literature emphasises the positive role of foreign direct investment in enhancing economic growth. Hermes and Lensink (2003) argue that foreign direct investment increases capital formation in host countries and introduces innovative technologies, thereby enhancing economic growth. Lee and Chang (2009) claim that foreign direct investment has positive outcomes, such as managerial skills and modern processes, the process of technological transfer, international networks, and skill of local employees.

De Mello Jr (1997) asserted that there are two main channels through which foreign direct investment may affect economic growth. First; through capital spillover, such as using new technological methods to produce goods and services and improving the efficiency of domestic firms. Shahbaz and Rahman (2012) argue that existing and advanced foreign technology is the most important benefit of foreign direct investment. Second, foreign direct investment improves economic growth through knowledge transfer and acquisition of skills, where foreign direct investment develops the quality of local employees and increases their productivity through providing advanced training programs. Becker (1993) argues that people productivity can be improved by training and education. In addition, Jones (2002) pointed out that the accumulation of knowledge is the engine of growth. Also, foreign direct investment provides domestic firms with funds that are required for their investment, physical capital and administration skills (Shahbaz and Rahman, 2012).

However, the impact of foreign direct investment on economic growth does not seem entirely positive. Foreign firms may realise negative scale effects, and this negatively affects the productivities of local firms. Omran and Bolbol (2003) claimed that foreign direct investment improves the productivity of domestic firms only if there is a considerable technological gap among domestic and foreign firms. Moreover, foreign direct investment may crowd out domestic investment. Therefore, the positive influence of foreign direct investment on economic growth depends on absorptive capacities in the host economies, such as human capital, suitable infrastructure and financial development. More attention in the recent FDI-growth literature to the role of advanced financial systems in enhancing the relationship between foreign direct investment and economic growth is presented by Adeniyi, Omisakin, Egwaikhide and Oyinlola (2012); Alfaro, et al., (2004); Hermes and Lensink (2003; and Lee and Chang (2009).

Adeniyi, et al. (2012) asserted that a developed financial system enhances the capacity of receipt countries to benefit from foreign direct investment in the following ways. First, financial system development enables domestic firms to access modern technologies, purchase new production equipment, and attract highly skilled workers. Second, a well-developed financial system enables foreign firms to obtain the required credit for their business easily without any constraints, *''A developed financial sector allows credit-constrained entrepreneurs to start their own business''* (Shahbaz and Rahman, 2012, p. 202), and this increases the production of intermediary goods, increases aggregate demand and eventually, leads to an

improvement in domestic activities. Finally, financial system development allows foreign direct investment to produce backward linkages with all domestic sectors. Hence, a well-advanced financial system is necessary in receiving countries to take advantage of foreign direct investment features. *"development of financial institutions is prerequisite to obtain positive spillovers from FDI"* (Shahbaz and Rahman, 2012, p. 202).

2.7 Conclusion

The finance-growth nexus is not very old in the history of economic literature. Economic theories have long been concerned with the financial system and its basic functions, but this interest has been focused on the analysis of these functions and not too much more. The emergence of ideas about the performance of the financial system was somewhat intuitive, and they were later developed by some economic theorists.

One of the most prominent and oldest of these thinkers was Fisher (1906), who praised the role of the functions of the financial system in initiating economic activities. Specifically, he focused on the role of the financial sector in the allocation of available resources in the economy over time. Moreover, he observed that possible risks may result from this process. Furthermore, the *"separation theory"* developed by Fisher (1930) argues that in efficient financial markets the decision of investment should be taken independently from the decision of inter-temporal consumption.

In monetary theories, Keynes (1936) and Hicks (1936) inspired Markowitz) (1952) to develop the theory of portfolio selection later in 1952, which had an important role in the evolution of theories of growth. However, many economic theorists of that period were not viewing financial markets as markets of demand and the supply side. They assumed that the prices of assets were determined by the expectation of the returns on capital. The monetary theorem of Keynes (1936) debates the issue finance and assumes that saving has no direct impact on the levels of interest rate and thereby, investment. Therefore, the Keynesian debates were against the view of financial liberalisation and supporting financial liberalisation (Keynes, 2016). The financial repression view dominated for several years. However, this view has gradually changed since the 1960s. For example, Robinson (1952) stresses the role of the financial system in enhancing growth.

In the 1970s the debate on financial development and growth focused on the issue of financial liberalisation. Based on Keynesian theory (1936) and Tobin's model (1965), many

governments have implemented different monetary policies to liberalise their financial system, such as lowering interest rates and inflationary policies, in order to increase the rate of savings and generate economic growth. However, McKinnon and Shaw (1973) had a different view regarding financial repression policies. They argued that such policies would negatively affect savings rates, financial market efficiency and economic performance. McKinnon and Shaw (1973) highlighted the importance of financial liberalisation in improving the financial system and accelerating the growth rate.

In the 1980s the McKinnon and Shaw (1973) theoretical framework was criticised by neo-structuralists and post-Keynesian economists. On the one hand, neo-structuralists predict that a liberalised financial system slows down the process of economic growth. They argue that financial liberalisation has a reverse impact on the rate of investment and thus, economic development. Neo-structuralists criticised the theoretical grounds of the financial liberalisation view of financial market failure. On the other hand, post-Keynesian theorists emphasise the issue of asymmetric information in making financial markets imperfect and less competitive. This in their view, justifies government intervention to set sensible regulations to make financial markets more stable and to avoid the risk of market failure. Moreover, post-Keynesian scholars argue that freeing the financial sector through the intervention of lowering interest rate levels would negatively affect aggregate demand and thereby, incomes. Consequently, this reduces the rates of savings and investments, and economic growth.

Also, the theoretical literature on the finance-growth link involves another important subject, which is the bank-based financial system versus the financial market-based financial system. The bank-based view suggests that the banking sector is highly efficient in relocating resources and determining profitable investment. Arestis and Demetriades (1996) emphasised the role of banks in simplifying information asymmetry. Some theorists debate that economies that adopt bank-based financial systems are much better than those that adopt financial market-based systems. Soskice and Hall (2001) contended that banks are more important than financial markets in corporate governance. Sawyer (2014) argued that there is no financial structure without banks.

According to the above reviewed theoretical literature there are two frameworks of causal links between financial development and the growth rate. First, the supply-leading hypothesis. This hypothesis suggests that finance motivates growth. The advocates of the supply-leading hypothesis assume that existing resources flow from slower growth sectors into rapid growth

sectors and this increases capital formation. Therefore, the supply-leading pattern suggests that the growth rate can be stimulated via directing available savings into productive investment.

Second, the demand-following hypothesis. This hypothesis suggests that economic growth leads to advancement in the financial system. The supporters of this pattern assume that as economies develop the demand for financial services increases and this would lead to development in the financial system. In addition to these two main patterns of causal relationship between financial development and economic growth, the theoretical literature has identified two more hypotheses, which are the feedback hypothesis and the neutral hypothesis. These two hypotheses are located in between the supply-leading and the demand-following hypotheses. The feedback pattern suggests that there is a mutual relationship between finance and growth. This indicates that the link between the two macroeconomic variables runs towards two directions between them. Endogenous growth theory supports the feedback hypothesis (Greenwood and Smith, 1997). However, the neutral hypothesis suggests that the association among finance and growth is thought not to exist.

Finally, this chapter reviewed the hypothetical literature on the connection between foreign direct investment, financial development and total growth. According to previous theoretical efforts, foreign direct investment impacts economic growth through two main channels which are capital spillover and knowledge transfer. Foreign direct investment provides host countries with modern technology that can be used to develop the production process. Moreover, foreign direct investment improves the productivity of local employees through appropriate training programs, since this also enhances economic growth.

In this vain, the theoretical literature showed that financial system development enhances the link between foreign direct investment and the growth rate, where the development of the financial system allows local enterprises to benefit from new technologies and to employ highly productive workers on one hand. On the other hand, the development of the financial system provides loanable founds for foreign enterprises without any limitations.

To this end, reviewing the above theoretical literature generates three significant themes. First, the theoretical literature focuses only on banking sector and stock market when investigating the relationship between financial system development and the total growth, and it does not consider this relation from other view like insurance sector development as a component of financial system. Therefore, there is a need to involve insurance sector when studying the

relationship between financial system development and economic growth. Second, the theoretical literature concentrates on the direct relationship between financial development and economic growth. However, there is no attention to the indirect impact of financial system development on economic growth that generated from the effect of financial system components on each other, For example, there is indirect impact resulting from banking sector development on economic growth through the direct impact of banking sector on stock market. This impact may exaggerate the final impact on economic growth, and vis versa, the stock market may indirectly impact economic growth through its impact on banking sector. Therefore, there is a need to investigate such issue. Finally, the finance-growth literature gives less attention to the channels through which financial system development improve the entire growth like domestic and foreign investment. Therefore, new studies are needed to consider this issue during the process of economic growth.

Chapter Three: Research Methodology

3.1 Introduction

The study attempts to investigate the issue of financial development and economic growth in *G20* countries, from different angles. Specifically, it investigates the impact of the development of financial system components on economic growth, the impact of the two main components on each other during the economic growth process and the role of financial system development in enhancing foreign direct investment, domestic investment and human capital to have a positive impact on economic growth. Therefore, an appropriate methodology with different modern econometric techniques is essential to provide a clear framework and suitable tools to clarify the dynamics of the connection among financial system development and economic growth, also, to avoid potential statistical estimation issues.

Thus, the methodology and the investigative methods followed in this study, are based on recent models of financial development and economic growth developed by mainstream theorists, including related macroeconomic variables, for example, the growth rate, banking sector, stock market, insurance system, foreign direct investment, domestic investment, human capital and some other macroeconomic variables used as control variables.

First of all, this thesis reviews and assesses the related theoretical and empirical literature using a combination of logical methods and applying fundamental economic philosophies, adopting deductive and inductive approaches, analogy and comparison methods in order to provide a constructive criticism of the academic literature and a deeper understanding of the relationship between financial development and total growth.

Second, analysing the financial system development and economic growth relationship presumes gathering, collecting and analysing secondary data on the suggested context from official sources. This study uses basic statistical methods and dataset from the World Bank and IMF publications on *G20* countries over the time period 1989 to 2015 in order to provide descriptive and graphical analyses.

Third, in addition of the theoretical investigation, the thesis relies on empirical investigations to explore the relationship between financial development and economic growth. Therefore, the methodology also involves a quantitative element which depends on econometric models

and uses econometric procedures to provide an empirical analysis of different aspects of the connection between financial structure development and economic growth and tests the suggested hypotheses.

For empirical investigation purposes this thesis investigates three related topics under the finance-growth nexus, employing three different econometric methodologies:

First, an autoregressive distributed lag to co-integration technique *(ARDL)* is used to examine the impact of the banking sector, stock market and insurance sector on economic growth separately.

Second, a panel data fully modified Ordinary Least Squares approach with Engle-Granger examines the existence of the long-run association between banking sector development and stock market development and the casual relationship between them. The methodology involves implementing a correlation test to find out whether these two financial components are complementary or if they substitute each other during the economic growth process.

Finally, a *Kao* co-integration method and panel data 2-stages Ordinary Least Square estimation, *GMM* estimation technique with an interactive term are used in order to examine the effect of financial system development in enhancing the positive relationship between foreign direct investment, domestic investment and human capital on one hand, and economic growth on the other.

It is appropriate here to mention that each method was selected based on its efficiency and in accordance with the nature of the data and the purposes of analysis and objectives of the study. For example, we employ ARDL estimation technique, FMOLS estimation method, and instrumental variable estimation procedure to deal with the issue of endogeneity that found in the most growth models and to problem of a single country effect.

Based on the main objectives of the thesis and the hypotheses to be tested, the empirical investigation involves five samples from *G20* countries. The number of countries and the time period of each sample was chosen taking into account the availability of data, inclusion of more countries, use of the latest available data, a set of data that covers a sufficiently long enough period for econometric analysis.

In three empirical chapters, this study investigates three related topics about the relationship between financial development and economic growth in *G20* countries. Therefore, based on

the goals to be achieved, the empirical investigation in each chapter requires the use of different data sets from different members of *G20* countries, over different time periods. In addition, it requires different econometric techniques.

Accordingly, this chapter's main objectives are to show the used data, its sources, the time period and the employed econometric approach in each empirical section. In doing so, the following three sections in this chapter are organised to present the data used, specification of employed models and the econometric analysis adopted in chapters four, five and six respectively.

3.2 The Employed Methodology in Chapter Four

3.2.1 Data and Model Specification

3.2.1.1 Data

Three main sources of data have been used in this study, from the *"World Development Indicators" (WDI)* online database, the *"Global Financial Development Database" (GFDD)* and the *"International Monetary Fund" (IMF)* online. The study has covered comprehensive datasets for the period 1990-2014 and 18 countries from the *G20* (the European Union and Russia have been excluded from the sample due to data insufficiency. Furthermore, only two observations were unavailable, Argentina's inflation value in 2014 and South Africa's credit to private sector value in 1991. Accordingly, the mean value of the variable in that country was used instead of the missing observation.

Due to the nonlinear relationship among dependent and independent variables, data have been transformed into natural logarithms (Zhang, Wang and Wang, 2012). Because the values of inflation, life insurance and non-life insurance are lower than one in some countries, taking natural logarithms produces negative values (Lee and Chang, 2009). Thus, to avoid this problem we added one to the series (log (1+X)) (Andriansyah and Messinis, 2014). Moreover, following Lartey (2010), Levine, Loayza and Beck (2000) and Liang and Reichert (2012), the data have been differentiated to eliminate the country specific-effect, except two control variables; inflation and human capital have only been transformed into natural logarithms.

The selected data have been used to create three balanced panel data sets in order to examine the individual impact of the development of each component of the financial system on the growth rate. Preparing samples was achieved by taking into account that each sample involves

a number of time series to meet the needs of the suggested model, involve a number of countries representing more than half of the total sample and covers a sufficient time period allowed to conduct economic and econometric analysis efficiently.

Thus, in addition to a number of selected macroeconomic variables to be utilised to control the regressions, each sample involves two indicators to indicate the development of the desired financial sector. While the first data set will be used to investigate the impact of the banking sector on economic growth, the second data set will be used to investigate the impact of the stock market on economic growth. However, the third data set will be used to investigate the impact of the insurance sector on economic growth.

3.2.1.1.1 Sample 1

This sample has been constructed in panel data form to be used in examining the impact of banking sector development on economic growth. It involves data from 14 countries, which include Argentina, Australia, Brazil, China, India, Indonesia, Japan, Korea Republic, Mexico, Saudi Arabia, South Africa, Turkey, UK and the USA over the period 1989 to 2014.

The sample includes six time series, where four variables are drawn from World Bank Indicator Statistics (*WBI*). These variables are; *GDP* per capita which will be used as an indicator of economic growth in our study, Credit to Private Sector CPS and money supply $m2$ both will represent development in the banking sector. The labour force indicator HC will be used as a proxy for human capital. In addition, the sample includes two variables downloaded from International Monetary Fund (*IMF*) online statistics. These two variables are the investment rate i-imf, and the customer price index which will be used as an indicator of the inflation rate.

Based on our hypothesis that banking sector development has a positive impact on the growth rate, GDP will be used as a dependent variable, while credit to private CPS, money supply $M2$, investment rate $i - imf$, inflation rate $cpi - imf$, and human capital all will be used as independent variables. Therefore, the general formula for the equation to be tested will take the following form:

$$Y_i = BDI_i + CV_i \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.1)$$

Where:

Y_i is Economic growth rate.

BDI_i is banking sector development indicators.

CV_i is control variables.

3.2.1.1.2 Sample 2

This sample will be used to test the effect of stock market development indicators on the level of economic growth in G*20* countries. This sample, in addition to gross domestic product per capita GDP time series, contains stock market development indicators and three control variable time series. On one hand, both stock market capitalisation SMC, and turnover ratio TOR are used to reflect the development of the stock market. Specifically, they indicate the size and the efficiency of the stock market respectively. On the other hand, investment ratio $i - imf$, life expectancy rate hc, and customer price index $cpi - imf$ are used to control the estimated regression in order to avoid the existence of econometric issues due to omitted variables.

The time series of gross Domestic Product per capita GDP, stock market capitalisation, SMC, turnover ratio TOR and the life expectancy rate are all drawn from the "World Bank Indictors" online database. However, both the consumer price index and $cpi - imf$ and the investment rate $i - imf$ time series are drawn from 'International Monetary' Fund IMF online statistics.

The selected sample involves 16 countries of the *G20* (Argentina, Australia, Brazil, Canada, France, Germany, India, Indonesia, Italy, Japan, Korea Republic, Mexico, South Africa, Turkey, UK and the USA) during the time period 1990 to 2012.

Based on the hypothesis that stock market development has a positive impact on economic growth, the suggested regression equation should use the time series of gross domestic product per capita as a dependent variable, whereas stock market capitalisation SMC and turnover ratio TOR should be treated as relevant variables and the investment rate $i - imf$, customer price index $cpi - imf$ and life expectancy time series are control variables. Therefore, the regression formula will be as follows:

$$Y_i = SMDI_i + CV_i \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.2)$$

Where:

Y_i is the economic growth rate.

$SMDI_i$ represents stock market development indicators.

CV_i represents control variables.

3.2.1.1.3 Sample 3

This sample is selected to test the impact of insurance sector development on economic growth. This sample contains six time series for 16 countries of the *G20* for 18 years starting from 1993. All the data were drawn from the "World Bank Indicators" online database except investment rate $i - imf$ and the consumer price index time series was downloaded from the "International Monetary Fund" (IMF).

The sample includes life premium and non-life premium time series in order to measure development in the insurance sector. To measure the impact of insurance sector development on the total growth rate, gross domestic product per capita is used as a dependent variable, however, life premium LP and non-life premium $N - LP$ are used as independent variable in the regression model and control the three remaining variables. Consequently, the regression equation proposes to take the following formula:

$$Y_i = ISDI_i + CV_i \dots\dots\dots\dots\dots\dots\dots\dots\dots. \dots\dots\dots. (3.3)$$

Where:

Y_i is the economic growth rate.

$ISDI_i$ represents insurance sector development indicators.

CV_i represents control variables.

3.2.1.2 Models Specifications

To analyse and investigate the relationship between financial development and economic growth for *G20* countries for the period 1989 to 2014, three panel data models have been specified according to the financial system components (banking sector, stock market and insurance sector). Therefore, the models investigate the relationship between economic growth and each component of the financial system separately. Gross domestic product gdp is employed as a dependent variable in each model to capture economic growth. These models are as follows.

First, the banking sector model is constructed to examine banking sector development in relation to economic growth. Two indicators have been derived from the literature to be used as independent variables; credit to private sector denoted by CPS, and money supply $m2$.

Second, the stock market model is built by including independent variables for the turnover ratio tor and stock market capitalization smc to investigate the relationship among development of the stock market and economic growth.

Finally, the insurance sector model is specified with two proxies of insurance sector improvement, life premium LP and non-life premium as independent variables to estimate the link between insurance sector development and the growth rate.

To escape the issue of omitted variables and increase model robustness a set of three control variables are drawn from the related literature, which are investment rate i_imf, inflation rate cpi_imf and human capital hc captured by life expectancy rates, were used in each model.

Due to the limitation of data for all G20 countries during the study period, each model of the three applies to a specific group of countries and a definite period of time. Firstly, banking development applies to a group of 14 countries of the G20for the period 1989 to 2014. Secondly, the stock market model which includes 16 of the G20over the period 1990 to 2012. Finally, the insurance sector model comprising 16 countries from all samples for a period of 18 years, starting from 1993 and ending at 2010. Despite the latter model covering a lesser period of time, it still includes more than 90% of the sample countries and covers an important period of time ranging before and after the financial crisis.

Based on the reviewed literature of finance-growth, specifically endogenous growth theory and following Zhang et al, (2012) and Akimov, Wijeweera and Dollery (2009), financial development and economic links can be represented by the following function:

$$Y_t = f(FD_t, CV_t) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.4)$$

Where:

Y_t = Economic growth.

FD_t = Financial development.

CV_t = A set of control variables (inflation, domestic investment, human capital)

If we substitute FD_t in equation (3.4) with BD_t, SD_t and ID_t interchangeably, then we will obtain the following equations:

$$Y_t = f(BD_t, CV_t) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.5)$$

$$Y_t = f(SD_t, CV_t) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.6)$$

$$Y_t = f(ID_t, CV_t) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.7)$$

Where:

BD_t = Banking sector development.

SD_t = Stock market development.

ID_t = Insurance sector development.

If we include the above-mentioned measures of economic growth, financial development and the suggested control variables in (3.5), (3.6), and (3.7), then we can obtain the following three models, which are appropriate to characterise the link between the development in each component of the financial system (banking sector, stock market and insurance sector) and economic growth.

First, by including the suggested indicators of banking sector development and control variables in (3.5), we can obtain the following model:

$$lngdp_t = f(lncps_t,\ lnm2_t,\ lni\_imf_t,\ lncpi\_imf_t,\ lnhc_t) \ldots\ldots\ldots\ldots\ldots (3.8)$$

Where:

$lncps_t$ = Credit to private sector.

$lnm2_t$ = Money supply.

$lncpi\_imf_t$ = Inflation.

$lnhc_t$ = Human capital.

Second, by including the proposed measures of stock market development and control variables in equation (3.6), we achieve the following model:

$$lngdp_t = f(lntor_t,\ lnsmc_t, ln\ i\_imf_t, lncpi\_imf_t,\ lnhc_t) \dots\dots\dots\dots\dots (3.9)$$

Where:

$lntor_t$ = Turnover ratio.

$lnsmc_t$ = Stock market capitalisation.

Third, if we involve the suggested proxies of the insurance sector in equation (3.7), then the following model is obtained:

$$lngdp_t = f(lnlp_t, lnn\_lp_t, lni\_imf_t, lncpi\_imf_t, lnhc_t) \dots\dots\dots\dots\dots\dots (3.10)$$

Where:

$lnlp_t$ = Life premium.

lnn_lp_t = Non-life premium.

Recalling that equations (3.8), (3.9) and (3.10) aforementioned can be optimised by the following three econometric models:

Model (1) - Banking sector development.

$$lngdp_t = a_\circ + lncps_t + lnm2_t + lni\_imf_t + lncpi\ \_imf_t + lnhc_t + \varepsilon_{it} \dots (3.11)$$

Model (2) - Stock market development.

$$lngdp_t = a_\circ + lntor_t + lnsmc_t + lni\_imf_t + lncpi\ \_imf_t + lnhc_t + \varepsilon_{it} \dots (3.12)$$

Model (3) - Insurance sector development.

$$lngdp_t = a_\circ + lnlp_t + lnn\_lp_t + lni\_imf_t + lncpi\_imf_t + lnhc_t + \varepsilon_{it} \ldots (3.13)$$

Where:

$a_\circ$ = Constant term.

ε_{it} = White noise residuals.

3.2.2 Econometric Methodology of Chapter Four

The followed econometric methodology in chapter four of this thesis is based on an ARDL Co-integration approach. Until the late1990s, the traditional statistical estimation methods dominated the finance-growth literature but these methods are often accompanied by some statistical problems, for example, spurious estimation, since they assume that all the time series involved in the regression are stationary. However, most of prior empirical studies on the finance-growth nexus have shown that most time series are non-stationary, they suffer from infinitive variance and their mean is different from zero. Accordingly, the traditional estimators relied on non-realistic assumptions and would produce uncertain estimation and would lead to spurious regression.

As a majority of macroeconomic time series are assumed to have a unit root over time and are integrated (Hendry and Doornik, 2001), the previous econometric analysis relied on the technique of taking the first difference of any time series that has a unit root. However, this procedure is often accompanied by the problem of losing long-term information. Therefore, to avoid such problems recent research has adopted co-integration techniques for analysing the long-run relationship between time series. Mainly, co-integration techniques are used for investigating long run relationships between time series. As this thesis involves economic growth and financial time series which are assumed to be have unit roots, co-integration procedures are required to establish long-run patterns.

The econometric literature has identified three common co-integration methods which are the two step methods developed by Engle and Granger (1987), the Johansen likelihood method and the ARDL co-integration method developed by Pesaran, Shin and Smith (1999).

Although the two-step co-integration method is adequate for bivariate models, it is not applicable in the case of multivariate models. As this study deals with regressions involving more than two-time series, it is unlikely to use two step co-integration approaches. Also, Johansen co-integration methods cannot be applied if the time series are not co-integrated of the same order. Whereas, the *ARDL* co-integration method is more flexible and has the advantage of tackling such problems, where it can be applied even the time series are co-integrated of different order (Pesaran and Pesaran, 1997). Inder (1993) argues that the *ARDL* co-integration technique yields a reliable estimation, in comparison with other techniques, even if there is a misspecification in the dynamic model, and it produces reliable t-test results.

The advantages of *ARDL* co-integration techniques over other available techniques makes them suitable for empirical investigation. Therefore, to investigate dynamic and long run relationships between financial development and economic growth, this study adopts a more recently popularised co-integration technique known as the *ARDL* co-integration approach developed by Pesaran and Shin (1995) and Pesaran, Shin and Smith (2001).

This technique has been adopted for several reasons. First, the *ARDL* approach is appropriate to address two common econometric issues in financial data which are endogeneity and serial correlation. Pesaran et al. (2001) asserted that endogeneity and serial correlation can be corrected if *ARDL* is adopted with a sufficient number of lags. Also, Yaoxing (2010) notes that using appropriate lags in *ARDL* models helps to correct the serial correlation between residuals and solves the endogenous regressors issue.

Second, an *ECM* can be simply obtained from an *ARDL* model through linear transformation (Banerjee, Dolado and Mestre, 1998). *ECM* links short run dynamics and long run equilibrium without any remarkable impact on long run information.

Third, *ARDL* is unlike previous multivariate co-integration techniques such as Johansen and Juselius (1990) and Engle and Granger (1987), which estimate co-integration by using OLS if lag order has been selected. Moreover, ARDL can be applied even when variables are not integrated at the same level, whereas Johansen and Juselius (1990) and Engle and Granger (1987) require integration of variables of the same order.

Fourth, relatively more efficient results can be obtained from *ARDL* procedures in case of small samples. Banerjee et al. (1998) argue that *ARDL* co-integration is more efficient than VAR approaches when the samples are relatively small.

Finally, by using non stationary dynamic panel test approaches, this study permits heterogeneity in individual specific fixed effects across countries (Jun, 2012).

Given the advantages of the *ARDL* approach over other traditional co-integration techniques, it can be used effectively and reliably for examining the relationship between the development of financial components and economic growth for *G20* countries.The general formula of the EC version of the *ARDL* co-integration model developed by Pesaran and Shin (1998) can be presented as follows:

$$\Delta Y_{ti} = a_o + \sum_{i=m}^{n} bi\, \Delta Y_{t-i} + \sum_{i=m}^{n} ci\, \Delta X1_{t-i} + \sum_{i=m}^{n} di\, \Delta X2_{t-i} + \cdots + \sum_{i=m}^{n} ni\, \Delta Xn_{t-i} + \delta_1 Y_{t-m} + \delta_2 X1_{t-m} + \delta_3 X2_{t-m} + \cdots + \delta_n Xn_{t-m} + \varepsilon_{it}. \quad (3.14)$$

Where:

ΔY_{ti} is the dependent variable.

a_o is the drift constant.

Y_{t-i} is a lagged dependent variable.

$X1_{t-i,}\ X2_{t-i}, \ldots, and\ \ Xn_{t-i}$ are the independent variables.

$bi, ci, di, \ldots, and\ ni$ are short run parameters.

$\delta_1, \delta_2, \ldots, and\ \delta_n,$ are long run parameters.

ε_{it} is a white noise error.

By embedding the variables of model (1), model (2) and model (3) in the above *ARDL* co-integration model, three error correction versions of the *ARDL* can be constructed respectively, as follows:

ARDL model (1)

$$\Delta lngdp_t = \alpha_o + \sum_{i=m}^{n} bi\, \Delta gdp_{t-i} + \sum_{i=m}^{n} ci\, \Delta lncps_{t-i} + \sum_{i=m}^{n} di\, \Delta lnm2_{t-i} + \sum_{i=m}^{n} ei\, \Delta lni\_imf_{t-i} + \sum_{i=m}^{n} fi\, \Delta lncpi\_imf_{t-i} + \sum_{i=m}^{n} gi\, \Delta lnhc_{t-i} + \delta_1\, lngdp_{t-m} + \delta_2\, lncps_{t-m} + \delta_3\, lnm2_{t-m} + \delta_4\, lni\_imf_{t-m} + \delta_5\, lncpi\_imf_{t-m} + \delta_6\, lnhc_{t-m} + \varepsilon_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.15)$$

ARDL model (2)

$$\Delta lngdp_t = \beta_o + \sum_{i=m}^{n} bi\ \Delta gdp_{t-i} + \sum_{i=m}^{n} ci\ \Delta lntor_{t-i} + \sum_{i=m}^{n} di\ \Delta lnsmc_{t-i} + \sum_{i=m}^{n} ei\ \Delta lni\_imf_{t-i} + \sum_{i=m}^{n} fi\ \Delta lncpi\_imf_{t-i} + \sum_{i=m}^{n} gi\ \Delta lnhc_{t-i} + \delta_1\ lngdp_{t-m} + \delta_2\ lntor_{t-m} + \delta_3\ lnsmc_{t-m} + \delta_4\ lni\_imf_{t-m} + \delta_5\ lncpi\_imf_{t-m} + \delta_6\ lnhc_{t-m} + \varepsilon_{it}$$.(3.16)

ARDL model (3)

$$\Delta lngdp_t = \gamma_o + \sum_{i=m}^{n} bi\ \Delta gdp_{t-i} + \sum_{i=m}^{n} ci\ \Delta lnlp_{t-i} + \sum_{i=m}^{n} di\ \Delta lnn\_lp_{t-i} + \sum_{i=m}^{n} ei\ \Delta lni\_imf_{t-i} + \sum_{i=m}^{n} fi\ \Delta lncpi\_imf_{t-i} + \sum_{i=m}^{n} gi\ \Delta lnhc_{t-i} + \delta_1\ lngdp_{t-m} + \delta_2\ lnlp_{t-m} + \delta_3\ lnn\_lp_{t-m} + \delta_4\ lni\_imf_{t-m} + \delta_5\ lncpi\_imf_{t-m} + \delta_6\ lnhc_{t-m} + \varepsilon_{it}$$.(3.17)

Where, on the left-hand side in the aforementioned three models, $\Delta lngdp_t = (lngdp_t - lngdp_{t-1})$ represents changes in economic growth as the independent variable. However, on the right-hand side, the expressions bi, ci, di, ei, fi, gi associated with the summation sign corresponds to the short run dynamics of the variables, whereas the expression from δ_1 to δ_6 illustrates the long run relationship between dependent and independent variables. While α_o, β_o , and γ_o, shows a drift constant and ε_{it} depicts a pure white noise.

3.2.3 Econometric Analysis

As we use the *ARDL* approach to co-integration to test short and long run relationships, the econometric analysis would go through a number of steps as follows:

3.2.3.1 Unit root test

Generally, co-integration techniques need to be preceded by unit root tests for the used time series to specify their integration order. This helps to choose the appropriate technique to be used for the co-integration analysis. For example, applying Johansen co-integration methods requires that the time series be estimated as stationary at first difference. Thus, in the Johansen approach of co-integration, the long run relationship exists only if the time series all have unit root at level *I(0).*

However, *ARDL* co-integration approaches require all time series to be stationary at levels and/or the first differences, and none of them at the second. If a variable/variables is/are

stationary at second differences, the *ARDL* process may collapse (Ouattara, 2004) and the calculated F-statistics suggested by Pesaran et al. (2001) become invalid due to the underlying assumption that the variables are mixed of I(0) and I(1).

As this thesis in chapter four implements an *ARDL* co-integration to estimate short and long run links among banking sector development and the growth rate; stock market development and the growth rate; and insurance sector development and the growth rate, there is a need to conduct stationary tests for all the time series. The econometric literature presents several effective unit root tests. Here, we would use an Augmented Dickey Fuller-Fisher (*ADF-Fisher*) and Phillips-Perron-Fisher (*PP-Fisher*) panel unit root test in order to confirm our result. Both tests would be implemented with trend and using the Schwarz Information Criteria (*SIC*) to select the best structure of the *ADF* model and the appropriate lags of the dependent variable.

The basic concept of these two tests is that the *ADF* unit root test is relevant where the rate of change of the variable ΔY_t is regressed on its one period lag Y_{t-1} and its first difference lags in order to solve the issue of serial correlation of the white noise term ε_t as follows:

$$\Delta Y_{ti} = \delta Y_{ti-1} + c_i \sum_{i=1}^{m} \Delta Y_{t-i}\, \varepsilon_{ti} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.18)$$

By considering the constant α and the time $b_i T$ trend the equation of the ADF unit root test can be written as follows:

$$\Delta Y_{ti} = a + b_i T + \delta Y_{ti-1} + c_i \sum_{i=1}^{m} \Delta Y_{t-i}\, \varepsilon_t \dots\dots\dots\dots\dots (3.19)$$

Then, the next step involves computing the Dickey Fuller t-test by using the following formula:

$$t_{ADF-Statistic} = \frac{\hat{\delta} - 1}{Se(\hat{\delta})} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.20)$$

The null hypothesis $H_0: \delta = 0$ assumes that the employed time series has a unit root. However, the alternative hypothesis $H_1: \delta < 0$ assumes that the employed time series has no unit root.

The decision about the time series having or not having a unit root is dependent on accepting or rejecting the null hypothesis and this is based on comparing the calculated *ADF* statistic value with the critical *ADF* statistic value. On one hand, the null hypothesis is accepted if the absolute ADF calculated value is less than the absolute *ADF* critical value and therefore the time series is not stationary and it has a unit root. On the other hand, the null hypothesis is rejected if the calculated value is higher than the critical value and then the tested time series should be stationary, and it is free from a unit root.
Based on above discussion, the co-integration order *I(N)* relies on how many times the time series is differenced to become free from the unit root. For example, if a definite time series needs to be differenced once to become stationary, then it should be integrated of order 1*I(1).*

3.2.3.2 Selecting The Optimal Number Of Lags For The ARDL Model

To develop the optimal *ARDL* co-integration model, it is essential to select the number of maximum lags for each variable involved in the *ARDL* model. This step is important in order to obtain Gaussian error terms that are free from econometric issues such as autocorrelation, normality and heteroskedasticity.

Determining the appropriate number of lags can be achieved by using one or more criterions. A number of criterions have been widely used in the finance-growth literature, for example the Akaike Information Criterion (*AIC*), the Hannan Quin Criterion (*HQC*), the R-squared Criterion R^2, the Schwarz Bayesian Criterion (*SBC*) and the Final Prediction Error Criterion (*FPE*).

To obtain appropriate *ARDL* co-integration models, this study in the next stage will use three well known information criterions to choose the optimal lag order in each model. These criterions are:

3.2.3.2.1 Akaike Information Criterion

The Akaike Information Criterion can be calculated by using the following equation:

$$AIC = -\frac{N}{2}(1 + log2\pi) - \frac{N}{2log\delta^2} - P \dots\dots\dots\dots\dots\dots\dots (3.21)$$

3.2.3.2.2 Schwarz Bayesian Criterion

The Schwarz Bayesian Criterion can be calculated by using the following equation:

$$SBC = log(\delta^2) + \left(\frac{logN}{N}\right)P \dots\dots\dots\dots\dots\dots\dots\dots\dots (3.22)$$

3.2.3.2.3 Hannan Quin Criterion

The Hannan Quin criterion can be calculated by using the following:

$$HQC = log(\delta^2) + \left(\frac{2log * logN}{N}\right)P \dots\dots\dots\dots\dots\dots\dots (3.23)$$

Where:

δ^2 is maximum like likelihood value.

N is the total number of parameters in the model.

P is the optimum order of the selected model.

The optimal number of lags for the *ARDL* co-integration model is chosen based on the values of the Akaike Information Criterion (*AIC*), the Schwarz Bayesian Criterion (*SBC*) and the Hannan Quinn criterion (*HQC*), where the smallest criterion values refer to an efficient model that can be used to estimate the long and short relationship between financial development and economic growth.

3.2.3.3 Bounds Co-integration Test

The previous econometric literature has shown a great advancement regarding the investigation of the relationship level between time series. For example, using Engle and Granger and Johnson co-integration techniques to test the level of co-integration between time series. However, such co-integration approaches are mainly based on the hypothesis that the time series are suffering from a unit root at their level and they are stationary at their first difference. Under this assumption, prior to investigating the co-integration relationship between variables, unit root tests are required to test whether these variables are stationary. Also, these co-integration techniques presume that the long run relationship between time series is stable. However, this assumption may lead to invalid estimation results if there is a nonlinear relationship among the underlying time series (Shin, Yu and Greenwood-Nimmo, 2014). Finally, the obtained results from using Johnson co-integration approaches can be badly affected by error specification due to asymptotic characteristics assumptions, particularly in small samples.

Pesaran et al. (2001) present a co-integration test known as the bounds co-integration test. This test uses an *ARDL* model to investigate the presence of the co-integration association between time series. This test uses the lagged periods of time series in the unrestricted *ECM* to detect the existence of the log run relationship. Pesaran et al., (2001) recommended the F-test to test the two opposed hypotheses:

1- Null hypothesis H_o: $\delta_1 = \delta_2 = \delta_3 = \delta_n = 0$, which assumes that the variables involved in the *ARDL* model are not co-integrated.

2- Alternative hypothesis H_1: $\delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_n \neq 0$, which suggests that the variables involved in the *ARDL* model are co-integrated.

Pesaran et al., (2001) present two different sets of critical values. While the first set suggests that all the time series are *I(0)*, the second set suggests that all are *I(1)*. The observance of co-integration depends on the computed value of F-statistics. If the obtained F-statistic is higher than the upper bound of the asymptotic critical value, the null hypothesis that there is no co-integration among time series is rejected. However, if the computed value of the F-statistic is lower than the lower bound, in this case the null hypothesis cannot be rejected and it is accepted that the underlying time series are co-integrated. Lastly, if the calculated F-statistic falls between the two bounds, the decision becomes indecisive.

Finally, if the time series are found to be co-integrated, the next step requires estimation of the coefficients in both the long-run and short-run periods.

3.3 The Employed Methodology in Chapter Five

3.3.1 Data

Chapter fives uses balanced panel data in order to investigate the relationship between developments in two main components of the financial system. The sample measures the link between banking sector development and stock market development during the process of economic growth.

The annual panel data sample covers the period 1989-2014 and the data are extracted and transformed from two official, reliable sources of online secondary data; firstly, World Bank Indicators issued by the World Bank. Secondly, the International Monetary Foundation. This sample considers ten developed and developing economies. These economies represent the *G20* members (other members of *G20* are excluded due to insufficient data to cover the period of this study). Our focus on G20 countries has at least two advantages. First, *G20* countries are the most relevant sample with which to investigate our theme: as *G20* involves membership of both developing and developed countries. Second, focusing on this sample enables us to study financial development and other macroeconomic variables often used in the finance growth literature. The data have been transformed to natural logarithms in order to minimise any correlation among the variables and to smooth the data (El-Nader and Alraimony, 2013). Moreover, using equations in logarithm form helps to interpret coefficients as an elasticity (Eita, 2012). Then the data are organised in a panel data form, in alphabetic order of the countries sampled.

To measure the efficiency of banks, the study uses the bank credit ratio, which equals the value of deposit money bank credit to the private sector as a share of GDP. This measure excludes credit to the public sector (central and local government as well as public enterprise). King and Levine (1993c) posit that, financial intermediaries mainly provide financial service to private firms more than government or state enterprises.

This sample is organised in panel data form in order to examine the relationship between banking sector development and stock market development in terms of their size and efficiency throughout the economic growth process on one hand and to test whether there is a complementarity between these two components of the financial sector on the other.

Two-time series of banking sector development and two of stock market development were included within the sample to achieve the suggested hypotheses. On one hand, the credit to private sector variable cps, and the money supply m2 variable were employed to measure the efficiency and size of banks operating in the economies of these countries, respectively. On the other hand, the stock market capitalisation variable SMC, and turnover ratio variable TOR were comprised in order to denote the size and effectiveness of the stock market, respectively. In addition, the sample includes four macroeconomic time series to be used as control variables in the regression equations. These time series are Gross Domestic Product per capita (GDP), domestic investment rate, saving rate SAV and the consumer price index.

The data in this sample will be used to test eight hypotheses. Therefore, a regression equation will be utilised to test each hypothesis. These hypotheses and their relevant regression equations are as follows:

(1) Hypothesis to be tested: The impact of the efficiency of the banking sector on stock market size is positive.

The regression equation is:

$$SMSI = BSEI + CV \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.24)$$

where:

$BSEI$ repersents a banking sector efficiency indicator.

$SMSI$ is a stock market size indicator.

CV is a control variable.

(2) Hypothesis to be tested: The impact of the efficiency of the banking sector on stock market efficiency is positive.

The regression formula is:

$$SMEI = BSEI + CV \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots . (3.25)$$

Where:

$SMEI$ is a stock market efficiency indicator.

(3) Hypothesis to be tested: The impact of the size of the banking sector on stock market size is positive.

The regression formula is:

$$SMSI = BSSI + CV \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.26)$$

Where:

$BSSI$ is a banking sector size indicator.

(4) Hypothesis to be tested: The impact of banking sector size on stock market efficiency is positive**.**

The regression formula is:

$$SMEI = BSSI + CV \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.27)$$

(5) Hypothesis to be tested: The impact of stock market size on banking sector efficiency is positive.

The regression formula is:

$$BSEI = SMSI + CV \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.28)$$

(6) Hypothesis to be tested: The impact of stock market size on banking sector size is positive.

The regression formula is:

$$BSSI = SMSI + CV \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.29)$$

(7) Hypothesis to be tested: The impact of stock market efficiency on banking sector efficiency is positive.

The regression formula is:

$$BSEI = SMEI + CV \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.30)$$

(8) Hypothesis to be tested: The impact of stock market efficiency on banking sector size is positive.

The regression formula is:

$$BSSI = SMEI + CV \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.31)$$

3.3.2 Specification of the models

This study modifies the Calderon-Rossell model to combine banking sector, stock market and other macroeconomic variables so that they may foster the relationship between banking sector development and stock market development. In particular, to examine the long run relationship between banking sector development and stock market development and to explore the causality link between them. Accordingly, a system of simultaneous equations will be used. Where banking sector development and stock market variables are the fundamental endogenous variables, while controlling for a number of macroeconomic variables that drive development in the banking sector and the stock market.

$$Y_{it} = \alpha_i + \beta Y_{it-1} + \delta X_{it} + \lambda M_{it} + \varepsilon_{it} \ldots\ldots\ldots\ldots\ldots (3.32)$$

$$X_{it} = \alpha_i + \beta X_{it-1} + \delta Y_{it} + \lambda M_{it} + \varepsilon_{it} \ldots\ldots\ldots\ldots\ldots (3.33)$$

Where:

Y_{it} = Stock market development.

α_i= Constant representing unobserved country specific fixed effect.

X_{it}= Banking sector development.

M_{it}= A set of macroeconomic variables.

ε_{it} = White noise.

Also, a lagged dependent variable is included as an independent variable for dynamic analysis.

Based on simultaneous equations (3.32) and (3.33), and employing the abovementioned proxies of banking sector development, stock market development and macroeconomic variables, eight panel regressions are formulated for estimation to achieve the objectives of the current study using pooled data on 10 countries of the G20, the eight regressions are the following:

$$lncps = lncps(-1)\ lnsmc\ lngdp\ lninv\ lncpi \ldots\ldots\ldots\ldots (3.34)$$

$$lncps = lncps(-1)\ lntor\ lngdp\ lninv\ lncpi \ldots\ldots\ldots\ldots\ldots (3.35)$$

$$lnm2 = lm2(-1)\ lnsmc\ lngdp\ lninv\ lncpi \ldots\ldots\ldots\ldots\ldots (3.36)$$

$$lnm2 = lnm2(-1) lntor\ lngdp\ lninv\ lncpi \ldots\ldots\ldots\ldots\ldots\ldots (3.37)$$

$$lnsmc = lnsmc(-1)\ lncps\ lngdp\ lnsav\ lncpi \ldots\ldots\ldots\ldots (3.38)$$

$$lnsmc = lnsmc(-1)\ lnm2\ lnsav\ lncpi \ldots\ldots\ldots\ldots\ldots\ldots (3.39)$$

$$lntor = lntor(-1)\ lncps\ lngdp\ lnsav\ lncpi \ldots\ldots\ldots\ldots\ldots (3.40)$$

$$lntor = lntor(-1)\ lnm2\ lngdp\ lnsav\ lncpi \ldots\ldots\ldots\ldots\ldots (3.41)$$

Regression equations (3.34), (3.35), (3.36) and (3.37) are constructed to investigate the effect of stock market development on banking sector development. In contrast, regression equations (3.38), (3.39), (3.40) and (3.41) are established to study the impact of the development of the banking sector on stock market development. More specifically, equations (3.34), (3.35), (3.36) and (3.37) are used to study the impact of stock market capitalisation and turnover ratio as two distinct indicators of stock market development on two different measures of banking sector development, which are domestic credit to the private sector to GDP and stock money supply. However, the remaining equations are employed to examine the influence of domestic credit to private sector to GDP and M2 to GDP on stock market capitalisation to GDP and turnover ratio. Variables real income, total investment to GDP, total saving to GDP and consumer price index to GDP are used in the above regressions as control variables. It may be noted that the control variable savings to GDP is used instead of the control variable investment to GDP in the equations where the measures of stock market development are used as dependent variables. The reason for this is to test whether saving to GDP is a good predictor for stock market development.

3.3.3 Econometric Procedure

The thesis in chapter five, adopts an econometric technique which involves four methodical steps. First, using two reliable panel data unit root tests to test the stationarity of the employed time series. Second, applying Padroni's panel data co-integration tests to examine the presence of long run relationships between the time series in the above proposed models. Third, estimating long run coefficients by utilising Fully Modified Ordinary Least Squares (FMOLS). Fourth, grouping long run causality between the variables and that is by using panel Granger tests for causality. Finally, the econometric methodology of this chapter involves finding the correlation matrix for the main indicators of both banking sector development and stock market

development in order to find out if these indicators are complementary or substitutes to each other during the economic growth process.

3.3.3.1 Panel Data Stationary Tests

To investigate the existence of panel co-integration among time series, it is paramount to check the stationary for these time series. Therefore, the study will employ two panel unit root tests which are Pesaran and Shin panel unit root tests, and Levine, Lin and Chu panel unit root tests.

3.3.3.1.1 Pesaran and Shin Unit Root Test

Pesaran and Shin (2003) developed a panel unit root test based on the Dickey Fuller approach. This unit root test uses individual ADF regressions to calculate the mean of the cross sectionally adjusted data and accordingly, computes the t-statistics since the regression in *ADF* controls the residual serial correlation in the time series, *Pesaran and Shin* unit root tests can automatically control the time series and moreover, it permits for error variance and for heterogeneity across the data. *ADF* regression can be written as follows:

$$\Delta Y_{it} = \partial_i + \gamma \Delta Y_{it-1} + \sum_{j=1}^{K_i} \beta_j \, \Delta Y_{it} + \varepsilon_{it} \dots\dots\dots\dots\dots\dots (3.42)$$

Where ΔY_{it} is the first difference of the variable to be tested in the country i at time $t. k_j$ is the number of lags to be used in the regression which is not constant and allowed to change across the groups. ε_{it} is the error term with zero mean and is assumed to be normally distributed. IPS tests the null hypothesis that the time series has a unit root and it is non-stationary $H_o: \gamma_i = 0$ for each i against the alternative hypothesis that this time series does not contain a unit root and it is a stationary $H_1: \gamma_i < 0$.

Rejecting the null hypothesis indicates that the time series are stationary across the group of countries. IPS calculates the average of the t-statistics $\bar{t}$ from the individual ADF t-statistics $t_i N$ for all the sample cross section countries and that by using the following equation:

$$\bar{t} = {}^{1}/_{n} \sum_{i=1}^{n} t_i N \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.43)$$

Where, n is the number of cross section countries and $t_i N$ is assumed to be have finite variance and mean. Accordingly, the panel unit root t-statistic of IPS $t_{IPS-statistics}$ is calculated by using the following equation:

$$t_{IPS-statistics} = \frac{\sqrt{n}(\bar{t} + E(\bar{t})}{\sqrt{var(\bar{t})}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.44)$$

Where, $E(\bar{t})$ and $var(\bar{t})$ are the mean and variance of $(\bar{t})$, respectively. Based on simulations by Im et al. (2003), the $\bar{t}$ test is powerful and has the right size if the error term of the panel data time series is not serially correlated, even for samples with a small T. However, if there is a serial correlation among these error terms, the power and size of the $\bar{t}$ test is reasonably compatible. In such a case, it is preferred to increase T and N of the sample.

3.3.3.1.2 Levin, Lin and Chu Unit Root Test

Levin, Lin and Chu (2002) developed a panel unit root test based on the *ADF* unit root test. The procedure of this test involves the following steps.

The first step starts with running *ADF* unit root tests for each cross-sectional time series by using *ADF* regression equations as follows:

$$\Delta Y_{it} = \partial_i + \emptyset T + \varphi \Delta Y_{it-1} + \sum_{j=1}^{K_i} \beta_j \Delta Y_{it} + \varepsilon_{it} \ldots\ldots (3.45)$$

Then, the second step involves the following auxiliary regressions:

$$\Delta Y_{it} = +\varphi \Delta Y_{it-1} + \emptyset T \ + \varepsilon_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.46)$$

$$Y_{it-1} = +\varphi \Delta Y_{it-n} + \emptyset T \ + v_{it-1} \ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.47)$$

In the third step, the residuals are standardised by dividing the obtained residuals $\tilde{\varepsilon}_{it}$ and $\hat{v}_{it-1}$ from the above auxiliary regressions by the standard error $\hat{\sigma}_{ei}$ obtained from each *ADF* regression, as follows:

$$\tilde{\varepsilon}_{it} = \frac{\tilde{\varepsilon}_{it}}{\hat{\sigma}_{ei}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (348)$$

$$\tilde{v}_{it-1} \ = \frac{\hat{v}_{it-1}}{\hat{\sigma}_{ei}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.49)$$

The final step involves the following pooled regression using the Ordinary Least Squares Method:

$$\bar{e}_{it} = \tilde{\varepsilon}_{it} + \varphi \tilde{v}_{it-1} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.50)$$

Levin, Lin and Chu test the null hypothesis that each time series in the panel have unit root $H_o: \varphi = 0$, against the alternative hypothesis that each time series in the panal is stationary and has no unit root $H_o: \varphi < 0$.

3.3.3.2 Co-integration Test

The co-integration tests suggested by Pedroni (1999) have become a typical technique in panel data analysis. Although there are other tests of co-integration which can be used such as McCoskey and Kao (1998) and Kao (1999) , Padroni co-integration tests are still more

efficient. Because Pedroni co-integration tests use specific parameters which permit heterogeneous changes to occur across the countries in the sample and permit dependency across countries at different points of time (Maeso Fernández, Osbat and Schnatz (2004).

According to the Pedroni (2004) co-integration procedure, we need first to test the existence of the long relationship between the employed variables by using the following formula:

$$Y_{it} = \partial_i + \theta_i T + \gamma_t + \beta 1 x_{it} + \cdots + \beta N x_{Nt} + \varepsilon_{it} \ldots . (3.51)$$

Where, ∂_i is a constant, $\theta_i T$ is a common time effect, γ_t is a country specific effect, N is the number of regressors, and ε_{it} the residuals.

Following Pedroni's equation, we can specify the following equations to be used in testing the presence of the long run co-integration of our models:

$$lncps_{it} = \partial_i + \gamma_t + \beta 1 lncps(-1)_{it} + \beta 2 lnsmc_{it} + \beta 3 lngdp + \beta 4 lninv_{it} + \beta 5 lncpi_{it} + \varepsilon_{it} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots . (3.52)$$

$$lncps_{it} = \partial_i + \gamma_t + \beta 1 lncps(-1)_{it} + \beta 2 lntor_{it} + \beta 3 lngdp + \beta 4 lninv_{it} + \beta 5 lncpi_{it} + \varepsilon_{it} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots . \ldots (3.53)$$

$$lnm2_{it} = \partial_i + \gamma_t + \beta 1 lnm2(-1)_{it} + \beta 2 lnsmc_{it} + \beta 3 lngdp + \beta 4 lninv_{it} + \beta 5 lncpi_{it} + \varepsilon_{it} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots . (3.54)$$

$$lnm2_{it} = \partial_i + \gamma_t + \beta 1 lnm2(-1)_{it} + \beta 2 lntor_{it} + \beta 3 lngdp + \beta 4 lninv_{it} + \beta 5 lncpi_{it} + \varepsilon_{it} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots . (3.55)$$

$$lnsmc_{it} = \partial_i + \gamma_t + \beta 1 lnsmc(-1)_{it} + \beta 2 lncps_{it} + \beta 3 lngdp + \beta 4 lnsav_{it} + \beta 5 lncpi_{it} + \varepsilon_{it} \quad \ldots (3.56)$$

$$lnsmc_{it} = \partial_i + \gamma_t + \beta 1 lnsmc(-1)_{it} + \beta 2 lnm2_{it} + \beta 3 lngdp + \beta 4 lnsav_{it} + \beta 5 lncpi_{it} + \varepsilon_{it} \quad \ldots (3.57)$$

$$lntor_{it} = \partial_i + \gamma_t + \beta 1 lntor(-1)_{it} + \beta 2 lncps_{it} + \beta 3 lngdp + \beta 4 lnsav_{it} + \beta 5 lncpi_{it} + \varepsilon_{it} \quad \ldots (3.58)$$

$$lntor_{it} = \partial_i + \gamma_t + \beta 1 lntor(-1)_{it} + \beta 2 lnm2_{it} + \beta 3 lngdp + \beta 4 lnsav_{it} + \beta 5 lncpi_{it} + \varepsilon_{it} \quad \ldots (3.59)$$

The overall concept is to obtain residuals from the above specified equations and then to check if the obtained residuals are integrated of order one I(1), by estimating the following residual equation:

$$\varepsilon_{it} = \delta_i \varepsilon_{it(-1)} + \gamma \omega_{it} \quad \ldots (3.60)$$

The Pedroni method involves seven residual tests which are asymptotically normally distributed and based on the null hypothesis that there is no co-integration between underlying time series. The seven statistics of Pedroni (2001) and Pedroni (2004) involve a Panel-PP statistic, a Panel-ADF statistic, a Panel v-statistic, Panel-rho statistics, group-PP, group-ADF and group-rho statistics. The first four statistics of Pedroni tests refer to panel-statistic tests and they are based on ‘’within’’ dimensions, therefore the alternative hypothesis of there is a co-integration between the said variables takes the structure of $H_1: \rho_i = \rho < 1$. However, the

remining three statistics refer to group-statistic tests and they are based on *''in between''* dimensions, therefore the alternative hypothesis for these statistics is $H_1: \rho_i < 1$.

The null hypothesis of no co-integration is rejected if the value of the calculated statistic for each test is less than the critical value tabulated by Pedroni. As there are seven statistics in this study, the decision of co-integration among the employed variables is taken if four or more tests out of seven have rejected the null hypothesis that there is no co-integration relationship between variables.

3.3.3.3 Granger Causality Test

Prior to estimating our long run coefficients by using the $FMOLS$ estimation method, the current study aims to utilise a Granger causality approach to achieve two goals. First, to confirm the presence of the long run relationships between financial stock market development indicators (SMC, and TOR) and banking sector development indicators (CPS, and $M2$). Second, to determine the direction of these relationships.

The granger causality equations can be written as following:

$$Y_t = \sum_{i=1}^{n} \beta_i Y_{t-i} + \sum_{j=1}^{n} \gamma_i X_{t-j} + \varepsilon_{1t} \dots\dots\dots\dots\dots\dots\dots\dots (3.61)$$

$$X_t = \sum_{i=1}^{n} \delta_i X_{t-i} + \sum_{j=1}^{n} \theta_i Y_{t-j} + \varepsilon_{2t} \dots\dots\dots\dots\dots\dots\dots\dots (3.62)$$

Where, ε_{1t} and ε_{1t} are uncorrelated noise terms. The F-statistic is used to test the null hypothesis that the variable X does not Granger cause the variable Y, $H_o: \gamma = zero$, alongside the alternative hypothesis that the variable X Granger causes the variable Y, $H_o: \gamma \neq zero$. If the achieved value of the F-statistic at a significance of (0.05%) is less than the value from Granger schedules, then we accept the null hypothesis that there is no Granger causality running from the variable X to the variable Y, $(X \nRightarrow Y)$. Conversely, if the computed value of the F-statistic test at the suggested significance is above the critical value of Granger's tables, then the alternative hypothesis that there is a Granger causality runs from the variable X to the

variable Y, $(X \Rightarrow Y)$ is accepted. Also, if we reject both null hypotheses for the two equations, then there is a bidirectional relationship between the variable X and the variable Y, $(X \Leftrightarrow Y)$. However, if both the null hypotheses are accepted, then the decision will be no mutual relationship between both variables X, and Y, $((X \nLeftrightarrow Y)$.

Based on the above questions of Granger causality, this study will test the following equations in order to find Granger causality relationships between our suggested variables:

$$lnsmc_t = \sum_{i=1}^{n} \beta_i \, lnsmc_{t-i} + \sum_{j=1}^{n} \gamma_i \, lncps_{t-j} + \varepsilon_{1t} \dots\dots\dots\dots\dots\dots (3.63)$$

$$lncps_t = \sum_{i=1}^{n} \delta_i \; CPS_{t-i} + \sum_{j=1}^{n} \theta_i \, lnsmc_{t-j} + \varepsilon_{2t} \dots\dots\dots\dots\dots\dots\dots (3.64)$$

$$lntor_t = \sum_{i=1}^{n} \beta_i \, lntor_{t-i} + \sum_{j=1}^{n} \gamma_i \, lncps_{t-j} + \varepsilon_{1t} \dots\dots\dots\dots\dots\dots\dots (3.65)$$

$$lncps_t = \sum_{i=1}^{n} \delta_i \; lncps_{t-i} + \sum_{j=1}^{n} \theta_i \, lntor_{t-j} + \varepsilon_{2t} \dots\dots\dots\dots\dots\dots\dots (3.66)$$

$$lnsmc_t = \sum_{i=1}^{n} \beta_i \, lnsmc_{t-i} + \sum_{j=1}^{n} \gamma_i \, lnm2_{t-j} + \varepsilon_{1t} \dots\dots\dots\dots\dots\dots\dots (3.67)$$

$$lnm2_t = \sum_{i=1}^{n} \delta_i \; lnm2_{t-i} + \sum_{j=1}^{n} \theta_i \, lnsmc_{t-j} + \varepsilon_{2t} \dots\dots\dots\dots\dots\dots\dots (3.68)$$

$$lntor_t = \sum_{i=1}^{n} \beta_i \, lntor_{t-i} + \sum_{j=1}^{n} \gamma_i \, lnm2_{t-j} + \varepsilon_{1t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.69)$$

$$lnm2_t = \sum_{i=1}^{n} \delta_i \, lnm2_{t-i} + \sum_{j=1}^{n} \theta_i \, lntor_{t-j} + \varepsilon_{2t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.70)$$

3.3.3.4 Fully Modified OLS Estimator

Having found a linear association that combines the pooled time series to each other in the long run, we can continue to estimate individual long run relationships for our suggested models. Different modern econometric methods have been introduced to estimate the long relationship between time series. Among these methods, is a Fully Modified *OLS* methodology that has been suggested by Kao and Chiang (2001). This method is appropriate to estimate a vector of long run co-integration, for panels with a unit root. This estimator operates to correct the pooled *OLS* for endogeneity and serial correlation that are assumed to be found in long run relationships. In addition, Kao and Chiang (2001) argue that the *FMOLS* estimator produces consistent estimation of the parameters in small size samples. Therefore, this study will use an *FMOLS* estimator to estimate the long run relationship between banking sector development and stock market development.

3.4 The Employed Methodology in Chapter Six

3.4.1 Data

Chapter six uses balanced panel data, called sample 5. Besides the suggested time series, sample 5 involves some interaction terms to investigate the role of a specific variable in impacting the relationship between two other variables.

The Sample

This sample is used to investigate the role of financial system development in enhancing the relationship between foreign direct investment and economic growth on one hand and its role

in enhancing the relationship between domestic investment and economic growth on the other. Also, the data of this sample will be used to investigate the role played by human capital in augmenting the positive link among foreign direct investment and economic growth. Furthermore, the sample will be used to explore whether development in the financial system is the most important channel through which foreign direct investment positively impacts the overall economic growth rate.

The selected sample involves information from 14 countries of the G20, covering the period 1989-2014. The remaining countries of the G20 were excluded due to the unavailability of data. From 666 observations employed in this study only two observations were missed. Precisely, from the credit to private sector series, France 1998 and South Africa 1991. Thus, the mean value of each series is used instead of the missing observations. Following the existing literature on financial development and economic growth for example, (Akisik, 2013; Alom, 2018; Ullah, Shah and Khan, 2014), the data have been transferred to logarithm form to overcome the issue of non-linearity. Due to the presence of some observations with values less than one in the FDI series, this produces negative values in the case of taking natural logarithms. Therefore, to escape this issue we enter equations as log one plus FDI (Andriansyah and Messinis, 2014; Gantman and Dabós, 2012; Owusu and Odhiambo, 2015) to transfer the FDI series to the logarithm form. *‘’The World Bank Indicators''* (*WBI*) and *''International Monetary Fund''* (*IMF*) online database are the sources of these data.

Based on the hypotheses to be studied and the employed model, this sample contains a number of time series pre-arranged in a balanced panel data structure from 1989 to 2014. These time series are; Gross Domestic Product per capita time series to indicate the rate of economic growth, credit to private sector time series CPS to indicate financial system development, foreign direct investment time series FDI to indicate the flow of foreign investment to host countries, gross fixed capital formation time series GFF to measure gross domestic investment, population group aged between 15-64 time series HC to measure human capital. In addition to these time series, the chosen sample includes general government expenditure time series GGE to be used as a control variable.

This sample will be used to investigate some determinants of economic growth and to test the following hypotheses:

First, Financial system development enhances the positive relationship between foreign direct investment and economic growth. Second, financial system development enhances the positive relationship between domestic investment and economic growth. Third, human capital is another channel through which foreign direct investment may have a positive impact on economic growth. Finally, financial system development is a more important channel through which foreign direct investment enhances the positive relationship between foreign direct investment and economic growth than the human capital channel.

In doing so, it is necessary to employ the idea of the interaction term in our models. Therefore, a number of regression equations with and without an interaction term are suggested.

3.4.2 Model Specification

This study uses a traditional method to derive a model from the production function of Cobb-Douglas (Goldberger, 1968). This model will be used to detect the relationship between financial development, foreign direct investment and economic growth.

$$Y_{it} = AL_{it}^{\alpha} K_{it}^{\beta} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.71)$$

Y_{it} = Economic Growth

A_{it} = Technological Development

K_{it} = Physical Capital

L_{it} = Human Capital

Where physical capital K involves both domestic capital dK and foreign capital fK. Thus, the above equation can be written as:

$$K_{it} = (dK_{it}^{\beta}, fK_{it}^{\theta})^{\gamma} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.72)$$

Substituting equation (3.72) in equation (3.71) produces equation (3.73) as follows:

$$Y_{it} = AL_{it}^{\alpha}(dK_{it}^{\beta}, fK_{it}^{\theta})^{\gamma} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.73)$$

By rewriting equation (3.73), we obtain the following equation:

$$Y_{it} = AL_{it}^{\alpha}\ dK_{it}^{\beta\gamma}\ fK_{it}^{\theta\gamma} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.74)$$

Where:

θ = The marginal elasticity of substitution among domestic and foreign investment.

∂ = The inter-temporal elasticity of substitution among domestic and foreign investment.

This equation indicates that if $\partial\ and\ \gamma$ are more than zero, then foreign direct investment will enhance the elasticities of economic growth. By taking the natural logarithms and time derivatives of equation (4), we obtain the following equation:

$$Y_i = A_i + (\alpha)L_i + (\beta\partial\gamma)dK_i + (\theta\partial\gamma)fK_i \ldots\ldots (3.75)$$

If we take into account the economic environment by embedding our suggested variables in the above model, then the general formula of the production function can be presented as follows:

$$gdp = \alpha + fdi + gff + hc + cps + gfe + \varepsilon \ldots (3.76)$$

The model can be written in log form as follows:

$$lngdp = \alpha + lnfdi + lngff + lnhc + lncps + lngfe + \varepsilon.. (3.77)$$

Where :

$lngdp$ = The natural logarithm of GDP.

$lnfdi$ = The natural logarithm of foreign direct investment.

$lngff$ = The natural logarithm of gross fixed capital formation.

$lnhc$ = The natural logarithm of human capital.

$lncp$ = The natural logarithm of credit to private sector.

$lngf$ = The natural logarithm of government expenditure.

This model (in a log form) has been broadly used in the existing literature of FDI-growth, for instance Choong and Lim (2009). Sbia and Alrousan (2016); Shahbaz (2012); Suliman and Elian (2014) argue that the empirical results obtained from log-linear specification are more efficient and reliable than the results obtained from a simple linear specification.

Based on the principle equation (3.77), we construct the following eleven regressions:

$$lngdp = lnfdi + lnhc \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.78)$$

$$lngdp = lngff + lnhc \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.79)$$

$$lngdp = lncps + lnhc \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.80)$$

$$lngdp = lngfe + lnhc \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.81)$$

$$lngdp = lnfdi + lncps + lngfe + lnhc \dots\dots\dots\dots\dots\dots (3.82)$$

$$lngdp = lnfdi + lngff + lnhc + lnfdi * lncps \dots\dots (3.83)$$

$$lngdp = lnfdi + +lngff + lngfe + lnfdi * lncps \dots (3.84)$$

$$lngdp = lnfdi + lnhc + lnfdi * lncps \dots\dots\dots\dots\dots\dots (3.85)$$

$$lngdp = lngff + lnhc + lngff * lncps \dots\dots\dots\dots\dots\dots (3.86)$$

$$lngdp = lnfdi + lngfe + lnhc + lnfdi * lnhc \dots\dots\dots\dots (3.87)$$

$$lngdp = lnfdi + lngfe + lnhc + lnfdi * lncps + lnfdi * lnhc. (3.88)$$

The above models will be used for our empirical investigation, particularly as follows:

1-To examine the impact of foreign direct investment on economic growth without involving the interaction term, we will use the following equation:

$$GDP = FDI + CV \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3.89)$$

Where:

GDP is Gross Domestic Product per capita.

FDI is foreign direct investment.

CV are control variables.

2-To examine the impact of domestic investment on economic growth without involving the interaction term, the following equation will be used:

$$GDP = GFF + CV \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.90)$$

Where:

GFF is Gross Domestic Formation.

3-To examine the impact of selected financial system indicators on economic growth, the following equation will be used:

$$GDP = CPS + CV \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.91)$$

Where:

CPS is credit to private sector.

4-To examine the impact of human capital on economic growth without involving the interaction term, we will use the following equation:

$$GDP = HC + CV \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.92)$$

Where:

HC is human capital.

5-To examine the hypothesis that the development of the financial system enhances the positive relationship between foreign direct investment and economic growth, we need to involve foreign direct investment and financial development interaction terms in the adopted model as follows:

$$GDP = FDI + FDI * CPS + CV \dots\dots\dots\dots\dots\dots\dots (3.93)$$

Where:

$FDI * CPS$ is a foreign direct investment and financial development interaction term.

6-To test the hypothesis that the development of the financial system enhances the positive relationship between domestic investment and economic growth, a combination of the domestic investment time series with credit to private sector time series are used in the following equation:

$$GDP = GFF + GFF * CPS + CV \dots\dots\dots\dots\dots\dots\dots (3.94)$$

Where:

$GFF * CPS$ is a domestic investment and financial development interaction term.

7-To test the hypothesis that human capital is another channel through which foreign direct investment may have a positive impact on economic growth, we need to interact two variables

which are human capital and credit to private sector, and use this interaction in the repression equation as follows:

$$GDP = FDI + HC + FDI * HC + CV \dots\dots\dots\dots (3.95)$$

Where:

$FDI * HC$ is a foreign direct investment and human capital interaction term.

8-To test the hypothesis that financial system development is more important than human capital in enhancing the positive relationship between foreign direct investment and economic growth, two interaction terms (foreign direct investment and human capital and foreign direct investment and financial development) are simultaneously used in one regression equation as follows:

$$GDP = FDI + HC + FDI * HC + FDI * CPS + CV \dots\dots\dots (3.96)$$

3.4.3 Econometric Procedure

Now, after we have specified the appropriate models those are proposed to be used in studying the relationships between foreign direct investment, domestic investment, human capital and economic growth. The next step aims to determine the proper econometric method to estimate these models. Therefore, this section explains the estimation strategy that will be used for this purpose.

With *OLS* estimation methods, models fail to deliver reliable results particularly when there is a correlation between the error term and the explanatory variables. Therefore, instrument variable estimators are highly recommended to obtain accurate and reliable estimation. Instrument estimators produce valid results where endogeneity is expected. These estimators are based on two steps. In the first, instrument variable/variables is/are utilised in estimating

independent variables. The second step uses the estimation of the first step in estimating the dependent variable. Using instrument variables in estimating independent variables alleviates the correlation between independent variables and the error term.

As the suggested models are multivariate models, they contain more than one explanatory variable and they include unspecified country fixed effects, hence the emergence of both endogeneity and unobserved country features is highly anticipated. Therefore, to take into account both expected issues and to check the robustness and confirm our results, two instrumental variables estimation methods will be utilised. These methods are; generalised method of moments *GMM* dynamic system panel data estimation by Holtz-Eakin, Newey and Rosen (1988) and Arellano and Bover (1995), two-stage *OLS*. Our findings will be based on both methods which were used in the most recent applications of this theme. This enables us to compare our results with those that have been obtained from other studies in this area.

To utilise these methods, the investigation must involve tests of the co-integration relationship between the underlying variables. Therefore, it is essential to establish the existence of unit roots in the data and then check the co-integrating relationship.

To establish the presence of unit roots in the data, Levin et al. (2002) and Im et al. (2003) unit root tests for panel data are used. If the time series suffer from the presence of the unit root at levels, but are stationary at first differences, then the Kao co-integration test will be permissible to use. Shahbaz (2009) argues that two-time series are co-integrated if both have long run relations among them.

3.4.3.1 Stationary Test

Reviewing finance-growth provides indications that many macroeconomic aggregate levels, such as gross domestic product per capita *GDP* and financial time series show non-stationary means or trending behavior. Econometrically, it is crucial to determine the appropriate trend in the data. For example, growth models suggest that there is a long run relationship between non-stationary variables. Co-integration procedures are used to check the presence of long run associations, if the variables are stationary at first difference *I(1)*. Consequently, unit root tests are required as first steps in applying co-integration techniques. Moreover, Ordinary Least Square *OLS* estimation is based on assumptions that the time series under consideration are stationary. However, if these time series were not subject to stationary, the estimation might

lead to inaccurate results due to spurious regression. Verbeek (2008) argues that there isa kind of spurious correlation between any two-time series.

Normal unit root tests are appropriate and valid for well characterised time series. However, as most financial time series have an intricate structure, they cannot be captured by ordinary unit root tests. Therefore, we will use two panel unit root tests, to be precise, Levine, Lin and Chu panel unit root tests and Im, Pesaran and Shin panel unit root tests (*For more details, see above sections 3.3.3.1.1, and 3.3.3.1.2*).

3.4.3.2 Kao Co-integration Test for Panel Data

After specifying an integration order of the time series, the next stage requires a test to verify whether these series are co-integrated. As this study uses a set panel data, consequently it is applicable and more effective to conduct a panel co-integration test.

The econometric literature has identified two main panel co-integration tests. The Pedroni co-integration test (*we have applied this test in chapter four*) and the Kao co-integration test for panel data developed by McCoskey and Kao (1998). The later test will be used to investigate the existence of long run affiliation among the time series. The Kao co-integration test uses residual-based LM-statistic tests to solve the issue of nuisance parameters in models with a single equation.

3.4.3.3 Instrumental Variables Estimation

This study uses two Instrumental Variables Estimation techniques to investigate the role of financial development in enhancing the positive relationship between foreign direct investment and economic growth. First, the GMM approach developed by Arellano and Bover (1995). Second, two-stage Ordinary Least Squares developed by Anderson and Hsiao (1981). The reason for using the two methods is to confirm the estimation findings.

Both techniques are widely used in the finance-growth literature because they are appropriate to control unobserved country specific effects, to overcome the issues resulting in first difference non-stationary time series and to deal with the issue of endogeneity by using a set of instrumental variables (Adusei, 2013b; Saci, Giorgioni and Holden, 2009). These estimators are considered more reliable than other types of estimators. Komal and Abbas (2015) argue

that estimation methods that use instrumental variables are reliable and produce unbiased estimations.

Furthermore, these techniques are suitable when the employed panels have small T and large N (Muhammad, Islam and Marashdeh, 2016; Roodman, 2007). Bond, Hoeffler & Temple (2001) argue that *GMM* estimators are appropriate to estimate growth models because most of the studies use averaged data to avoid cyclical dynamic effects. Hence, this affects the time series.

Finally, using the previous lags of independent variables as instruments in the regression equation is a common option in the finance-growth literature (Adusei, 2013a; Barbosa and Eiriz, 2009). Because it is not expected that there is a correlation between the error term in the current period and the exploratory variables in the previous period, this study will use one period lags of explanatory variables in each regression as instrumental variables.

Chapter Four: The Short and Long-Run Impact of Financial Development on Economic Growth

4.1 Introduction

It is true that in the last three decades there have been numerous theoretical and empirical debates on the linkage between financial development and economic growth. However, disagreeing views from various theoretical studies and conflicting outputs come out from different empirical studies, employing various econometric methods on a single country or group of countries. Sawyer (2014, pp11) mentioned that *"it appears that using different measures of financial development may give rise to different conclusions about the way financial development and economic growth are related"*. Khadraoui and Smida (2012, pp96) argue that *"econometric approach and both country sample and period essentially lie behind the differences of results found in author's papers in the finance-growth relation"*.

There are divergent views in the finance-growth literature regarding the nature and direction of the relationship between financial development and economic growth. These views can be classified into two main views and two other views in between them. The main views is supply-lending versus demand-following.

The first view is known as *"supply leading"* (Abdel-Gadir, 2012). This view suggested that there is a positive impact of financial development on economic growth. Famous studies in the finance-growth nexus, (Ang, 2008; Goldsmith, 1969; Gurley and Shaw, 1967; McKinnon, 1973; Sawyer, 2014; Schumpeter, 1911) declared that there is a positive and strong linkage among financial development and the rate of economic growth. Supporters of this view believe that the efficiency generated from financial deepening and financial depression improves saving allocation between investment projects. Therefore, the financial sector has an effect in a positive way on the real sector. Sawyer (2014) argues that economic growth is facilitated by the financial sector through the effect on saving behavior, investment funding and the quality of investment. Sawyer (2014) goes further and emphasises that financial liberalisation improves monetary transmission, increases saving and investment and reduces capital cost. Mishal (2011) believes that stock markets promote investment decisions and increase financial asset liquidity. Obstfeld (1992) shows that by facilitating risk sharing, internationally integrated stock markets affect saving decisions, allocation of capital and the economic growth

rate. Based on this argument, one can conclude that stock markets have a positive impact on economic growth. Sawyer (2014) emphasises the gap between willingness of saving and willingness of investment. King and Levine (1993c) argue that intervention of the government in the financial system has a negative impact on the rate of growth.

However, the second view *is "demand following"* (Romer, 1990). It postulates that financial development follows economic growth (Robinson, 1952). This implies that real economic growth leads to demand expansion for the financial system. This means that there is a causal relationship from economic growth to financial development. Other views even suggest that the impact of financial development on the growth rate can be negative (Buffie, 1984; Cevik and Rahmati, 2013). Rousseau and Vuthipadadorn (2005) suggested that the competition between domestic firms and financial intermediaries may lead to a credit crisis that shrinks investment and productivity.

A third view is the *"feedback"* hypothesis (Rousseau and Vuthipadadorn, 2005). It states that there is a mutual causal relationship between financial deepening and the growth rate. This suggests causality between them exists in both directions (Greenwood and Smith, 1997).

The last view postulated that there is no causal relationship among financial development and growth. Mukherjee (2013) supported this view as he stated *"that financial development does not matter for economic growth"*. *"Economists badly overstress the role of financial factors in economic growth"* (Lucas, 1988).

Nevertheless, there is no agreement on a definite conclusion regarding financial development and economic growth linkages (Elsayed, 2013). In general, this result can be ambiguous and varies depending on the variables that are used as proxies of financial development (Elsayed, 2013; Kouki, 2013).

Moreover, these debates have not settled in a definite pattern the casual direction between both financial development and economic growth. Therefore, it can be said that there is a limitation in both theoretical and empirical studies. The first were limited to a sufficient analytical description. Whereas, the latter suffer from several shortages, such as none of these studies involving all financial components in one single study. A few studies, for example Ghimire and Giorgioni (2013); Mishal (2011); Odhiambo (2014) have involved two of these components, banking sector and the stock market simultaneously. Also, most empirical studies concentrated on a single country or avoided studying a mixture of developing and developed

countries. In addition to this, these empirical studies suffer from a deficiency of analysing panel data.

Therefore, this study empirically investigates the relationship between financial development and economic growth in the context of *G20* countries, using balanced panel data from 1989 to the most recent available data, employing an *ARDL* estimation approach.

The contribution of this chapter to the empirical literature of financial development and economic growth is by three features. Firstly, this would be the first work involving the three components of the financial system (banking sector, stock market and insurance sector) to investigate the relationship between financial development and economic growth. Salari, Hassanzadeh and Ebrahimpour (2014) and also Sawyer (2014) asserted that banks, stock markets and securities (e.g. insurance companies) are components of a financial system which may have different effects on economic growth. Secondly, adopting *G20* countries as a study sample enables this study to examine the relationship between financial development and economic growth in both developing and developed countries. Finally, this study can be considered as the first attempt at using an *ARDL* approach to estimate panel data in the finance growth nexus. However, most previous studies have used time series or cross-sectional data and those that have used panel data have adopted ordinary estimation techniques.

The present chapter has three main objectives. First, investigate whether there is a long-run influence of financial development (represented by improvement in: banking sector, stock market and the insurance sector) on economic growth. Second, examine how financial development is integrated with economic growth in the long-run. Finally, examine the dynamic short-run effects of financial structure development on overall growth in order to introduce guidelines of financial strategy for economic growth. To accomplish these objectives, we need to estimate three regression equations, with *GDP* as an independent variable and two proxies of financial development representing the banking sector, stock market and insurance sector development, employed interchangeably as independent variables. These three equations share similar three explanatory control variables.

The empirical investigation in this study is accomplished in three steps. Firstly, two distinctive forms of panel unit root tests are used to affirm the stationary of the series in panel data of the whole sample. Secondly, to establish a co-integrating (long-run equilibrium) relationship between financial development and economic growth, a bounds test to co-integration method

is employed. Finally, an Autoregressive Distributed Lag to Co-integration technique (*ARDL*) is utilised to estimate finance-growth regression models. This estimation is implemented in short-run and long-run periods.

This chapter is divided into seven sections including the introduction. In section two, the paper reviews the finance-growth literature underlying our hypothesis for empirical investigation. Section three presents measurement and calculations of the variables. In section four, this chapter looks at empirical results. Lastly, section five elaborates on the conclusion.

4.2 Empirical Literature Review

4.2.1 Financial Development and Economic Growth Relationship

Komal and Abbas (2015) used a *GMM* estimation technique to investigate the effect of financial development on energy consumption in Pakistan for the period 1972-2012 They established that financial development has positive and significant effects on energy consumption through economic growth.

Samargandi, Fidrmuc and Ghosh (2015) affirmed an adverse impact of financial development on growth of the economy in 52 middle income countries over the period 1980-2008. They estimated their panel data by using a pooled mean estimator.

Samargandi, Fidrmuc and Ghosh (2014) characterised the leverage of financial evolution on the oil and non-oil sectors in Saudi Arabia. Using an estimation method of ARDL and annual data during 1968-2010. The results suggest that the impact of financial development is significant and positive on the non-oil sector. In contrast, the impact of financial deepening on the oil sector is negative, but not significant.

Venegas-Martínez and Rodríguez-Nava (2014) implemented various econometric investigations using panel data during the period 1990-2011, to scrutinise the financial- growth connection in 7 Latin American countries. They derived no evident proof that financial amelioration leads to economic growth.

Cevik and Rahmati (2013) used *OLS* and *VAR* estimation to investigate the causal relationship between financial intermediation and non-hydrocarbon *GDP* growth in Libya for the period 1970-2010. They found that the relationship among variables is none existent in the long-run. However, in the short-run the results of *OLS* estimation showed that financial development has

a negative impact on non- hydrocarbon *GDP*, but *VAR* estimation presented insignificant findings.

Eggoh and Villieu (2013) estimated the relation for 71 countries using panel data over the period 1960-2006, applying *GMM* dynamic panel techniques. They found that financial development and economic growth are inter-linked in financially developed economies, whereas it is negative in less financially developed economies.

Hassan, Sanchez and Yu (2011) used multivariate time series models with six proxies of financial development and examined the general relationship between financial development and the real sector for panel data from 168 developing countries. They found that the relationship between financial development and economic growth is positive and there was a bi-directional causality between financial development and economic growth in most countries. However, the causality direction from growth to financial development was proved in only the two poorest countries.

4.2.2 The Impact of Banking Sector on Economic Growth

Numerous empirical studies have investigated the link between banking sector development and economic growth. These studies have used different econometric methods, different measures for bank development and different types of data sets covering different periods of time. We present some of these studies as follows.

Al-Moulani and Alexiou (2017) used five measures of banking sector development and a *GMM* estimator to investigate the relationship between banking sector depth and economic growth in two groups of countries, these groups represent; natural resource-based economies and non-resource-based economies, over the period 1964-2013. They concluded that the positive relationship between banking sector development and economic growth is only existant at definite levels of banking sector depth in both country groups and this relation becomes negative under and above these certain levels. In addition to a number of financial development proxies, this study was characterised by four indicators of economic growth and this enables us to identify all possible channels through which growth is efficiently estimated.

Assefa and Mollick (2017) used the Pedroni panel co-integration test and a *DOLS* estimator for the case of the countries categorised according to income levels during the years 1995-2010. Domestic credit to *GDP* ratio was used as a banking sector development indicator. The findings demonstrate that financial development affects growth in developed countries.

However, it is not the case in low income countries. This study uses a modern econometric analysis, but its weakness lies in relying on a single measure of financial deepening and only two control variables.

Avc (2017) studied the causal relationship between the development of financial arrangements and the growth rate for Turkey, using sequential quarterly data for the period 2003Q1-2016Q1. Credit to private non-financial sector was the banking development indicator. Employing a Granger causality technique, the study found support for the demand following hypothesis of Patrick (1966).

Ahmed and Bashir (2016) examined the impact of banking sector development on economic growth by using endogenous growth models and three estimation methods. They found that both financial system measures, credit to private sector by banks and money and quasi money m2 have a positive and robust impact on the growth rate in six SAARC economies through the years of 1980-2013.

Dudian and Popa (2013) tested a sample of eight countries in Central and Eastern European though the period 1996-2011. The study empirically investigates the relationship between financial development and economic growth. This study differentiates between credit to private sector to *GDP* and its annual growth to indicate banking sector development. The author summarised the effect of credit to private sector to *GDP* on economic growth as negative. However, its annual growth has positive effects on economic growth. Furthermore, they found a minor effect of money supply on total growth.

Kazar and Kazar (2016) in their recent paper, empirically explore the effects of globalisation and financial development on economic growth for groups of countries through a period of 30 years from 1980 to 2010. They used panel co-integration tests and a Dynamic Least Squares estimation approach, *DOLS*, to examine the long run relationship among the adopted variables. The findings support the hypothesis that banking sector development as indicated by the ratio of credit to private sector to *GDP* has a positive impact on economic growth.

In a modern study Inoue and Hamori (2016) study the impact of financial access on economic growth. This study uses the number of commercial banks per 100,000 adults and the number of commercial banks per 1,000 Km^2 to indicate the accessibility of banking services and it deploys a *GMM* panel approach and panel data covering 37 sub-Saharan African countries

during the period of 2004-2012. The findings introduced indicate in favour of a positive and robust influence of banking advancement on economic growth.

By using time series data, Saqib (2016) investigated the effect of financial liberalisation on economic growth in Pakistan over the period 1971-2011. He used the macroeconomic variable broad money $m2$ as a single proxy for banking sector development. He summarises the development of banking sector as inspiring growth. However, this finding was the subject of an endogeneity problem as it uses the *OLS* estimation approach.

Xu (2016) employed a *GMM* estimator and panel data from 28 Chinese series during 1978-2008 to examine the correspondence between financial development and economic growth. The results confirmed that both the depth and size of financial structure measured, respectively, by total loans by the financial system as a ratio to *GDP* and the total deposits in the financial system as a ratio to *GDP* have a positive and significant impact on economic growth. However, the results show a negative effect of financial intermediary advancement on economic growth when it is indicated by household savings as a ratio to *GDP*.

Ayadi, Arbak, Naceur and De Groen (2015) study bank efficiency and economic growth in Northern and Southern Mediterranean countries over the period of 1985-2009. They include two indicators of banking sector development in their model, credit to private sector to *GDP* and bank deposits. The results show that the influence of banking sector development on economic growth is significantly negative. They attribute this finding to two problems; bad allocation of bank credit and weak regulation of financial systems in these countries.

Hamadi and Bassil (2015) employed panel data and *GMM* estimation techniques to identify the role of both the stock market and the banking system promoting economic growth in 13 MENA economies during the years of 1988-2009. The researchers suggest that the role of the banking sector in enhancing economic growth depends on stability periods.

Samargandi et al. (2015) collect data from 52 countries covering the period of 1980-2008 to examine the impact of the financial sector on economic growth. They use principle components analysis to construct an indicator from three measures of banking sector development. The findings found a u-shaped relationship among banking sector development and the real sector.

Jedidia, Boujelbène and Helali (2014) considered the association among financial expansion and economic growth in the economy of Tunisia throughout the period 1993-2008, by adopting *ARDL* performance. They established that credit to private sector leads to growth in the long-term, but not in the short-term.

Musamali, Nyamongo and Moyi (2014) used a fixed effects model to estimate a large set of financial cross-sectional data covering 50 economies from Africa for 1980-2008. They used two proxies for bank development, credit to private sector CPS as a ratio to GDP and the ratio of broad money $M2$ to GDP. Their findings support the hypothesis that banking sector improvement has positive effects on economic growth.

In another empirical study of 25 African economies, over the period of 1960-2012, Pradhan, Tripathy, Chatterjee, Zaki and Mukhopadhyay (2014) found that there is a mutual relationship between banking sector development and total growth. This study was able to signal the general status of the banking sector in an economy as it uses composite indices of banking sector development.

Rashti, Araghi and Shayeste (2014) applied Generalised Method of Moments (*GMM)* to investigate the influence of financial development on economic growth in three different groups of countries: low average income countries, high average income counties and developed countries members of the OECD, during 1990-2010. They concluded that the influence of the banking sector on economic growth is negative in each group of the study. However, the impact of capital markets on economic growth is positive in the group of low average income countries and negative in high average income and developed countries.

Saad (2014) found that there is a short-run positive impact of the banking sector on *GDP* in Lebanon through the years 1972 and 2012, whereas this power was insignificant in the long-run period.

Salari et al. (2014) employed an *ARDL* approach to evaluate the long-run association between financial development and economic growth in Iran through the period of 1981-2011. They have suggested that the private credit to *GDP* ratio has a significant positive linkage with *GDP*.

Zhang et al. (2012) studied 286 Chinese cities during a short period from 2001 to 2006. They applied more recent estimation methods, *GMM* for dynamic panel data. Their findings

presented evidence that the traditional measures of banking sector development promote growth in China.

Khan (2008) examined the impact of bank efficiency in Pakistan, using an *ARDL* framework and annual data over the period 1961-2005. The results indicate that the ratio of credit to the private sector can lead to economic growth.

Koivu (2002) in his empirical study considered the relationship between financial development and economic growth in 25 countries over the period 1993-2000. He concluded that credit to private sector as a ratio to *GDP* is irrelevant for economic growth.

4.2.3 The Impact of Stock Market Development on Economic Growth

Parallel with the studies on banking sector development and economic growth, there is no agreement regarding the relationship between stock market development and economic growth. While there are some studies confirming the positive relationship between them, there are other studies which found that the relation between them is negative. In this section we present the most important studies on the stock market and growth nexus.

Ailemen and Unemhilin (2017) adopted an Error Correction Model to consider the influence of a market-based financial system on Nigerian gross domestic product through the years 1980-2014. They focused on total new issues, total volume of transactions, total listed equities, stock market capitalisation and government stocks to measure the development of the stock market. Their outcomes show that the used variables hold substantial positive influence on gross domestic product in Nigeria.

Amu, Nwezeaku and Akujuobi (2017) in their recent study on the Nigerian economy have evaluated the influence of development in the capital market on the growth rate through the period of 1981-2012. They provided evidence that the Nigerian capital market has a significant influence on economic growth. However, they did not find a significant effect of stock market development on the Nigerian economy.

Azam et al. (2016) used time series annual data from China, India, Singapore and Bangladesh to check whether stock markets have an impact on economic growth in these countries during the years 1991-2012. The researchers relied on an ARDL to co-integration procedure to estimate the short and long run impact of the stock market on economic growth. Their findings indicate that first; in the long run period, stock market capitalisation has a significant positive

influence in Singapore and China. However, it has an insignificant positive influence in India and Bangladesh. Second, in the short run period, the impact of the stock market on economic growth is found significantly positive only in China and India.

Lahura and Vega (2017) explored the impact of stock market improvement on the real growth rate in Peru for a relatively long time period from 1965 to 2013. By using time series analysis and three different indicators of stock market development, the authors found that there is a minor effect of stock market shocks on dynamic growth. However, they found a considerable impact of stock market development on economic growth only during the period 1991-2013.

Naik and Padhi (2015) used annual panel data from 27 developing economies throughout the years 1995-2012 in order to examine the role played by stock market development in augmenting total growth. By using a *GMM* estimation method, they found that the development of the stock market leads to economic expansion. Moreover, by using the test of heterogeneous panels, the researchers found that there is a unidirectional relationship from stock market development to economic growth. Their study characterises three indices of stock market development.

Bayar (2014) conducted empirical research on seven Asian countries over the period of 1992-2011. The main objective of this research is to investigate the finance-growth link. With other financial development indicators, stock market capitalisation to GDP and stock market turnover ratio were used to indicate the size and liquidity of stock market. The author concluded that improvements in the stock market leads to improvements in economic growth.

Bayar, Kaya and Yildirim (2014) used financial quarterly data from the stock market in Turkey over the period of 1999-2013. Johansen co-integration test and Granger Causality methods were employed to study long run causality among stock market functions and economic growth. Unlike previous studies, this does not consider control variables. The results found that positive long run relationships run from stock market capitalisation to *GDP* and turnover ratio to economic growth.

Caporale, Rault, Sova and Sova (2015) used *GMM* estimation methods and dynamic panel models to examine long run relationships among financial system development and economic growth in ten European countries, all new members of the European Union during the period 1994-2007. They relied on stock market capitalisation as an independent variable to capture

the development in stock markets. The results indicate that the stock market contribution to economic growth has been limited.

Masoud (2013) explored the causality connection among the performance of stock markets and growth in eight developed economies namely; UK, USA, Canada, France, Germany, Japan, Switzerland, and Australia. The study covers two different time periods which are 1970-2000 and 2001-2006. The author found that there is a short and long run positive effect on economic growth from the improvement of stock market efficiency.

Caporale and Soliman (2004) investigated that whether the development of stock markets leads to the entire growth in a selected sample of seven countries during the period Q1: 1977 – Q4: 1998. They used Toda Yamamoto technique for causality in VAR model. Tow indicators of stock market development were used in their model which are value traded ratio, and the total value of shares traded, The Authors contended that economic growth can be fostered by well-developed stock markets.

4.2.4 The Impact of Insurance Sector on Economic Growth

Ying, Linsen and Wenjie (2017) used the Solow (1956) growth model to study insurance scheme advancement. The researchers used life and non-life premiums income to measure the development of the insurance industry and used and GDP and TEF to indicate total growth. Based on their multivariate co-integration investigation, they found a stable long-term association among insurance development measures and the quality of China's economic growth. Furthermore, their results indicate that there is unidirectional relationship from life insurance to economic growth.

Alhassan Biekpe (2016) employed an ARDL estimation procedure and time series analysis to identify the long run relationship among insurance penetration and the growth in eight African economies for the years 1990-2010. For measuring development in the insurance market, the author preferred to rely on life and non-life premiums to *GDP* ratios. The long run relationship between the insurance market and economic growth existed in five of eight investigated countries. Moreover, this study provided results of a unidirectional causal relationship from insurance market development indicators to economic development in most of the sample.

By using time series data Olayungbo (2015) tested the asymmetric causality among economic growth and insurance market development in Nigeria during 1976-2010. The results indicated that there is an asymmetric impact within the insurance market of Nigeria. Also, the study found that high economic growth is promoted by weak insurance.

Pradhan et al. (2015) used both cross sectional and panel data from G20 members to examine the relationship among insurance system development and economic growth. Five indicators were used to reflect the insurance sector namely; life insurance density, non-life insurance density, life insurance penetration, non-life insurance penetration, total life density and total life penetration. The study concluded that insurance sector development contributes to economic expansion and in some cases, they cause each other. Despite this, the study has considered many measures of insurance industry development, but it ignored other macroeconomic variables in the growth model such as total investment, human capital and the inflation rate.

By using panel data techniques and GMM estimator models, Han, Li, Moshirian and Tian (2010) studied the impact of insurance industry development on the growth rate in 77 developing and developed economies through the time period of 1994-2005. The researchers measured insurance development by means of insurance density and by using annual life and non-life premiums to population ratios. The empirical findings of the study show that insurance sector development indicators are positively influencing economic growth in both developing and developed countries. However, this effect is more obvious in developing countries.

Ćurak, Lončar and Poposki (2009) empirically analysed the influence on economic growth caused by development of the insurance industry in 10 European countries for the period 1992-2007. Three variables were utilised as proxies of insurance sector development explicitly; life insurance, non-life insurance and total insurance. To control the endogeneity issue, this study applied a fixed effects panel model. The investigators established that improvement in the insurance industry leads to a higher growth rate.

In an interesting study at a country level Vadlamannati (2008) employed Vector Error Correction models and Granger causality methods to survey the impact of insurance growth and insurance reforms on Indian economic growth between the years 1980 and 2006. Gross domestic product GDP, life insurance growth, non-life insurance growth, total insurance growth and six other macroeconomic variables were included in the growth model. The study

summaries that both total insurance growth and life insurance growth have considerable influences on the Indian economy, however, the influence of non-life insurance growth on economic growth is nonexistent before a period of one year.

An empirical study at a country level was also conducted by Adams, Andersson, Andersson and Lindmark (2009). The study explored the dynamic relationship among insurance sector development, banking sector development and Swedish economic development through a long-time period between 1830 and 1998. Both non-life and life insurance premiums were selected to measure insurance industry development. The authors followed time series analysis and used Granger methods in their investigation. They concluded that the insurance sector did not precede economic growth during the nineteenth century, but it did during the twentieth century. Moreover, they found that insurance sector development is caused by, but not leading to economic growth over the whole period.

Ward and Zurbruegg (2000) investigated the link among insurance activities and overall growth within 9 OECD member countries throughout the years 1961-1996. GDP was used as an indicator of economic growth and total insurance was used to indicate insurance activities. The empirical analysis was based on bivariate VAR models and Granger causality techniques. The results reveal that insurance activities contributed to growth in Japan and Canada and the bidirectional relationship between economic growth and insurance activities exists in Italy, Japan and Canada. However, it is less significant in Japan and Canada than in Italy. The researchers suggested that due the presence of a country specific effect, the relationship among insurance activities and economic development might change from country to another.

To this end, the above empirical literature on finance-growth connection can be classified into four groups of studies. First, some of empirical studies use a mixture of financial development indicator, and they do not focus on a specific component of financial system. For example, Hassan, Sanchez, and Yu (2011). Second, Other empirical studies focus only on banking sector development while investigating the relationship between financial system and economic growth. For example, Ahmed and Bashir (2016). Third group of empirical work concentrates on the connection between stock market and the total growth. For example, Bayar (2014). Finally, other empirical studies use only insurance sector development indicators, and disregard banking sector and stock market development indicators. For example, Alhassan and Biekpe (2016). Therefore, there is a need for further empirical studies that consider all the components of financial system, and this is the aim of the current chapter of this study.

4.3 Measurement and Variables Calculations.

4.3.1 Financial Development Measurement.

Several proxies and indicators have been used in the finance growth nexus to indicate development in the financial sector. These measures can be classified according to the components of the financial system into three: First, banking sector development indicators. Second stock market development indicators and third Insurance sector development indicators. This empirical chapter will employ financial development indicators that are more commonly employed in the finance-growth literature. Regarding banking sector development indicators, this study follows the studies by Abdel-Gadir (2012); Khan (2008) and Sehrawat and Giri (2015) in employing credit to private sector as a ratio to GDP to measure the role of banks in financing the private sector. Besides and following Alkhuzaim (2014); Ellahi and Khan (2011); Mahran (2012) money stock ($M2$) as a percentage to GDP will be used to capture the size and depth of the banking sector.

In line with most previous studies that use turnover to GDP ratios and/or stock market capitalisation to GDP, for example Ghimire and Giorgioni (2013); Mishal (2011), this study uses both indicators to indicate the size and the liquidity of stock market development, respectively.

Finally, two indicators, the life premium volume to GDP ratio (%) and non-life insurance premium volume to GDP ratio (%) were used by Adams et al. (2009); Ćurak et al. (2009); Deltuvaitė and Sinevičienė (2014) and Vadlamannati (2008). Following these studies, both measures will be used in our empirical investigation to indicate development of the insurance sector.

4.3.2 Economic Growth Measurement

Levine (1997) proposed three indicators for measuring economic growth: productivity growth, average capital stock per capita and real GDP per capita. Following the studies by Alkhuzaim (2014); Kumar (2014); Zhang et al. (2012), this study uses natural logarithms of real GDP per capita to indicate the growth rate.

4.3.3 Control Variables

A set of three macroeconomic variables from the finance-growth literature would be used as control variables: First, total investment as a ratio to GDP. This indicator was employed by

Khan (2008)and Rashti et al. (2014). Khan (2008) emphasised that the investment share has a positive influence on economic growth via the multiplier effect. Second, inflation represented by the consumer price index. Owusu and Odhiambo (2015) use inflation to reduce the impact of some outlier rates. Abdel-Gadir (2012) suggested that high rates of inflation have a negative impact on economic activity and restrict economic growth. Finally, unlike most previous studies of finance–growth, for example, Ghimire and Giorgioni (2013) that use the number of secondary school enrolled pupils to the total population as a proxy of human capital, this study captures human capital by the ratio of people aged between 15 to 65 to the whole population. This indicator was adopted because the vast majority of the labour force belong to this segment of society. Human capital enables the generation of new products or concepts that motivate technological advancement. Hence economies with vast human capital are supposed to be developed faster Ductor and Grechyna (2015). The following table shows the definitions of employed variables and how they would be calculated.

Table (4. 1)

List of variables, definitions and calculation

Variable name	Symbol	Description	Calculation*
Gross Domestic Product	$lngdp$	Total value of gross domestic product divided by midyear population.	$Log(gdp) - log(gdp)$
Credit to private sector	$lncps$		$log(cps) - log(cps)$
Money Supply	$lnm2$	sum of currency outside banks, demand deposits other than those of the central government, and the time, savings, and foreign currency deposits of resident sectors other than the central government, relative to GDP	$log(m2) - log(m2)$
Stock traded Turnover ratio	$lntor$	the total value of shares traded during the period divided by the average market capitalization for the period ratio to GDP	$log(tor) - log(tor)$
Stock Market Capitalization	$lnsmc$	Total value of shares of listed company in stock market as a ratio to GDP	$log(smc) - log(smc)$
Life Premium	$lnlp$	Ratio of life insurance premium volume to GDP. Premium volume is the insurer's direct premiums earned (if Property/Casualty) or received (if Life/Health) during the previous calendar year.	$log(lp) - log(lp)$
Non-Life Premium	lnn_lp	Ratio of nonlife insurance premium volume to GDP. Premium volume is the insurer's direct premiums earned (if Property/Casualty) or received (if Life/Health) during the previous calendar year.	$log(n\_lp) - log(n\_lp)$
Total Investment	lni_imf	Total additions to the fixed domestic assets by both public and private sectors as ratio GDP	$log(i\_imf) - log(i\_imf)$
Consumer Price Index	$lncpi\_imf$	Consumer price index refers to the deviations in the price to the average consumer of purchasing a basket of goods and services that could be changed or unchanged at definite periods, for example, yearly.	$lncpi\_imf$
Human Capital	$lnhc$	The ratio of people between the ages 15 to 64 to the total population of the country of origin	$lnhc$

*log: is the natural logarithm

4.4 Econometric Analysis and Empirical results:

4.4.1 Descriptive Statistics and Correlations

Prior to performing any econometric test, it is obligatory to present descriptive statistics and correlation matrices for economic growth and the explanatory variables in each model (see chapter 3). Table (4.2), (4.3) and (4.4) Shaw a considerable variation across countries and the correlations among the explanatory variables in models (1), (2) and (3) are generally low (there is no multicollinearity problem). This implies that the problematic of endogeneity is resolved and there is a good case for well specified models (Akimov et al., 2009).

Table (4. 2)

Descriptive Statistics and Correlations for Model (1)

Statistics	$lngdp$	$lncps$	$lnm2$	lni_imf	$lncpi\_imf$	$lnhc$
Mean	0.026434	0.020971	0.025302	0.001622	6.245420	4.173596
Median	0.025660	0.029601	0.023807	0.006446	4.614997	4.178582
Maximum	0.127514	0.626151	0.553572	0.671448	30.89056	4.308826
Minimum	-0.155310	-0.949830	-0.744320	-0.638030	0.187309	4.007443
Std. Dev.	0.036665	0.136108	0.099570	0.103666	6.504418	0.058964
Observations	336	336	336	336	336	336
$Lngdp$	1.000000					
$Lncps$	0.130834	1.000000				
$Lnm2$	-0.103869	0.530563	1.000000			
Lni_imf	0.502193	0.193743	-0.078586	1.000000		
$Lncpi\_imf$	-0.069479	-0.016467	0.010654	-0.005588	1.000000	
$Lnhc$	0.251637	0.014652	0.035126	-0.055910	0.083481	1.000000

Source: Author's calculations

Table (4. 3)

Descriptive Statistics and Correlations for Model (2)

Statistics	$lngdp$	$lntor$	$lnsmc$	lni_imf	lncpi_imf	$lnhc$
Mean	0.019660	0.023207	0.044509	-0.002648	5.995804	4.178773
Median	0.020060	0.029652	0.077059	0.004701	4.592561	4.184065
Maximum	0.105582	2.021537	1.438687	0.671448	30.76941	4.289301
Minimum	-0.155311	-1.556303	-1.216300	-0.638035	0.187309	4.048864
Std. Dev.	0.031830	0.361878	0.382521	0.098523	6.087855	0.048936
observation	352	352	352	352	352	352
correlations						
$lngdp$	1.000000					
$lntor$	0.265498	1.000000				
$lnsmc$	-0.089977	-0.123106	1.000000			
lni_imf	0.626250	0.165810	-0.209731	1.000000		
$lncpi\_imf$	-0.011464	0.006584	0.028004	0.009204	1.000000	
$lnhc$	0.014315	0.0060256	-0.063638	-0.042629	0.046592	1.000000

Source: Author's calculations

Table (4. 4)

Descriptive Statistics and Correlations for Model (3)

Statistics	$lngdp$	$lnlp$	lnn_lp	lni_imf	lncpi_imf	$lnhc$
Mean	0.025747	0.021166	-0.000415	0.001480	4.422142	4.187995
Median	0.023503	0.017402	-0.004901	0.006267	4.531560	4.189496
Maximum	0.127514	0.552320	0.210804	0.671448	5.589381	4.308637
Minimum	-0.155311	-0.380728	-0.184042	-0.638035	0.783902	4.073876
Std. Dev.	0.038317	0.089572	0.043719	0.103480	0.562672	0.049871
Observation	238	238	238	238	238	238
Correlation						
$lngdp$	1.000000					
$lnlp$	0.045364	1.000000				
lnn_lp	-0.106213	0.072861	1.000000			
lni_imf	0.600389	0.029762	-0.174013	1.000000		
$lncpi\_imf$	0.044002	-0.020651	0.010427	0.083206	1.000000	
$lnhc$	0.179405	-0.048754	0.090252	-0.009126	0.240079	1.000000

Source: Author's calculations

4.4.2 Analysing the Impact of the Banking Sector on Economic Growth

To empirically investigate dynamic and long run relationships between financial development and economic growth, this study adopts a more recently popularised co-integration technique known as the ARDL co-integration approach developed by Pesaran et al. (2001).

4.4.2.1 Model (1) Unit Root Test

Before selecting the suitable framework of econometric models, it is essential to consider univariate properties of variable series in the panel data and determine the degree of integration between them. Testing for the presence of a unit root in panel data is crucial, because lack of stationarity will invalidate model specification. Thus, due to the advantage of panel-based unit root tests over the individual time series-based unit root tests and to robustness checks to confirm the result of stationarity, two panel data unit root tests will be employed namely; ADF-Fisher and PP-Fisher unit root tests. The benefits of using Fisher-type panel unit root tests is that they allow to differ the lag lengths of individual ADF tests (Choi, 2001), and they can be easily implemented in E Views software.

Quah (1992) and Quah (1994) suggested asymptotically normal unit root tests to explore unit roots in panel data. However, these tests become difficult to estimate, because they rely on unknown nuisance parameters (Choi, 2001). Choi (2001), and (Maddala and Wu (1999) proposed Augmented Dickey Fuller-Fisher and Phillips Perron-Fisher panel unit root tests to investigate stationary properties for panel data. These tests have become widely employed in this regard. Therefore, this study employs ADF-Fisher and PP- fisher panel unit root tests in order to examine the presence of unit roots in model (1) (Banking sector development model).

Table (4.5) reports the results of the ADF-Fisher panel unit root test. This test at levels and at the first difference rejects the null hypothesis that Gross Domestic Product, Credit of Private Sector, Money supply, Total Investment, Inflation and Human Capital are non-stationary. Thus, all variables that are involved in model (1) are stationary at I(0) and I(1).

Table (4. 5)

ADF-Fisher Panel Unite Root Test for Model (1)

Test	$ADF-Fisher\chi^2 at\ I(0)$		$ADF-Fisher\chi^2 at\ I(1)$		Decision
Variable	Statistic	Prob.	statistic	Prob.	
$lngdp$	146.023	0.0000	241.670	0.0000	$I(0)$
$lncps$	132.785	0.0000	286.801	0.0000	$I(0)$
$lnm2$	172.489	0.0000	342.014	0.0000	$I(0)$
lni_imf	207.168	0.0000	291.997	0.0000	$I(0)$
$lncpi\_imf$	64.5664	0.0001	113.614	0.0000	$I(0)$
$lnhc$	54.6946	0.0018	44.3407	0.0257	$I(0)$

Source: Author's calculations. Note: Results reported are those with intercept

To confirm this result from ADF-Fisher unit root tests, a PP- Fisher unit test is carried out. Table (4.6) shows that the results of PP-Fisher test support the results of the ADF-Fisher panel unit root test. Therefore, it can be concluded that all variables of model (1) are stationary at I(0).

Table (4. 6)

Phillip-Perron Fisher Panel Unit Root Test for Model (1)

Test	$PP-Fisher\chi^2 at\ I(0)$		$PP-Fisher\chi^2 at\ I(1)$		Decision
Variable	Statistic	Prob.	statistic	Prob.	
$lngdp$	165.461	0.0000	1268.88	0.0000	$I(0)$
$lncps$	148.440	0.0000	903.195	0.0000	$I(0)$
$lnm2$	226.663	0.0000	1482.58	0.0000	$I(0)$
lni_imf	276.787	0.0000	1403.11	0.0000	$I(0)$
$lncpi\_imf$	103.166	0.0000	78.8137	0.0000	$I(0)$
$lnhc$	105.954	0.0000	49.9223	0.0066	$I(0)$

Source: Author's calculations. Note: Results are reported those with intercept

4.4.2.2 Model (1) Optimal Lag Selection

As the variables in model (1) are integrated at the same order I(0), it is permitted to employ ARDL co-integration methods to investigate the relationship between development in the banking sector as a component of the financial system and economic growth. ARDL co-integration approaches involve running ARDL bounds tests. But before this stage it is necessary to select the optimal lag order of the ARDL model. For this purpose, we used the Akaike Information Criterion, Bayesian Information Criterion and the Hannan and Quinn Criterion.

Table (4.7) presents the lowest values of AIC (-4.513), BIC (-4.410), and HQ (-4.473). These are associated with an ARDL (3, 0, 0, 0, 0, 0) model. Moreover, graph (4.1) confirms that this model is the best among the other applicable models by using AIC. Consequently, we decide to adopt an ARDL (3, 0, 0, 0, 0, 0) model to investigate the relationship between banking sector development and growth rate, in order to obtain optimal results.

Table (4. 7)

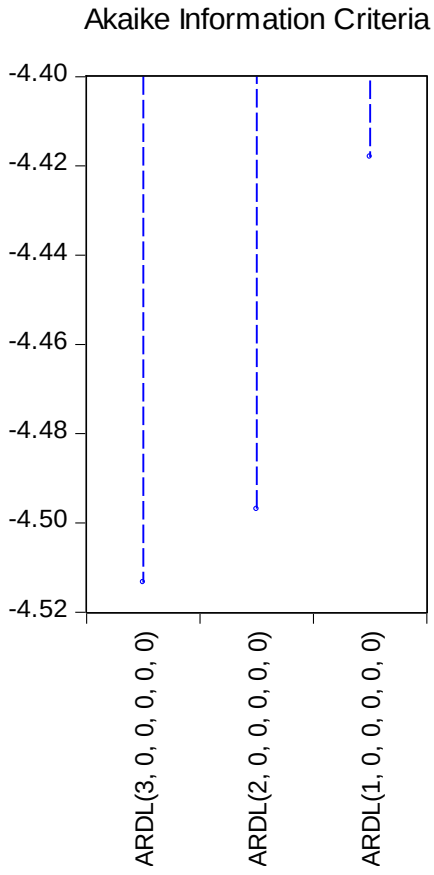
Lag selection criteria for model (1)

model specification	AIC	BIC	HQ	Conclusion
(3, 0, 0, 0, 0, 0)	4.513326-	4.410403-	-4.472285	(3, 0, 0, 0, 0, 0) Is the best model
(2, 0, 0, 0, 0, 0)	-4.496931	4.405444 -	-4.460450	
(1, 0, 0, 0, 0, 0)	4.417953-	4.353885-	4.386033 -	

Source: Author's calculations

Figure (4. 1)

Lag selection criteria for model (1)



4.4.2.3 Model (1) Bounds Co-integration Test

Based on the best ARDL model with optimal lags of (3, 0, 0, 0, 0, 0), a bounds co-integration test is applied to model (1) and zero restrictions are imposed on the lagged-level variables (Khan, 2008). This test uses the value of the F-statistic with respective critical values to examine the null hypothesis of no co-integration between dependent and independent variables; ($H_o: \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = \lambda_6 = 0$), against the alternative hypothesis of co-integration between these variables; ($H_I: \lambda_1 \neq \lambda_2 \neq \lambda_3 \neq \lambda_4 \neq \lambda_5 \neq \lambda_6 \neq 0$). The purpose of running this test is to conclude the presence or otherwise of a long-run relationship between dependent and explanatory variables in model (1). The bounds co-integration result for model (1) is reported in table (4.8).

Table (4.8) reveals that the calculated F-statistic value (14.782) is higher than the lower bound I(0), and the upper bound I(1) critical value at significance degree of 2.5% and 5% (Turner, 2006) and (Narayan, 2005), and 1% (Pesaran et al. 2001). Thus, the null hypothesis of no long-run relationship between the variables is rejected. Therefore, it can be concluded that the long-run relationship between development in the banking sector and economic growth exists.

Table (4. 8)

Bounds Test for Co-integration for Model (1)

Bounds test for co-integration								
test	Computed value	Critical value at 0.01		Critical value at 0.025		Critical value at 0.05		conclusion Long-run relationship exist
		$I(0)$	$I(1)$	$I(0)$	$I(1)$	$I(0)$	$I(1)$	
F-statistic	14.78214	3.41	4.68	2.96	4.18	2.62	3.79	
Source: Author's calculations **Note: using ARDL (3, 0, 0, 0, 0, 0)**								

4.4.2.4 Banking Sector Development and Economic Growth Long-run Relationship

Having a stable long-run relationship between dependent and independent variables in model (1), the next step requires estimating of this relation using selected optimal lags (3, 0, 0, 0, 0, 0) to derive long-run coefficients of independent variables. On one hand, regarding the proxies of banking sector development, there is a positive but insignificant long-run relationship between credit to private sector $lncps$ (0.006) and economic growth. However, there is an unexpected negative significant long-run relationship between money supply $lnm2$ (-0.119) and economic growth (see table (4.9)). This implies that a 1% rise in credit to private sector leads to a trivial improvement in economic growth of about 0.06%. Whereas a 1% increase in the money supply leads to the deterioration in economic growth by 11%. On the other hand, regarding control variables, the coefficients of the variables, total investment i_imf (0.463) and human capital $lnhc$ (0.226) are positive and highly significant. This implies any improvement in total investment by 1% recovers economic growth by 46.3% and if human capital has developed by 1% this would enhance economic growth by 22.6%. However, the coefficient of the consumer price index $lncpi\_imf$ (-0.0005) is negative and not significant (0.31). This implies that inflation has a small negative effect on economic growth. Furthermore, the coefficient of error correction term $ECT - 1$ (-0.411) of the suggested ARDL (3, 0, 0, 0, 0, 0) model is negative and extremely significant at a level of 5%. This is an additional evidence for long-run co-integration and a stable long-run relationship between variables. The error correction term epitomises the adjustment speed to retrieve equilibrium in the model following a disturbance. The coefficient of $ECT - 1$ (-0.411) indicates that the variation from long term to short-term shocks is modified after each year by approximately 41%.

Table (4. 9)

ARDL Long-run Estimation for Model (1)

ARDL Long-run estimation			
Dep. variable: $lngdp$, ARDL model (3, 0, 0, 0, 0, 0), Model selection method: $A\|C$, Obs.: 333			
Regressors	Coefficient	t-statistic	Probability
$lncps$	0.006865	0.222088	0.8244
$lnm2$	-0.119916	-2.710945	0.0071
lni_imf	0.463283	6.234881	0.0000
$lncpi\_imf$	-0.000512	-0.997856	0.3191
$lnhc$	0.226199	3.927353	0.0001
$ECT-1$	-0.411153	-7.632433	0.0000
c	-0.912997	-3.802246	0.0002

Source: Author's calculations

4.4.2.5 Banking Sector Development and Economic Growth Short-run Relationship

Short-run dynamics are important for policy makers because the scale and signs provide variable trends and movements (Abdel-Gadir, 2012). Table (4.10) shows the ARDL short-run dynamics for model (1). This model suggested that credit to private sector $\Delta lncps$ (0.002) has a minor positive impact on economic growth, but is insignificant at the 5% level. Whereas, money supply $\Delta lnm2$ (-0.049) has a visible negative and significant impact on economic growth.

Regarding the control variables in model (1), total investment Δlni_imf, and human capital $\Delta lnhc$ coefficients have reasonable positive and significant effects on economic growth, with a coefficient of (0.190) and (0.093), respectively. However, the variable coefficient of inflation $\Delta lncpi\_imf$ reflects a slight negative and significant effect (-0.0002) on economic growth.

Table (4. 10)

ARDL Short-run Dynamics Model (1)

Dep. variable: $lngdp$, $ARDL$ model (3, 0, 0, 0, 0, 0), Model selection method: AIC ,Obs.:333			
Regressors	Coefficient	t-statistic	Probability
$\boldsymbol{\Delta lncps}$	0.002822	0.221089	0.8252
$\boldsymbol{\Delta lnm2}$	-0.049304	-2.883504	0.0042
$\boldsymbol{\Delta lni\_imf}$	0.190480	13.301657	0.0000
$\boldsymbol{\Delta lncpi\_imf}$	-0.000210	-0.991156	0.3223
$\boldsymbol{\Delta lnhc}$	0.093002	3.714036	0.0002
$\boldsymbol{Coint.eq.} = lngdp - (0.0069^{*}\ lncps - 0.1199^{*} lnm2 + 0.4633^{*} lni\_imf - 0.0005^{*} lncpi\_imf + 0.2262^{*} lnhc - 0.9130)$			

Source: Author's calculations

4.4.3 Analysing the Impact of the Stock Market on Economic Growth

4.4.3.1 Panel Unit Root Test for Model (2)

ADF-Fisher and PP-Fisher panel unit root tests for variables of stock market development model at *I(0)* and *I(1)* are presented in table (4.11) and (4.12) respectively. The results of both tests show that the null hypothesis; there is unit root, is rejected at levels and at first differences, for each variable in model (2), except human capital $lnhc$ where the null hypothesis; there is unit root, cannot be rejected at first differences given the Chi-square values of ADF-Fisher

(45.664) and PP-Fisher (43.708) were insignificant at a level of 5%. Therefore, the indication of these tests is that the variables in model (2) are I *(0).*

Table (4. 11)

ADF-Fisher Panel Unit Root Test for Model (2)

Test	$ADF-Fisher\chi^2 at\ I(0)$		$ADF-Fisher\chi^2 at\ I(1)$		Decision
Variable	Statistic	Prob.	statistic	Prob.	
$lngdp$	160.502	0.0000	249.625	0.0000	$I(0)$
$lntor$	228,026	0.0000	281.638	0.0000	$I(0)$
$lnsmc$	262.964	0.0000	263.403	0.0000	$I(0)$
lni_imf	208.333	0.0000	306.629	0.0000	$I(0)$
$lncpi\_imf$	61.7784	0.0012	123.074	0.0000	$I(0)$
$lnhc$	67.3557	0.0003	45.6646	0.0556	$I(0)$

Source: Author's calculations. Note: Results are reported those with intercept

Table (4. 12)

Phillip-Perron Fisher Panel Unit Root Test for Model (2)

	$PP-Fisher\chi^2 at\ I(0)$		$PP-Fisher\chi^2 at\ I(1)$		Decision
Test Variable	Statistic	Prob.	statistic	Prob.	
$lngdp$	184.289	0.0000	1498.15	0.0000	$I(0)$
$lntor$	295.841	0.0000	1958.43	0.0000	$I(0)$
$lnsmc$	594.040	0.0000	3195.10	0.0000	$I(0)$
lni_imf	293.858	0.0000	1383.59	0.0000	$I(0)$
$lncpi\_imf$	123.213	0.0000	122.676	0.0000	$I(0)$
$lnhc$	103.220	0.0000	43.7084	0.0812	$I(0)$

Source: Author's calculations. Note: Results are reported those with intercept

4.4.3.2 Model (2) Optimal Lag Selection

The obtained results from ADF-Fisher and PP-Fisher panel unit root tests in table (4.11) and (4.12) do not dispute the use of ARDL co-integration approaches to examine stock market and economic growth relationships. Therefore, the major stage is that of selecting the set of optimal lags for the ARDL model. The Akaike Information Criterion, Bayesian Information Criterion and Hannan and Quinn Criterion were used to determine the appropriate lags that produce the super ARDL model.

Table (4.13) shows the ARDL model with lag sets of (2, 1, 1, 0, 0, 1) is the most appropriate model, it has the lower values of AIC (-4.967), BIC (-4.846) and HQ (-4.919). With this outcome, it becomes logical to nominate the ARDL (2, 1, 1, 0, 0, 1) model to measure short and long-run relationships between the stock market and economic growth.

Table (4. 13)

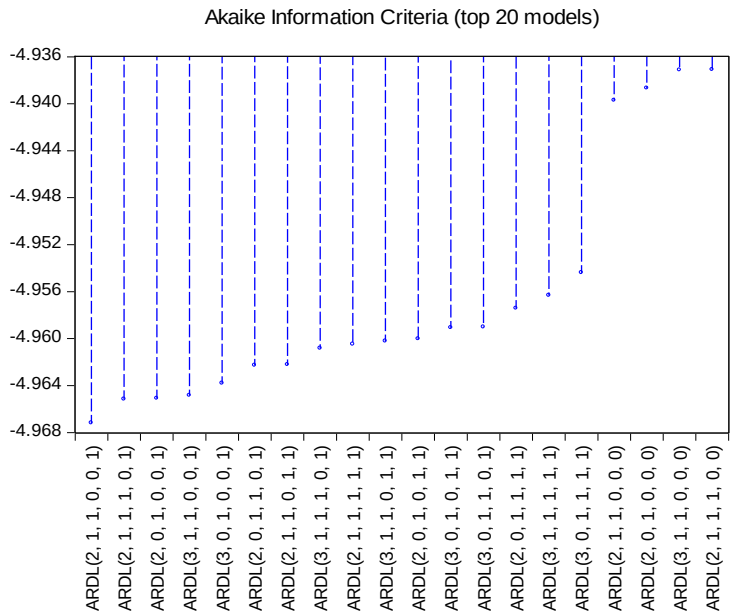
Lag Selection Criteria for Model (2)

Lag selection criteria				
model specification	AIC	BIC	HQ	Conclusion
(2, 1, 1, 0, 0, 1)	4.967185-	4.845679-	4.918816-	(2, 1, 1, 0, 0, 1) Is the best model
(2, 1, 1, 1, 0, 1)	4.965154-	4.832601-	4.912388-	
(3, 1, 1, 0, 0, 1)	4.964851-	4.832298-	4.912085-	
(3, 0, 1, 0, 0, 1)	4.963792-	4.842286-	4.915423-	
Source: Author's calculations				

Similarly, the Akaike Information Criterion graphically shows that an ARDL (2, 1, 1, 0, 0, 1) model is the most reliable model among the top 20 ARDL models (see graph (4.2)).

Figure (4. 2)

Lag selection criteria for model (2)



4.4.3.3 Model (2) Bounds Co-integration Test

Now, after identifying the most appropriate ARDL model with optimal lag sets of (2, 1, 1, 0, 0, 1), it is convenient to run a bounds co-integration test, in order to ascertain if there is a relationship between stock market development and economic growth in the long term. Table (4.13) exhibits the result of a bounds test for model (2). From this table, it is noticeable that the value of calculated F-statistics (31.830) exceeds the critical value of *I(0)* and *I(1)* at 1% (Pesaran et al., 2001), 2.5%, and 5% (Narayan, 2005) and (Turner, 2006). So, the bounds test rejects the null hypothesis that there is no co-integration among the variables; $H_o: \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = \lambda_6 = 0)$ and accepts the alternative hypothesis that there is co-integration between variables; $(H_I: \lambda_1 \neq \lambda_2 \neq \lambda_3 \neq \lambda_4 \neq \lambda_5 \neq \lambda_6 \neq 0)$. Hence, one can affirm that the long run relationship between stock market development and economic growth exists.

Table (4. 14)

Bounds Test for Co-integration for Model (2)

test	Computed value	Critical value at 0.01		Critical value at 0.025		Critical value at 0.05		conclusion
		I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	Long-run relationship exist
F-statistic	31.82989	3.41	4.68	2.96	4.18	2.62	3.79	

Source: Author's calculations. Note: using ARDL (2, 1, 1, 0, 0, 1)

4.4.3.4 Stock Market Development and Economic Growth Long-run Relationship

After rejecting the null hypothesis of no co-integration among variables in model (2), the next step is to estimate long run relationships, employing the selected ARDL (2, 1, 1, 0, 0, 1) model. Table (4.15) shows that both coefficients for stock market development indicators, turnover

ratio $lntro$ (0.0277) and stock market capitalisation $lnsmc$ (0.0556) are positive and extremely significant. This implies that these two indicators have a substantial positive impact on economic growth. Concerning the control variables, the impact of total investment lni_imf (0.0363) on economic growth is positive and significant and human capital $lnhc$ (0.051) is positive but insignificant. Whereas inflation cpi_imf (-0.0003) is negative and insignificant. Furthermore, $ECT - 1$ (-0.0518) has a very significant negative coefficient. This affirms once again the presence of a co-integration relationship between variables of the model and suggests that the speed of adjustment is about (52%), which means the amendment occurs relatively speedily in model (2).

Table (4. 15)

ARDL Long-run Estimation Model (2)

Dep. variable: $lngdb$, Model selection method: $A\|C$, *ARDL* model (2, 1, 1, 0, 0, 1), Obs.: 350			
Regressors	Coefficient	t-statistic	Probability
$lntor$	0.027653	3.092069	0.0022
$Lnsmc$	0.055572	5.139095	0.0000
Lni_imf	0.363020	8.847458	0.0000
$Lncpi\_imf$	-0.000273	-0.803464	0.4223
$lnhc$	0.051060	1.176048	0.2404
$ECT - 1$	-0.517695	-11.920664	0.0000
C	-0.194606	-1.072755	0.2841

Source: Author's calculations

4.4.3.5 Stock Market Development and Economic Growth Short-run Relationship

Short-run relationships between stock market development and economic growth have been estimated by using an ARDL (2, 1, 1, 0, 0, 1) model. The result in table (4.16) indicates that all explanatory variables that have been involved in model (2), Δlntor, Δlnsmc, Δlni_imf , and $\Delta lnhc$ have a significant positive impact on economic growth, (0.0199), (0.0099), (0.1879), (0.2097), respectively. This is true with the exception of the variable $\Delta lncpi\_imf$ (-0.0001) and its impact on economic growth is insignificant and negative.

Table (4. 16)

ARDL Short-run dynamics model (2)

Dependent variable: $lngdp$, Model selection method $A\|C$, ***ARDL***model**:** (2, 1, 1, 0, 0, 1)**,** Observations: 350			
Regressors	Coefficient	t-statistic	Probability
$\Delta lntor$	0.019877	6.479519	0.0000
$\Delta lnsmc$	0.009875	3.240568	0.0013
Δlni_imf	0.187934	15.250472	0.0000
$\Delta lncpi\_imf$	-0.000141	-0.804739	0.4215
$\Delta lnhc$	0.209729	3.788308	0.0002
$Coint.eq. = lngdp - (0.0277^{*}lntor + 0.0556^{*}lnsmc + 0.3630^{*}lni\_imf - 0.0003^{*}lncpi\_imf + 0.0511^{*}lnhc - 0.1946)$			

Source: Author's calculations

4.4.4 Analysing the Impact of the Insurance Sector on Economic Growth

4.4.4.1 Panel Unit Root Test for Model (3)

Table (4.17) introduces the results of an ADF-Fisher panel unit root test for model (3). This results indicate that; on one hand, all variables in model (3) are stationary at levels except the Inflation variable $cpi\_imfwhich$ is not stationary at levels, as the value of the ADF-Fisher Chi-square (38.923) test is insignificant at a level of 5%. On the other hand, all variables in the insurance development model have no unit root, with the exception of the human capital variable $lnhc$ which has a unit root, because the value of the ADF-Fisher panel unit root test is (36.364) at the 5% level, this allows us to accept the null hypothesis of the presence of a unit root.

Table (4. 17)

ADF-Fisher Panel Unite Root Test for Model (3)

Test	$\boldsymbol{ADF-Fisher\chi^2 at\ I(0)}$		$\boldsymbol{ADF-Fisher\chi^2 at\ I(0)}$		Decision
Variable	Statistic	Prob.	statistic	Prob.	
$lngdp$	91.1624	0.0000	168.688	0.0000	$I(0)$
$lnlp$	117.492	0.0000	222.700	0.0000	$I(0)$
lnn_lp	117.088	0.0000	189.356	0.0000	$I(0)$
lni_imf	139.289	0.0000	215.346	0.0000	$I(0)$
$lncpi\_imf$	38.9227	0.0822	89.0119	0.0000	$I(1)$
$lnhc$	79.4094	0.0000	36.3643	0.1336	$I(0)$

Source: Author's calculations. Note: Results are reported those with intercept

ADF-Fisher panel unit root results have been strengthened by implementing PP-Fisher panel unit root tests reported in table (4.18). The results were confirmed regardless of the inflation variable cpi_imf which is reported stationary at levels and at first differences (Null hypothesis of non-stationary is rejected). From these two panel unit root tests, it is established that the variables in model (3) are a mixture of *I(0)* and *I(1).*

Table (4. 18)

Phillip-Perron Fisher Panel Unit Root Test for Model (3)

Test	$\boldsymbol{PP-Fisher\chi^2 at\ I(0)}$		$\boldsymbol{PP-Fisher\chi^2}$ at $\boldsymbol{I(1)}$		Decision
Variable	Statistic	Prob.	statistic	Prob.	
$lngdp$	105.056	0.0000	218.202	0.0000	$I(0)$
$lnlp$	151.103	0.0000	314.359	0.0000	$I(0)$
lnn_lp	140.700	0.0000	272.447	0.0000	$I(0)$
lni_imf	159.018	0.0000	291.618	0.0000	$I(0)$
$lncpi\_imf$	88.7035	0.0000	102.224	0.0000	$I(0)$
$lnhc$	50.3481	0.0059	45.7403	0.0185	$I(0)$

Source: Author's calculations. Note: Results are reported those with intercept.

4.4.4.2 Lag Selection for the ARDL Model (3)

In the bounds testing approach to co-integration, it is not necessary that all series are *I(0)* and *I(1)* (Abdel-Gadir, 2012). Although model (3) variables are stationary at different orders of *I(0)* and *I(1)*, and none of the variable series are *I(2)* (Paul, 2014), it is still possible to employ an ARDL approach in order to explore the relationship between insurance sector development as a part of the financial sector and economic growth. Thus, the subsequent step is to nominate an ARDL model by specifying the suitable number of lags within this model. Therefore, for this objective the AIC, BIC, and HQ criteria were adopted.

Table (4. 19)

Lag Selection Criteria for Model (3)

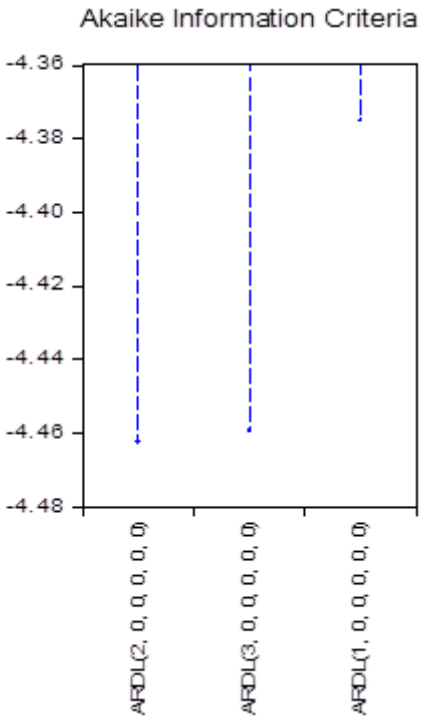
model specification	AIC	BIC	HQ	Conclusion
(2, 0, 0, 0, 0, 0)	-4.462358	-4.344585	-4.414877	(2, 1, 1, 0, 0, 1) Is the best model
(3, 0, 0, 0, 0, 0)	-4.459347	-4.326853	-4.405932	
(1, 0, 0, 0, 0, 0)	-4.374984	-4.271933	-4.333439	

Source: Author's calculations.

Table (4.19) exposes that the greatest negative values of AIC (-4.462), BIC (-4.345), and HQ (-4.415), are at ARDL model (2, 0, 0, 0, 0, 0), in comparing with those values at other applicable ARDL models. This implies that ARDL model (2, 0, 0, 0, 0, 0) is the best. Besides, this result had been graphically corroborated via Akaike Information Criterion in graph (4.3).

Figure (4. 3)

Lag selection criteria for model (3)



4.4.4.3 Bounds Test for Model (3)

A bounds test is performed on model (3), using appropriate lags. Thus, to verify whether there is long run relationship between the insurance sector as an element of the financial system and economic growth, the results of this test are demonstrated in table (4.20). This table shows the value of the computed F-statistic is not lower nor between lower and upper critical values, at levels of significance of 1% (Pesaran et al., 2001), 2.5%, and 5% (Turner, 2006) and (Narayan, 2005). Therefore, we accept the alternative hypothesis of co-integration between variables in model (3); ($H_I: \lambda_1 \neq \lambda_2 \neq \lambda_3 \neq \lambda_4 \neq \lambda_5 \neq \lambda_6 \neq 0$). The result of the bounds test implies that the long run relationship between the insurance sector and economic growth can be recognised.

Table (4. 20)

Bounds test for co-integration for model (3)

test	Computed value	Critical value at 0.01		Critical value at 0.025		Critical value at 0.05		Conclusion
		I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	Long-run relationship exist
F-statistic	12.96721	3.41	4.68	2.96	4.18	2.62	3.79	

Source: Author's calculations

4.4.4.4 Insurance Sector Development and Economic Growth Long-run Relationship

Table (4.21) presents the estimation results of the long-run relationship between insurance sector development and economic growth, employing the most appropriate ARDL model with two lags in the dependent variable and no lags for explanatory variables. Besides, table (4.21) introduces three important features. First, the coefficient of the error correction term (-0.480) has a negative sign and is very significant. This is an additional evidence of the presence of a long-run relationship between development in the insurance sector and economic growth, and the convergence towards long-run equilibrium is very high, approximately 48%. Second, while

the coefficient of the life premium $lnlp$ (-0.007) is insignificantly negative, the non-life premium lnn_lp coefficient (-0.187) is negative and significant. This implies that the life premium does not contribute to increasing economic growth, and a non-life premium has a negative impact on economic growth. This result is derived in contradiction of what was expected (life and non-life premiums have a positive impact on economic growth). Lastly, control variables in model (3) have similar behaviour in models (1) and (2). As projected, total investment lni_imf (0.483) and human capital $lnhc$ (0.179) have significant positive effects on economic growth and inflation cpi_imf (0.005) has a slightly insignificant negative effect on economic growth.

Table (4. 21)

ARDL Long-run Estimation Model (3)

Dep. variable: $lngdp$, $ARDL$ model (2, 0, 0, 0, 0, 0) Obs.: 236 Model selection method: $A\|C$			
Regressors	Coefficient	t-statistic	Probability
$lnlp$	-0.006538	-0.166081	0.8682
Lnn_lp	-0.187122	-2.105010	0.0364
Lni_imf	0.482749	7.112273	0.0000
Lncpi_imf	-0.005460	-0.848858	0.3969
lnhc	0.178541	2.452397	0.0149
$\mathrm{ECT}-1$	-0.480149	-8.693656	0.0000
C	-0.698505	-2.335522	0.0204

Source: Author's calculations

4.4.4.5 Insurance Sector Development and Economic Growth Short-run Relationship

Table (4.22) discloses the short-run estimation result for model (3). On one hand, both proxies of insurance sector development $\Delta lnlp$ (-0.0031) and Δln_lp (-0.0898) have coefficients with a negative sign. But, while the variable of life premium $\Delta lnlp$ is significant, the variable of non-life premium Δlnn_lp is insignificant. On the other hand, for control variables in model (3), the coefficient of the inflation variable $\Delta lncpi\_imf$ (-0.0026) is negative and insignificant; both coefficients of the total investment variable Δlni_imf (0.2318) and human capital variable $\Delta lnhc$ (0.0857) are positive and significant.

Table (4. 22)

ARDL Short-run Dynamics Model (3)

ARDL Short-run Dynamics Model (3)			
Dependent variable: $lngdp$, Model selection method $A\|C$, $ARDL$model: (2, 0, 0, 0, 0), Observations: 236			
Regressors	Coefficient	t-statistic	Probability
$\boldsymbol{\Delta lnlp}$	-0.003139	-0.166459	0.8679
$\boldsymbol{\Delta lnn\_lp}$	-0.089847	-2.268992	0.0242
$\boldsymbol{\Delta lni\_imf}$	0.231791	13.803528	0.0000
$\boldsymbol{\Delta lncpi\_imf}$	-0.002622	-0.850951	0.3957
$\boldsymbol{\Delta lnhc}$	0.085726	2.409743	0.0168
$Cointeq = lngdp - (-0.0065^{*}lnlp - 0.1871^{*}lnn\_lp + 0.4827^{*}lni\_imf - 0.0055^{*}lncpi\_imf + 0.1785^{*}lnhc - 0.6985)$			

Source: Author's calculations

4.4.5 Stability Test

Cumulative Sum (CUSUM) structural stability tests suggested by Brown, Durbin and Evans (1975) have been performed to examine whether the estimated short-run and long-run models based on estimates of ARDL models (1), (2) and (3) are stable. Graphs (4.4), (4.5) and (4.6) plot (CUSUM) stability tests for ARDL models (1), (2) and (3), respectively. The null hypothesis that all coefficients in the model are stable, would not be rejected if the (CUSUM) plot remains within a critical bound of the 5% level (Al-Malki and Al-Assaf, 2014).

Graphs (4.4), (4.5) and (4.6) show that all the plot (CUSUM) statistics are within the 5% critical bounds and none of the straight lines (represented by the 5% level) are crossed by (CUSUM). This implies that the null hypothesis of (CUSUM) stability tests, that model coefficients are stable, cannot be rejected for all three ARDL models. This means that all coefficients in models (1),(2) and (3) are stable.

Figure (4. 4)

Plot of Cumulative Sum (CUSUM) of Recursive Residuals for Model (1)

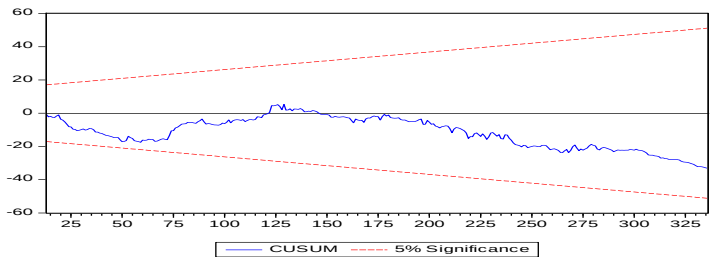


Figure (4. 5)

Plot of Cumulative Sum (CUSUM) of Recursive Residuals for Model (2)

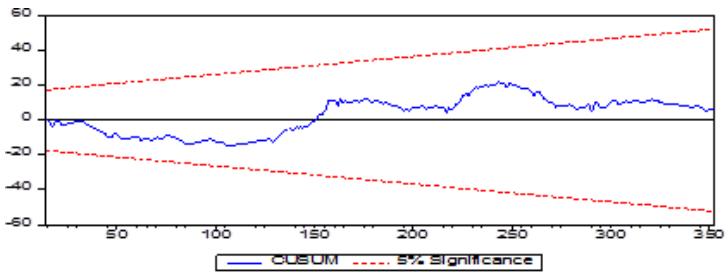
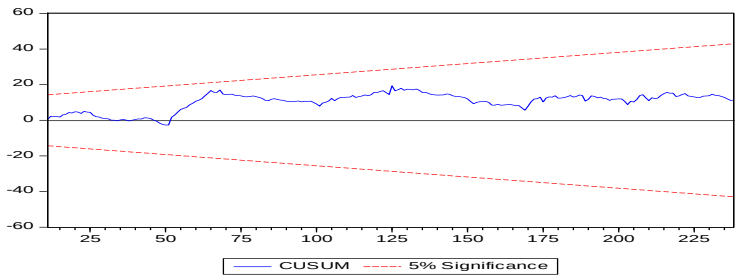


Figure (4. 6)

Plot of Cumulative Sum (CUSUM) of Recursive Residuals for Model (3)



4.4.6 Diagnostic Tests

A set of four diagnostic tests was applied on each model. First, R square tests to test the model's goodness of fit. Second, an LM test to examine the null hypothesis of no serial correlation against the alternative hypothesis of serial correlation. Third, a Ramsey RESET test (Regression Specification Error Test) developed by Ramsey (1969), to detect incorrect functional form through examining the null hypothesis of the model as correctly specified with (H_o: $\delta_1 = 0, \delta_2 = 0$). Fourth, a Harvey (1976) test for heteroskedasticity to check whether the model is miss-specified under the null hypothesis of no heteroskedasticity.

Table (4.23) reveals that the explanatory powers for the models (1), (2) and (3) are quite high at (57%), (60%) and (60%), respectively. Secondly, results of the LM test (up to 4 lags) for the three above mentioned models do not reject the null hypothesis of no serial correlation among residuals. This indicates all models have no serial correlation. Third, Ramsey test results from all models cannot be rejected at the null hypothesis that the model is well specified. This means that all models are not miss-specified. Lastly, a Harvey test reflects no heteroskedasticity at the (5%) significance level in models (2) and (3). However, in model (1), the null hypothesis of heteroskedasticity can be rejected at a significance level of (5%). Heteroskedastic problematic detection in ARDL methods is natural and expected, because the model has different integration orders I(0) and I(1), and involves data of mixed time series (Samargandi et al., 2014; Shrestha and Chowdhury, 2007).

Table (4. 23)

Diagnostic Tests for Models (1), (2) and (3)

test	Model (1)	Model (2)	Model (3)
R^2	0.57	0.60	0.60
$LM\ serial\ correlation$	1.812 (0.126)	2.165 (0.072)	1.000 (0.369)
$Ramesy\ RESET$	0.157 (0.691)	1.163 (0.281)	0.983 (0.322)
$Harvey\ Test$	2.499(0.012)	1.687 (0.082)	1.246 (0.278)

Source: Author's calculations. Note: Figures between (.) reports $\rho - value$

4.5 Financial system development and Economic growth

For further investigation, in this section the impact of financial system on economic growth will be examined and that through measuring the impact of the development of different components of financial system on economic growth. For this purpose, an endogenous growth model been has constructed by using economic growth as a dependent variable. However, credit to private sector $lncps$, stock market chaptalisation $lnsmc$, and life insurance premium $lnlp$ will be used as exploratory variables. Moreover, inflation measure $lncpi - imf$ will be used to control the regression. Because of data availability, we will use a selected sample contains only eight members from G20 countries (Argentina, Australia, India, Indonesia, Japan, Korea Republic, Mexico, and UK) covers the time period 1993-2010. ARDL estimation technique will be used to estimate this model as the following:

4.5.1 Financial development and economic growth model Panel unit root test

It is essential before estimating any model to assess the univariate characteristics of the employed time series in order to specify the integration degree among these series. To do so, two panel unit root tests are adopted. Firstly, Im pesaran and Shin panel unit root test was employed at level and at first difference. The test was implemented with individual intercept and using schwarz information Criterion SIC for automatic lags selections. The results of Pesaren and Shin panel root test are reported in table (4.24). The findings at level form reported that the computed t-statistics for the time series $lngdp$ (-5.003), $lncps$ (-5.750), $lnsmc$ ( ), and $lnlp$ (-5.810) are highly significant at significance level of (0.05). Thus, the null hypothesis of the presence of panel unit root is rejected and accept the alternative hypothesis that these times series are free of unit root at level. Whereas, the t-statistic of time series $lncpi\_imf$ (1.552) is insignificant. So, the null hypothesis of unit root can not be rejected and confirm that the inflation time series has a unit root at its level. Also, table (4.24) shows the results of Im pesaran and Shin unit root at first difference. The obtained results reveal that the t-statistics for

all the time series are highly significant at significance level of (0.005). Therefore, the null hypothesis of Im pesaran and Shin unit root is not accepted for all the time series, and one can say all the employed time series with in the model are stationary at their level.

To confirm the results from Im pesaren unit root test, Levin, Lin and Chu panel unit root test was performed. SIC was used for automatic lags selection, and Newey-West for automatic Bandwidth. The results in table (4.25) reported that all the time series are stationary at their level and first difference except the inflation time series is only stationary at its first level. Thus, both unit root tests show that the employed variables are mixed of I (0), and I (1).

Table (4. 24)

Im Pesarn and Shin Unit Root Test

Test	$\boldsymbol{Im\ pesaran}$ & $\boldsymbol{Shin\ I(0)}$		$\boldsymbol{Im\ pesaran}$ & $\boldsymbol{Shin\ I(1)}$		Decision
Variable	t- Statistic	Prob.	t-Statistic	Prob.	
$\boldsymbol{lnsmc}$	-4.	0.000	-1	0.000	$I(0)$
$\boldsymbol{lncps}$	-5.750	0.000	-9.247	0.000	$I(0)$
$\boldsymbol{lngdp}$	-5.003	0.000	-10.089	0.000	$I(0)$
$\boldsymbol{lncpi\_imf}$	1.552	0.936	-4.073	0.000	$I(1)$
$\boldsymbol{lnlp}$	-5.810	0.000	-15.028	0.000	$I(0)$

Source: Author's calculations Note: Results are reported with individual intercept

Table (4. 25)

Levin Lin and Chu Unit Root Test

Test	$\boldsymbol{Levin, Lin}$ & $\boldsymbol{Chu\ I(0)}$		$\boldsymbol{Levin, Lin}$ & $\boldsymbol{Chu\ I(1)}$		Decision
Variable	t- Statistic	Prob.	t-Statistic	Prob.	
$\boldsymbol{lnsmc}$	-9.215	0.0000	-13.544	0.000	$I(0)$
$\boldsymbol{lncps}$	-6.938	0.000	-10.138	0.000	$I(0)$
$\boldsymbol{lnlp}$	-7.442	0.000	-17.992	0.000	$I(0)$
$\boldsymbol{lngdp}$	-6.234	0.000	-11.046	0.000	$I(0)$
$\boldsymbol{lncpi\_imf}$	-0.785	0.216	-4,223	0.000	$I(1)$

Source: Author's calculations. Note: Results are reported with individual intercept

4.5.2 Financial development and economic growth Model Optimal Lag Selection

The obtained results from both Im pesaran and Shin panel unit root test, and Levin Lin and Chu panel unit root test allow us to estimate the employed model by using ARDL estimation procedure. Therefore, the next step requires to select the number of optimal lags for ARDL model. For this purpose, we will use AIC, SIC, and HQ Criterions. Table (4.26) shows that the ARDL model with lags number (1,0,1,1,0) is the best model that can be adopted for dynamic and long run estimation, as this email has the lowest values of AIC (-4.003), BIC (-3.830), and HQ (-3.933). Moreover, by using AIC the figure (4.7) shows that the ARDL model (1,0,1,1,0) is the most consistent model.

Table (4. 26)

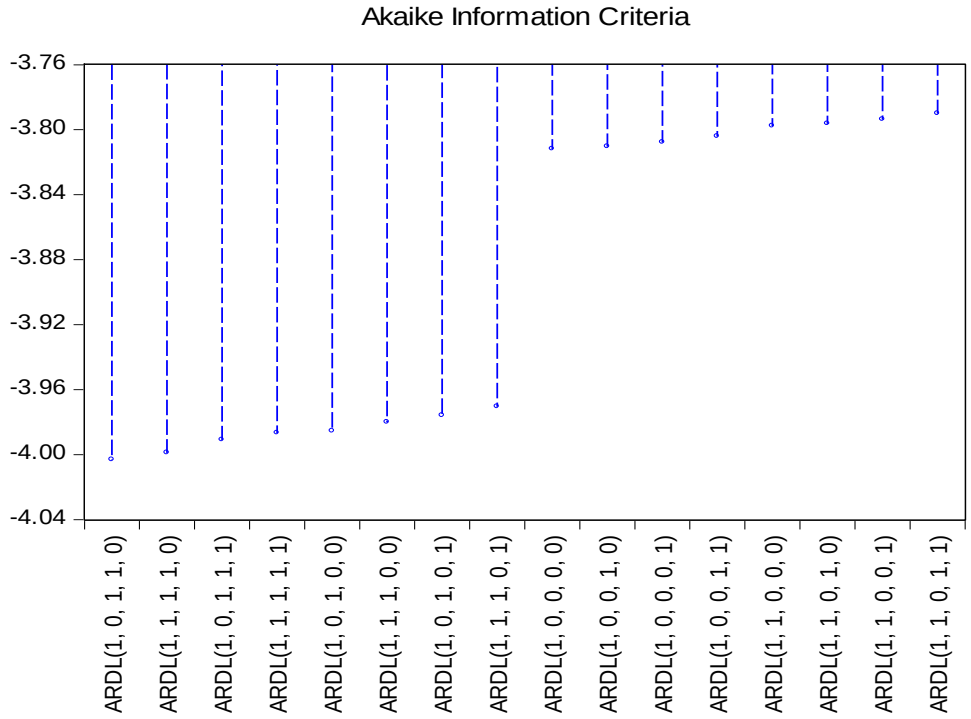
Lag selection criteria for the complete model

model specification	AIC	BIC	HQ	Conclusion
(1, 0, 1, 1, 0)	-4.0030	-3.8308	-3.9330	(1, 0, 1, 1, 0) Is the best model
(1, 1, 1, 1,0)	-3.9987	-3.8500	-3.9200	
(1, 0, 1, 1, 1)	-3.9908	-3.7972	-3.9192	

Source: Author's calculations

Figure (4. 7)

Lag Selection Criteria for FD and EG model



4.5.3 Financial development and economic growth Model Bounds Co-Integration Test

After specifying the best ARDL model, it becomes appropriate to examine whether there is long run connection among the employed variables, and that by computing the F-statistic of bounds co-integration test. The results from this test is reported in table (4.27). The accounted F-statistic (21.246) is higher than the critical values of lower and upper limits at different significant levels (0.001), (0.025), and (0.05). Thus, the bounds co-integration test does not accept the null hypothesis that there is no long run relationship between the used variables $(H_o: \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = 0)$, and accept the alternative hypothesis that there is long run relationship between the used variables $(H_I: \lambda_1 \neq \lambda_2 \neq \lambda_3 \neq \lambda_4 \neq \lambda_5 \neq 0)$.

Table (4. 27)

Bounds Test for Co-integration for FD & EG Model

Bounds test for co-integration								
test	Computed value	Critical value at 0.01		Critical value at 0.025		Critical value at 0.05		conclusion Long-run relationship exist
		$I(0)$	$I(1)$	$I(0)$	$I(1)$	$I(0)$	$I(1)$	
F-statistic	21.246	3.74	5.06	3.25	4.49	2.86	4.01	

Source: Author's calculations

Note: using ARDL (1, 0, 1, 1, 0)

4.5.4 Financial development and Economic growth Long-run Relationship

After confirming the presence of long run relationship between the used time series, the followed step involving the estimation of long run relationship by using the optimal model (1,0,1,1,0). Table (4.28) shows that both coefficients of banking sector development indicator

$lncps$ (0.047), and stock market development indicator $lnsmc$ (0.046) are positive, and extremely significant at (0.05) level. This implies that banking sector and stock market development have positive impact on economic growth in the long run period. However, the coefficient of insurance sector development $lnlp$ (-0.088) is negative and insignificant. This may imply that insurance sector has no effect on economic growth or this effect may be become negative in the long run period. Finally, with regard of inflation indicator $lncpi\_imf$, it shows insignificant positive coefficient (0.011)

Table (4. 28)

ARDL Long-run Estimation for the FD & EG Model

ARDL Long-run estimation			
Dep. variable: $lngdp$, ARDL model (1, 0, 1, 1, 0), Model selection method: $A\|C$			
Regressors	Coefficient	t-statistic	Probability
$lncps$	0.047	2.122	0.035
$lnsmc$	0.046	2.100	0.037
$lnlp$	-0.088	-1.348	0.179
$lncpi\_imf$	0.011	1.228	0.221
$ECT-1$	-0.665	-7.674	0.0000

Source: Author's calculations

4.5.5 Financial development and Economic growth Short-run Relationship

The dynamic relationship between financial development and the entire growth has been estimated by using ARDL (1,0,1,1,0) model and the results are displayed in table (4.29). The results in table (4.29) shows that the explanatory variables $\Delta lncps$ has a significant positive impact on economic growth. Whereas, the explanatory variables $\Delta lnsmc$ and $\Delta lnlp$ have no or even negative impact on economic growth. Thus, only banking sector development has positive impact on economic growth in the short run period.

Table (4. 29)

Financial development and Economic growth short-run relationship

Dep. variable: $lngdp$, $ARDL$ model (1, 0, 1, 1, 0), Model selection method: AIC			
Regressors	Coefficient	t-statistic	Probability
$\Delta lncps$	0.031	1.977	0.050
$\Delta lnsmc$	-0.012	-1.644	0.102
$\Delta lnlp$	-0.001	-0.040	0.968
$\Delta lncpi\_imf$	0.007	1.259	0.210

Source: Author's calculations

4.6 Conclusion

The contribution of the current empirical chapter to the finance-growth literature traces the linkage between financial development and economic growth. This relationship has investigated the individual impact of financial system components namely; the banking sector, stock markets and the insurance sector, on the real sector in the context of G20 countries by using more recent and reliable econometric analysis techniques with an ARDL approach to co-integration. In particular, this chapter examines both long-run relationships and short-run dynamic model parameters.

Unlike many studies that link the development of the financial system to banking development and stock market development, this study considers the most important components of financial organisation and this by involving two development indicators of each component of the financial system in a separate model. More specifically, model one is used to test the long and short-run influences of each indicator, domestic credit to private sector as a ratio to GDP and money supply m2 as a ratio to GDP on economic growth. While model two is used to test the effect of stock market capitalisation and turnover ratio on economic growth. Lastly, model three is used to test the impact of the indicators of development in the insurance sector namely, life premium and non-life premium on overall growth.

In addition, regarding the control variables, this empirical chapter introduces a new indicator for human capital namely; people aged 15-65 as a ratio to the total population. Moreover, the data for our different variables have been carefully reviewed and organised in panel data form and accurately checked for unit root issues.

In general, there are some indications drawn from various tests (bounds test to co-integration, CUSUM test and error correction term coefficients) suggesting a stable long-run association between the adopted financial development indicators and economic growth.

The findings from long-run and short-run dynamics can be viewed from the angle of financial system development indicators. First, regarding the banking sector, the tests provide additional evidence that the efficiency of the banking sector measured by credit to private lending has a positive impact on economic growth in both the long and short-run. This result is in line with Salari et al. (2014) and Anwar and Nguyen (2010). However, the depth and size of the banking sector measured by m2 to GDP constrains economic growth in the long and short-run. Accordingly, the banking sector should commence new polices to boost efficiency to increase economic growth rather than focusing on its depth and size.

Second, with respect to the stock market in the long and short-term and contrasting with many studies, for example, Ghimire and Giorgioni (2013), our results show that the size and liquidity of the stock market raise economic growth when they are indicated by stock market capitalisation to GDP ratios and turnover ratios to GDP. Moreover, the results demonstrate that stock market development is more important than banking sector development in raising economic growth. According to this finding, it crucial to concentrate on the role of the banking sector in supporting the stock market where the improvement in stock markets ensures macroeconomic stability.

Third and contrary to what was expected, the results indicate that the insurance sector is a burden on economic growth.

Fourth, tests found that total investment and human capital have positive effects on the growth rate. In contrast, the effect of inflation is negative. These findings were expected and provide a confirmation for the results of some studies, for instance Khan (2008).

To sum up, this chapter investigates the relationship between financial development and economic growth by examining the individual impact of the banking sector, stock markets and

the insurance sector on the real sector in G20 countries for the period 1990-2014 by using balanced panel data and ARDL bound co-integration techniques. The results indicate that banking sector efficiency, stock market size and liquidity, total investment and human capital have significant and fundamental influences on economic growth. However, banking sector size and inflation have a negative impact on growth rates. Moreover, this chapter provides evidence that the insurance sector is a burden on economic growth.

Chapter Five: The Relationship between Banking Sector and Stock Market

5.1 Introduction

Investigating the relationship between financial development and economic growth has been a significant subject of discussion. Not surprisingly that financial development involves banking sector development and stock market development (Sawyer, 2014). Therefore, financial development can be defined as the development in both banking system and stock market (Rudra P Pradhan, Arvin, Hall, & Bahmani, 2014). Based on this definition of financial development, the finance-growth literature can be classified into two strands; the first strand of the literature concerns with the impact of banking sector on economic growth. A number of studies, for example, (Demetriades & Luintel, 1996; Ferreira, 2008; Ho & Odhiambo, 2013; Iqbal, 2011; Kjosevski, 2013; Rudra P Pradhan, Dasgupta, Samadhan, & Tripathy, 2013; Rudra P Pradhan, Tripathy, et al., 2014; Tripathy & Pradhan, 2014) investigated the relationship between banking sector development and economic growth using different measures of banking sector development and followed different econometric methods. By large, the findings suggest that there is association among these indicators and economic growth. The second body of the literature examines the linkage between stock market and economic growth. In this vein (Abdalla, 2011; Arestis & Demetriades, 1996; Athanasios & Antonios, 2012; Badr, 2015; Castillo-Ponce, Rodriguez-Espinosa, & Gaytan-Alfaro, 2015; Chen, Roll, & Ross, 1986; Enisan & Olufisayo, 2009; Levine, 1991; Levine & Zervos, 1996; Naik & Padhi, 2015; Ngare, et al., 2014; Palamalai & Prakasam, 2015; Rudra P Pradhan, Arvin, & Bahmani, 2015; Shahbaz, Ahmed, & Ali, 2008; Tachiwou, 2010) largely fined evidence of positive relationship among stock market and economic growth.

Furthermore, finance-growth literature involves academic debates regarding banking system and stock market relationship. Some studies remarked the presence of this relation while investigating the macroeconomic determinants of stock market development. For example, (Abdelbaki, 2013; Eita, 2012; El-Nader & Alraimony, 2013; Evrim-Mandaci, Aktan, Gumus, & Tvaronavičienė, 2013; Garcia & Liu, 1999; Hsing & Hsieh, 2012; Ozcan, 2012; Shahbaz, Rehman, & Afza, 2016; Yartey, 2010). However, few studies (Odhiambo, 2010; Rudra P Pradhan, Arvin, Hall, et al., 2014) have empirically investigated the relationship between banking sector and stock market.

While there is a considerable concern in academic debates regarding the issue of financial development and economic growth relationship. There is a little attention to the relationship among the components of financial system itself. Therefore, this study not destined to investigate the impact of the development of banking sector and stock market on economic growth, rather it focuses on banking sector and stock market. This study attempts to find an answer for two empirical questions: Do banking sector and stock market influence each other during the process of economic growth? And whether they are complements or substitutes? Models of panel autoregressive are adopted to identify and examine the long run equilibrium relationship between banking sector development and stock market development and to establish the existence of the causality among the size and efficiency of banking sector and the size and liquidity of stock market. In addition, to investigate whether they are significantly correlated.

5.2 EMPRICAL LITRATURE REVIEW

In the finance-growth literature, the relationship between banking sector and stock market development has been argued and introduced along two lines; First, the relationship between banking sector and stock market while studying the macroeconomic determinants of stock market development. Second, while investigating the complementary relationship between stock market and banking sector. Therefore, to fulfill a sufficient understanding on the relationship between banking sector development and stock market development, it is worthy and beneficial to review the following empirical literature:

5.2.1 Banking Sector Development and Stock Market Development relationship

From our knowledge there is no specific study independently investigate the relationship between banking sector development and stock market development. However, the relationship between them can be noticed and monitored while reviewing some studies that concerning with determinants of banking sector and stock market development. For example:

Baranidharan and Vanitha (2016) applied ARDL approach to find out the impact of macroeconomic and financial development variables on stock market development in seven selected countries of Global Growth Generator Countries during the years 1992-2013. The results indication is in favor of the presence of long run relationship between financial

development in banks and stock market development. This study provides evidence that stock market development can be improved by effective banking system.

Shahbaz, et al. (2016) applied two different econometric techniques, ARDL approach and Vector Error correction Model and Granger Causality method to explain the macroeconomic determinants of stock market development and to identify the causality between these variables. He collected annual data on Pakistan economy covering the period of 1974-2010. The results show that there is bidirectional relationship between banking sector development and stock market development when they indicated by credit to private sector and stock market capitalization, respectively. This finding implies that banking sector and stock market are interdependent, and their conclusions display that stock market capitalization is granger cause credit to private sector.

Rudra P Pradhan, Arvin, Norman, and Hall (2014) utilized the econometric method of panel co-integration, and causality test to study whether the causal link is existing among the maturity of stock market, the maturity of banks, and other set of macroeconomic variables. They used panel data set from 35 Asian countries through the period 1961-2011. The findings were in favor of the presence of bidirectional causal relationship among stock market and banking sector development measures.

Abdelbaki (2013) used stock market capitalization and a number of macroeconomic variables including money supply to GDP, and credit to private sector to GDP to examine the casual relationship among macroeconomic variables and stock market development in Bahrain. ARDL econometric technique were applied in this study and the data covered the years 1990-2007. The study found that banking sector development is an important determinant of stock market development in Bahrain.

Al-Mamun (2013) in his paper analysed panel data set from eight countries of Global Growth Generator Countries between 1980 and 2011 has found that credit to private sector has long run negative impact on stock market development. This finding is codirecting the literature, and unacceptable as it is statistically insignificant.

Evrim-Mandaci, et al. (2013) use stock market capitalization as a measure for stock market development and credit to private sector to GDP as a measure for banking sector development. With a sample of thirty developed and developing countries for the period of 1960-2007. They

found that banking sector development has significant positive influence on stock market function.

Allen, Gu, and Kowalewski, (2012) asserted that the development of banking sector in a specific country can be jointly determined by stock market development and other macroeconomic variables.

Odhiambo, (2010) developed three growth models with interactive terms to find out whether banks and stock markets complement each other during the process of boosting economic growth in South Africa throughout the time period 1972-2011. Specifically, the researcher investigated the complementarity between credit to private sector and stock market capitalization, credit to private sector and stock market value, and the complementarity between credit to private sector and stock market turnover ratio. He concluded that that there is short and long run complementarity relationship between credit to private sector and stock market capitalization and traded value. However, the complementarity between credit to private sector and stock market turnover ratio is exist only in the short run period. While the previous studies considered only the long run relationship between stock market and banking sector, Odhiambo's (2014) study considered this relation in both short and long-term periods and that by using ARDL to co-integration procedure.

Yartey, (2010) investigated the influence of institutional quality on the stock market function in a sample of 42 emerging markets through the period of 1990-2004. He used credit to private sector to indicate the development in the banking sector, and the square of credit to private sector to indicate high level of development. The results show that the relationship between banking sector development and stock market development is significantly positive. Whereas, this relation may change to negative at very high level of development in the banking sector.

Billmeier and Massa, (2009) employed fixed effect panel regression to evaluate macroeconomic determinants of stock market capitalization in 17 Asian emerging markets during ten years from 1995 to 2005. The study found that banking sector development as measured by credit to private sector has positive impact on stock market capitalization. But this impact is weaker than found in most previous studies.

Ben Naceur, Ghazouani, and Omran, (2007) considered the issue of stock market and economic growth link and examined the main macroeconomic variables that effecting stock market progress in 12 MENA economies. By using random and fixed effect models, they found that

credit to private sector, traded value as a ratio to GDP, saving rate, and inflation rate are the main factors that determine the development of stock market. Additionally, they confirmed that both credit to private sector and stock market capitalization are complement, but not substitute during the process of the growth progression.

Quartey and Gaddah, (2007) employed Johansen's technique on quarterly data from Ghana over the period 1991-2004, to investigate the way of how macroeconomic variables influencing stock market capitalization in Ghana. They confirmed that stock market capitalization is positively sensitive to the improvement in credit to private sector.

Generally, the preceding literature provides an impression regarding the importance of both banking sector and stock market to boost the economic growth. Besides, this literature concerns with the issue of the complementarity and substitutability link between banking sector development and stock market development. Furthermore, this literature provides the evidence that there is a concrete relationship between banking sector development and stock market development. However, yet this relationship has not been independently investigated.

5.3 Variables

In this study Since the objective is to investigate banking sector development and stock market development relationship, we consider credit to private sector as a ratio to GDP and money supply M2 to GDP as empirical indictors of banking sector development. On the other hand stock market capitalization to GDP and turnover ratio are used to indicate the development in the stock market. In addition, based on exciting literature a set of macroeconomic variables are deliberated as control variables.

5.3.1 Credit to private sector to GDP

Credit to private sector involves loans, any received accounts that establish a claim for refund, and other financial resources that provided by banking system to the private sector (Beck, Demirgüç-Kunt, & Levine, 2010; Jedidia, et al., 2014). This indicator was used by a enormous studies for example, Kazar and Kazar (2016) to measure the efficiency of banking sector.

5.3.2 Broad Money Supply to GDP Ratio

Stock money supply $m2$ as a ratio to GDP is a financial deepening measure which has been widely utilized in Finance-Growth literature to indicate the monetization degree in economies. This indictor reflects the actual size of the financial system (Kar, Nazlıoğlu, & Ağır, 2011).

Lynch (1996) argues that broad money supply $m2$ as a ratio to GDP increases at a faster speed than money supply $m1$ as a ratio to GDP during the process of financial development. (Alom, 2018; Yan Wang, Li, Abdou, & Ntim, 2015) use this indicator as a proxy of financial structure expansion.

5.3.3 Stock market capitalization ratio

The term stock market capitalization ratio refers to the value of local equities traded at stock market as a ratio to GDP (Yartey, 2008). Stock market capitalization measures the size of stock market, and it can be used as a good indicator of stock market development because it is believed that it is less capricious than other individual indexes and indicators of stock market development (Garcia & Liu, 1999).

5.3.4 Turnover ratio

The turnover ratio *"equals the total value of shares traded on a country's stock exchange divided by stock market capitalization"* (Levine, 1997, p. 712). Turnover ratio can be used to measure stock markets activities in relative to their sizes. Also, because turnover ratio reflects the cost of transactions. It can be used as a measure of stock market efficiency, where high turnover ratio means that the stock market works with high efficiency.

5.3.5 Control Variables

A number of macroeconomic variables are included alongside with the indicators of both banking sector development and stock market development. The rationality for this is centred on various theoretical arguments; Firstly, the inclusion of GDP aims to consider the linkage between banking sector development and real income on the one hand and relationship between stock market and real income on the other hand. Saqib (2016) asserted that there is a concrete correlation between GDP and banking sector development. In the same vein, Naik and Padhi (2015) found a positive relationship between the real income and stock market development. According to the demand following theory the real sector facilities financial sector function. The argument implies that the economic growth generates demand for financial service and that financial sector effectually responses to this demand (Abdel-Gadir, 2012). Therefore, the GDP coefficient is projected to be positive and significant (Odhiambo, 2010). Secondly, total investment and total saving are other essential determinates of banking sector development and stock market development. Finally, to indicate the stability of macroeconomic an inflation variable represented by consumer price index has included. The impact of inflation is expected

to be negative on banking sector development and stock market development, because the higher rate of inflation the less incentive to invest in the financial sector.

5.4 Summary of Statistics

Table (5.1) exposes summary statistics of empirical measures for banking sector development and stock market development over the period of 1989-2014. From one point of view, if we investigate these measures in all countries, we would find the following; First, the average of banking sector development when measured by the ratio of credit to private sector to GDP is marginally higher in Japan and USA than the other countries. While this ratio is more than (5%) in Japan and USA, it is about (3%) or even less in the other countries. For example, it is (3.20%) in Turkey and (2.75%) in Argentina. Second, the broad money $m2$ to GDP records more than (3.5%) for all countries. Except Argentina whose broad money m2 to GDP is (3.12%). Third, the stock market development indictors in South Africa has the largest average of stock market capitalization to GDP ratio by more than (5%). While the UK and the USA come second and third with stock market capitalization ratio to GDP (4.74%) and (4.65), respectively. In contrast, Argentina has the lowest stock market capitalization ratio to GDP with average around (2.5%). Finally, while Korea has the highest turnover ratio of (5.03%), Argentina and South Africa have equal lowest turnover ratio of (3.03%).

From the other point of view, if we analyze the indicators of banking sector development and stock market development within one country for all countries, then it can be concluded that there is an equilibrium balance between the development in banking sector and the development in stock market in all countries. For example, in Indonesia, the averages of credit to private sector to GDP and turnover ratio are almost equal (3.50%) and (3.43%), respectively.

Table (5. 1)

Summary of Statistics

	$lncps$		$lnm2$		$lnsmc$		$lntor$	
Country	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.	Mean	Std.Dev.
Argentina	2.752	0.360	3.125	0.278	2.528	0.547	3.030	1.117
Australia	4.503	0.279	4.305	0.237	4.429	0.395	4.095	0.384
India	3.485	0.328	4.046	0.241	3.694	0.663	4.346	0.681
Indonesia	3.508	0.361	3.785	0.157	3.286	0.820	3.438	0.396
Japan	5.263	0.073	5.362	0.091	4.301	0.262	4.243	0.587
Korea	4.457	0.451	4.294	0.594	3.865	0.608	5.038	0.414
S. Africa	4.825	0.185	4.105	0.178	5.185	0.276	3.031	0.841
Turkey	3.200	0.516	3.653	0.283	3.045	0.552	4.791	0.552
UK	4.889	0.235	4.648	0.353	4.740	0.241	4.391	0.336
USA	5.072	0.201	4.289	0.130	4.653	0.343	4.563	1.312

Source: Author's calculations

5.5 Results

To accomplish a consistent estimation, methodological and econometrical methods are proceeded from easy to more complicated structure. This study uses various techniques to examine the properties of time series in the panel data as well as the relationship between banking sector development and stock market development. These techniques involve panel data unit root tests, co-integration test, long run estimation, and causality direction determination. The first step aims to test stationary of variables of the panel data. Thus, two of panel unit root tests are employed. In this context, Im pesaran and Shin unit root test and Liven, Lin, and Chu unit root test were adopted. As the integration order of the relevant variable has determined, the second step would involve applying co-integration test. The idea of co-integration test is that there is a co-integration between two series even they have unit root if

their differences are stationary. If there is co-integration between two or more variable can be interpreted as there is a stable long relationship among them (Rudra P Pradhan, Arvin, Norman, et al., 2014). Therefore, Pedroni co-integration test will applied to explore whether there is a stable long run relationship between variables. Since the co-integration between variables has confirmed, fully Modified Ordinary Least Square (FMOLS) long run estimation method would have performed to estimate the long run elasticities. This method permits a semi parametric correction for auto correlation in the co-integrated equations and resolve the problem of endogeneity (Refaei & Sameti, 2015).

5.5.1 Panel Unit Root Test

Before performing co-integration test two panel unit root tests have conducted to find out the integration order of the related variables, Im Pesaran and Shin unit root test along with Levin, Lin and Chu unit root test are carried out at level and first difference. The results of both test are reported in table (5.2) and table (5.3), respectively. It may have noticed that both unit root tests are implemented with including individual intercept in the test equation and by selecting the appropriate lags employing the Schwarz Information Criterion. Automatic Newey-West is selected with Bartlett Kernel. Kernel specification has used to specify the appropriate estimation method that used to estimate the variance in the long run period. Also, the total number of observations has balanced for both tests.

The outcomes from Levin Lin and Chu panel unit root test are revealed in table (5.2). These results indicate that; first, at level form, the measured t-statistic values range between (-0.591) for $lnm2$ and (-5.331) for $lncps$. The t-statistic values of the time series $lnsmc, lntor, lninv, and\ lncpi$ are significant at level of (0.05). Thus, the null hypothesis of Levin Lin and Chu panel unit root test that the time series has panel unit root is rejected and accept the alternative hypothesis that the time series has no unit root for these variables. However, the calculated t-statistic values of the variables $lncps$, $lnm2$, and $lngdp$ are not significant event at (0.10) significance level. Hence, the null hypothesis that confirm of the existence of panel unit root cannot be declined, Otherwise, we disagree with the alternative hypothesis that time are stationary for the later three variables. Second, at the first difference form, the computed $t - statistic$ value range between (-6.804) for $lncps$ and (-12.882), and the obtained values are significant at level of (0.05). Consequently, we do not accept the null

hypothesis that the tested variable is not stationary, Instead, we accept the alternative hypothesis that the tested variable is stationary for all the considered variables.

Table (5. 2)

Levin Lin and Chu Unit Root Test

Test	$\boldsymbol{Levin, Lin}$ & $\boldsymbol{Chu\ I(0)}$		$\boldsymbol{Levin, Lin}$ & $\boldsymbol{Chu\ I(1)}$		Decision
Variable	t- Statistic	Prob.	t-Statistic	Prob.	
$\boldsymbol{lnsmc}$	-4.772	0.0000	-12.489	0.000	$I(0)$
$\boldsymbol{lncps}$	0.891-	0.186	6.804 -	0.000	$I(1)$
$\boldsymbol{lntor}$	2.470-	0.006	-15.062	0.000	$I(0)$
$\boldsymbol{lnm2}$	-0.591	0.723	-10.193	0.000	$I(1)$
$\boldsymbol{lngdp}$	-0.096	0.538	-9.399	0.000	$I(1)$
$\boldsymbol{lninv}$	-1.857	0.031	-12.882	0.000	$I(0)$
$\boldsymbol{lncpi}$	-5.331	0.000	-7.881	0.000	$I(0)$

Source: Author's calculations. Note: Results are reported with individual intercept

The finding from implementing Im Pesaran and Shin panel unit root test are reported in the table (5.3). These outcomes suggest that firstly, at the level form of time series, the calculated values of t-statistic of the times series $lnsmc$, $lntor$, $lninv$, and $lncpi$ are all combined with probability values less than (0.05). This implies that the null hypothesis of the existing panel unit root is rejected and agree with the alternative hypothesis that time series has no unit root for these variables. Whereas, the t-statistic values of the variables $lncps$, $lnm2$, and $lngdp$ have probability values exceeding (0.05). Therefore, the latter time series are not stationary at their level. Secondly, at first difference form, the resulted t-statistic values for all variables are vastly significant. Accordingly, we reject the null hypothesis that presume the presence of panel

unit root within the time series and accept the alternative hypothesis that time series is free of unit root for all the used variables.

Table (5. 3)

Im Pesaran and Shin Unit Root Test

Test	$\boldsymbol{Im\ pesaran}$ & $\boldsymbol{Shin\ I(0)}$		$\boldsymbol{Im\ pesaran}$ & $\boldsymbol{Shin\ I(1)}$		Decision
Variable	t- Statistic	Prob.	t-Statistic	Prob.	
$\boldsymbol{lnsmc}$	-4.028	0.000	-12.916	0.000	$I(0)$
$\boldsymbol{lncps}$	1.017	0.845	-7.846	0.000	$I(1)$
$\boldsymbol{lntor}$	-2.355	0.009	-13.481	0.000	$I(0)$
$\boldsymbol{lnm2}$	2.685	0.996	-11.069	0.000	$I(1)$
$\boldsymbol{lngdp}$	2.590	0.995	-7.913	0.000	$I(1)$
$\boldsymbol{lninv}$	-1.811	0.035	-12.830	0.000	$I(0)$
$\boldsymbol{lncpi}$	-5.291	0.000	-8.292	0.000	$I(0)$

Source: Author's calculations Note: Results are reported with individual intercept

To this end, the decision of the series has unit root is taken if one of two test detects the existence of the unit root. Thus, It can be concluded, the results of Im Pesaran and Shin, and Levin, Lin and Chu unit root tests suggest that all variables are stationary at level and first difference with exceptional of both indicators of banking sector development ($lncps$ and $lnm2$) and $lngdp$ are reported have unit root at their levels.

5.5.2 Panel Co-integration Test

After applying unit root tests and accomplishing the stationarity of the variables by determining integration order, a co-integration test is needed to confirm whether there is a long run association between the adopted variables. Therefore, *Pedroni* residual co-integration test for panel data is performed on the eight regression equations those were suggested in our methodology chapter.

Pedroni test for co-integration uses more than ten considerable statistics with different degree of properties to examine the null hypothesis of there is no co-integration among variables against the Alternative hypothesis of there is co-integration among the used variables. These statistics are $Panel-v, Panel-PP,\ Panel\,rho,\ Panel-\ ADF,\ weighted\ Panel-v,$ $weighted\ Panel-PP,\quad weighted\ Panel\,rho,\quad weighted\ Panel-ADF,\quad Group\,rho,$ $Group\ PP$, and $Group\ ADF$ statistics. *Pedroni* residual co-integration test suggested that the computed statistic value must be lower than *Pedroni* tabulated critical value to reject the null hypothesis of no co-integration between variables. *Pedroni* co-integration test has applied individually on each model of our used models. It has been run with individual intercept using Automatic lag selection of Akaike Information Criterion, and spectral estimation *Kernel Parzen* with Bandwidth selection of Newey-West automatic. In this study the decision of variables is co-integrated will be taken if the majority of statistics from *Pedroi* co-integration test are rejecting the null hypothesis of no co-integration between variables. Results from *Pedroni* co-integration test for panel data are reported in table (5.4).

Table (5. 4) Pedroni Residual Co-Integration Test

Statistics	Eq. (1) Coin	Eq. (2) Coin.	Eq. (3) Coin.	Eq. (4) Coin.	Eq. (5) Coin.	Eq. (6) Coin.	Eq. (7) Coin.	Eq. (8) Coin.
Panel v	-1.258 (0.895)	-0.287 (0.613)	1.067 (0.143)	1.129 (0.129)	0.677 (0.249)	-1.193 (0.883)	3.386 (0.000)	2.491 (0.006)
Panel rho	0.799 (0.788)	0.786 (0.784)	-0.002 (0.499)	0.221 (0.587)	-0.140 (0.444)	0.025 (0.510)	-2.085 (0.018)	-1.387 (0.082)
Panel PP	-5.236 (0.000)	-12.097 (0.000)	-4.950 (0.000)	-6.906 (0.000)	-8.723 (0.000)	-7.846 (0.000)	-12.565 (0.000)	-9.292 (0.000)
Panel ADF	-5.047 (0.000)	-8.218 (0.000)	-5.014 (0.000)	-6.367 (0.000)	-6.714 (0.000)	-7.109 0.000)(	-6.295 (0.000)	-8.990 (0.000)
Panel v Weighted	-2.306 (0.989)	-1.856 (0.968)	1.058 (0.144)	1.147 (0.125)	-1.586 (0.943)	-3.290 (0.999)	1.502 (0.066)	1.170 (0.120)
Panel rho (weighted)	0.464 (0.678)	1.740 (0.959)	0.062 (0.525)	-0.262 (0.396)	0.685 (0.753)	1.864 (0.000)	-0.900 (0.184)	-1.027 (0.152)
Panel PP (weighted)	-9.950 (0.000)	-10.397 (0.000)	-4.412 (0.000)	-7.157 (0.000)	-6.275 (0.000)	-7.897 (0.000)	-8.174 (0.000)	-8.080 (0.000)
Panel ADF (weighted)	-7.964 (0.000)	-6.707 (0.000)	-4.465 (0.000)	-6.857 (0.000)	-5.565 (0.000)	-6.748 (0.000)	-6.766 (0.000)	-7.799 (0.000)
Group rho	1.567 (0.941)	2.020 (0.978)	1.267 (0.897)	1.078 (0.859)	1.310 (0.905)	1.072 (0.000)	-0.058 (0.476)	0.204 (0.581)
Group PP	-9.642 (0.000)	-13.125 (0.000)	-5.988 (0.000)	-9.948 (0.000)	-8.288 (0.000)	-13.277 (0.000)	-12.122 (0.000)	-8.894 (0.000)
Group ADF	-4.153 (0.000)	-7.937 (0.000)	-5.051 (0.000)	-7.266 0.000)(	-6.013 (0.000)	-6.953 0.000)(	-7.568 (0.000)	-8.654 (0.000)
Coin.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Source: Author's calculations.

Column (2) in table (5.4) shows the results of co-integration among the variables of regression (1). The results indicate that the obtained statistics $panel - v, panel - v\ (weighted)$, $panel\ rho, panel\ rho\ (weighted)$, and $Group\ rho$ are insignificant at (0.05) level, therefore, these statistics do not reject the null hypothesis of no co-integration among the variables in model (1), and reject the alternative hypothesis that the included variables are co-integrated. But, the statistics $panel\ PP$, $panel\ PP(weighted), panel\ ADF, panel\ ADF(weihted)$, $Group\ PP$, and $Group\ ADF$ are significant at (0.05) level, therefore, they reject the null hypothesis that the underlying variables are not co-integrated, a and accept the alternative hypothesis that there is a co-integration relationship among the variable. As the majority of the statistics of Padroni co-integration test agree with the null hypothesis of no co-integration between the variables, we content that the variables in model (1) are co-integrated and have long run relationship.

Column (3) of table (5.4) reveals the findings of Pedroni co-integration test when applied on model (2). It can be notices that, in one hand, the statistics $panel - v, panel\ rho$, $panel - v\ (weighted)$, $panel\ rho\ (weighted)$, and $Group\ rho$ are holding insignificant values at level of (0.05). On the other hand, the statistics $panel\ PP$, $panel\ ADF$, $panel\ PP\ (weighted)$, $panel\ ADF\ (weighted)$, $Group\ ADF$, and $Group\ PP$ are holding highly significant values. Thus, the former group of the statistics support the null hypothesis of *Pedroni* co-integration test and disagree with the alternative hypothesis that the used variables are co-integrated. Whereas, the later statistics group disagree with null hypothesis that there is no co-integration association among the considered variables, alternatively agree with the alternative hypothesis of the existence of co-integration. To this end, we decide that the used variables in the second model are co-integrated and the long run relationship is existing between them, because most of the statistics that adopted by *Pedroni* co-integration test confirm the existing of the co-integration relationship.

Column (4) of table (5.4) presents the statistics values and their significance level that resulted from implementing co-integration test of padroni on the model (3). The results display that six statistics namely; $Group\ ADF$, $panel\ ADF\ (weighted)$, $panel\ ADF$, $Group\ PP$, $panel\ PP\ (weighted)$, and $panel\ PP$ reject the null hypothesis of no co-integration, and accept the alternative hypothesis that the variables are co-integrated. Conversely, the reminder five statistics namely; $panel - v\ (weighted)$, $panel\ rho\ (weighted)$, $Group\ rho$, $panel\ v$, and $panel\ rho$ did not reject the null hypothesis of no co-integration, instead, reject

the alternative hypothesis that the involved variables are co-integrated. Accordingly, as six out of eleven statistics approve the presence of the co-integration connection among the used time series, we accept that the time series in the third model are co-integrated.

Column (5) of table (5.4) indicates that firstly; the tests $panel\ PP\ (weighted)$, $panel\ ADF\ (weighted)$, $panel\ ADF$, $panel\ PP$, $Group\ PP$, and $Group\ ADF$ are in favor of the alternative hypothesis of the existence of long-run relationship among the involved variables of the model (4). Nonetheless, the tests $panel\ rho$, $panel - v$, $Group\ rho$, $panel\ rho\ (weighted)$, and $panel - v\ (weighted)$ do not indicate a co-integration association between the involved variables. Since most of employed tests indicate the existing of the long-run relationship among the used time series, we would decide that the variables of model (4) have a co-integration relationship.

The co-integration relationship between the variables of model (5) has tested by using Padroni technique of co-integration, and the outcomes are presented in the sixth column of table (5.4). It can be observed that, on one hand, most of the used statistics $panel\ PP$, $panel\ ADF\ (weighted)$, $panel\ PP\ (weighted)$, $Group\ PP$, $panel\ ADF$, and $Group\ ADF$ detect the co-integration link between the suggested variables. On the other hand, fewer statistics $panel - v\ (weighted)$, $panel - v$, $panel\ rho\ (weighted)$, $Group\ rho$, and $panel\ rho$ do not find this relationship. Consequently, the variables that included in the fifth model are considered to be co-integrated.

Column (7) of table (5.4) presents the outcomes of *Pedroni* co-integration test of model (6). The results demonstrate that firstly; eight statistics specifically; $panel\ PP$, $panel\ ADF$, $panel\ rho\ (weighted)$, $panel\ ADF\ (weighted)$, $panel\ PP\ (weighted)$, $Group\ PP$, $Group\ rho$, and $Group\ ADF$ have vastly significant values. Therefore, they reject the null hypothesis that the tested variables are not co-integrated, rather than accept the alternative hypothesis that the tested variables are co-integrated. Secondly, only three of total eleven statistics precisely; $panel - v$, $panel\ rho$, and $panel - v\ (weighted)$ have insignificant values at (0.05) level. Therefore, these tests reject the alternative hypothesis of Pedroni co-integration test that says variables are co-integrated, and accept the null hypothesis that variables are not co-integrated. According to these results, we can adopt that there is long run relationship between the time series of model (6).

Column (8) of table (5.4) shows the results of co-integration between the time series of model (7). It can be seen that all statistics except $panel\ rho\ (weighted)$, $panel - v\ (weighted)$, and group rho confirm the presence of co-integration relationship between the variables of model (7). Accordingly, the variables of model (7) are co-integrated.

Finally, the co-integration association between the time series of model (8) has examined and the results revealed in column (9) of table (5.4). The co-integration relationship between the suggested variables was clearly detected by seven co-integration statistics specifically; $panel - v$, $panel\ PP$, $panel\ ADF$, $panel\ PP\ (weighted)$, $panel\ ADF (weighted)$, $Group\ PP$, and $Group\ ADF$. However, the other four statistics namely; $panel\ rho$, $panel - v\ (weighted)$, $panel\ rho\ (weighted)$, and $Group\ rho$ did no detect the long run relationship among the variables. Thus, we can decide that the co-integration relationship between the variables of regression equation (8) is exist.

From table (5.4) it can be seen that the results of panel statistics, panel (weighted) statistics, and group statistics employing $PP - tests$ and $ADF - tests$ show that the null hypothesis of absence of co-integration between variables is rejected for the eight regression equations at (5%) and (1%) level of significant. However, tests result from panel, panel (weighted), and group statistic using $rho - test$, $v - test$, and $v - test\ (weighted)$ accept the null hypothesis of no co-integration among variables for all regression equations, with exceptional of three cases. First; regression equation (6) based on panel rho-test and group rho-test. Second case is regression equation (7) which is based on panel $v - test$ and $panel\ rho - test$panel. Third, regression equation (8) is based on $panel\ v - test$. This implies that the majority of statistics of Pedroni panel co-integration test are rejecting the null hypothesis of no co-integration relationship between variables and accepting the alternative hypothesis of the presence of co-integration among series. Therefore, based on (Granger, 1988) representation proposition it can be said that there is equilibrium long relationship among variables in each of our regression equation.

5.5.3 Panel Fully Modified Least Squares (FMOLS) Estimation

The previous section confirms the presence of long run relationship between variables in all the regression equations. Thus, the subsequent step requires to estimate these relationships using the Fully Modified Ordinary Least Squares approach (FMOLS). Table (5.5) summarizes the results of estimation using pooled data on 10 countries from 1989 to 2014.

The first two columns exhibit results from running two separate regressions . In both regressions the credit to private sector to GDP is used as a dependent variable. Whereas the stock market capitalization to GDP and turnover ratio are used as independent variable, respectively. The main purpose of running these two regressions is that to measure the individual impact of stock market capitalization and turnover ratio on the credit to private sector to GDP. The results indicate that both stock market capitalization to GDP and turnover ratio has positive impact as expected on credit to private sector to GDP. but this affect is insignificant. Moreover, the findings reveal that, on one hand, when stock market capitalization ratio to GDP increase by (1%), credit private sector ratio to GDP increases by (0.026) percentage point. On the on the other hand, when turnover ratio increases by (1%), credit sector ratio to GDP increase by (0.025) percentage point. Also, results show that the impact of real income GDP and total investment ratio to GDP have significant positive effect on credit private sector to GDP, as was predicted. However, the coefficient of consumer price index shows a minor significant value of (0.005) with different sign in both regressions, this because including a constant trend in regression (2).

To test the impact of stock market capitalization to GDP and turnover ratio on another indicator of banking sector development, the ratio of Money supply to GDP is used as dependent variable instead of the ratio of credit to private sector to GDP in regression equations (1) and (2). The results are reported in table (5.5)- columns (3) and (4). While the turnover ratio shows a very significant positive effect (0.025) on the ratio of broad money supply to GDP in regression equation (4), against what was expected stock market capitalization not well-behaved and records insignificant negative effect (-0.030) on broad money supply to GDP in regression equation (3). Similar to the first two regressions the variables real income and total investment to GDPin regression equations (3) and (4) appear to have the right positive and significant effect on the ratio of money supply to GDP. Regarding to the coefficients of the inflation variable consumer price index seems to have the expected negative sign and statistically significant in both regressions.

Stock market capitalization is used as dependent variable in both regression equations (5) and (6) in order to examine the impact of two different measures of banking sector development namely; credit to private sector ratio to GDP and the ratio of broad money $M2$ to GDP on stock market function when the later captured by the ratio of stock market capitalization to GDP. Columns (5) and (6) in table (5.5) display the outputs from these regressions. According to

these outcomes both coefficients of the ratio of credit to private sector to GDP and broad money supply $M2$ to GDP hold positive sign, and statistically extremely significant as projected. The evidence specifies that one unit rise in the credit to private sector ratio leads to (0.133) unit increase in the stock market capitalization ratio to GDP, and if broad money $M2$ to GDP rises by one unit then the stock market capitalization ratio to GDP would increase by (0.278). Not surprisingly that the control variables real income and total savings to GDP positively associated with stock market capitalization to GDP in both regressions. These findings suggest that when the real income GDP increases by (1%) the stock market capitalization ratio to GDP increases by (0.387) and (0.280) percentage point in regression equations (5) and (6), respectively. Also, if the total saving to GDP increases by (1%) the stock market capitalization ratio to GDP increase by (0.009) and (0.076) in regression equation (5) and (6), respectively. Moreover, both regressions (5) and (6) show that the coefficients of consumer price index are positive (0.033) and (0.027) and very significant, respectively. However, this result contradict the theoretical expectations.

Finally, the last two columns in table (5.5) present the estimation findings when the dependent variable in regression equation (5) and (6) is replaced by turnover ratio instead of stock market capitalization to GDP. The foremost reason of implementing these two regressions is that to examine the influence of both credit to private sector to GDP and broad money supply to GDP on turnover ratio, independently. The estimation results reveal that both credit to private sector to GDP and broad money to GDP have a separate slight positive influence on turnover ratio, but not significant. The evidence suggests that when credit to private sector ratio increases by (1%) the turnover ratio rises by (0.004) percentage point in regression equation (7), on one hand. On the other hand, when broad money to GDP rises by (1%) turnover ratio increases by a negligible percentage point around (0.001). The results from both regressions (7) and (8) for total savings to GDP, real income GDP, and consumer price index confirm the prior results. Where both total saving and real income GDP have significant positive influence on turnover ratio. Whereas, the influence of consumer price index is negative and significant.

It may have interested that total savings to GDP is employing as a control variable in regression equations (5), (6), (7) and (8) instead of total investment to GDP in order to examine whether they have similar effect on the dependent variables that were employed in all regressions. The outcomes indicate that they both have positive effect on the indictors of banking sector development and stock market development. This infers that beside total investment to GDP,

total savings to GDP can be used as another predictor of the development of banking sector and stock market.

Table (5. 5)

Panel Fully Modified Least Squares (FMOLS) Estimation

$Indep.V.$	*Reg.* (1) $Dep.V.lncps$	*Reg.* (2) $Dep.V.lncps$	*Reg.* (3) $Dep.V.lnm2$	*Reg.* (4) $Dep.V.lnm2$
$lncps-1$	0.983 [129.016] (0.000)	0.905 [16.368] (0.000)		
$lnm2-1$			1.062 [34.638] (0.000)	1.036 [85.423] (0.000)
$lnsmc$	0.0261 [1.895] (0.059)		-0.030 [-1.712] (0.088)	
$lntor$		0.025 [0.718] (0.473)		0.025 [2.683] (0.007)
$lngdp$	0.007 [8.756] (0.000)	0.095 [6.293] (0.000)	0.007 [11.616] (0.000)	0.003 [5.753] (0.000)
$lninv$	0.028 [41.905] (0.000)	0.277 [21.046] (0.000)	0.028 [90.929] (0.000)	0.008 [24.591] (0.000)
$lnccpi$	-0.005 [-11.651] (0.000)	0.005 [1.110] (0.268)	-0.007 [-19.197] (0.000)	-0.001 [-3.704] (0.000)
Trend Spe.	*None*	*constant*	*None*	*None*
$Adj.R^2$	0.81	0.98	0.83	0.77

Source: Author's calculations.

Table (5. 5) (Continue)

Panel Fully Modified Least Squares (FMOLS) Estimation

$Indep.V.$	Reg. (5) $Dep.V.lnsmc$	Reg. (6) $Dep.V.lnsmc$	Reg. (7) $Dep.V.lntor$	Reg. (8) $Dep.V.lntor$
$lnsmc-1$	0.514 [6.406] (0.000)	0.425 [5.322] (0.000)		
$lntor-1$			0.879 [54.763] (0.000)	0.822 [52.122] (0.000)
$lncps$	0.133 [6.834] (0.000)		0.004 [1.228] (0.220)	
$lnm2$		0.278 [10.244] (0.000)		0.001 [0.798] (0.425)
$lngdp$	0.387 [22.330] (0.000)	0.280 [17.263] (0.000)	0.055 [69.687] (0.000)	0.059 [116.331] (0.000)
$lnsav$	0.009 [0.495] (0.620)	0.076 [3.841] (0.000)	0.061 [101.875] (0.000)	0.064 [104.738] (0.000)
$lncpi$	0.033 [5.729] (0.000)	0.027 [5.027] (0.000)	-0.037 [-103.697] (0.000)	-0.035 [-102.310] (0.000)
Trend Spec.	*Constant*	*Constant*	*None*	*None*
$Adj.R^2$	0.86	0.87	0.81	0.78

Source: Author's calculations.

5.5.4 Granger Causality Test

Next, Granger Causality test is carried out. The results from causality test can be viewed between banking sector development and stock market development in a more truthful method as demonstrated in table (5.6). Table (5.6) shows the following results:

1. Regarding the casual relationship between stock market capitalization as a ratio to GDP and credit to private sector as a ratio to GDP, the results indicate that first; the null hypothesis that stock market capitalization does not granger cause credit to private sector is rejected and accept the alternative hypothesis that stock market capitalization does granger cause credit to private sector. Second, the results, likewise, reject the null hypothesis that credit to private sector does not granger cause stock market capitalization, instead, accept the alternative hypothesis that credit to private sector does granger cause stock market capitalization. This implies that there is a bidirectional relationship among stock market development and banking sector development represented by the financial development indicators, stock market capitalization to GDP ratio and credit to private sector to GDP ratio.
2. Regarding the casual relationship between turnover ratio and credit to private sector to GDP ratio. The results cannot accept the null hypothesis that turnover ratio does not granger cause credit to private sector as a ratio to GDP, otherwise, accept the alternate hypothesis that turnover ratio does granger cause credit to private sector. Whereas, the results cannot be reject the null hypothesis that credit to private sector does not granger cause turnover ratio, alternatively, reject the different hypothesis that credit to private sector does granger cause turnover ratio. To this end, there is unidirectional relationship runs from turnover ratio towards credit to private sector as a ratio to GDP.
3. Regarding the casual relationship between stock market capitalization as a percentage to GDP and broad money supply $m2$ to GDP ratio. The Granger's test results in table (5.6) show that, in one hand, the null hypothesis that stock market capitalization does not granger cause broad money supply $m2$ is accepted, and the alternate hypothesis that stock market capitalization does granger cause broad money supply $m2$ is rejected. On the other hand, the null hypothesis that money supply $m2$ as a ratio to GDP does not granger cause stock market capitalization as a ratio to GDP is not accepted, and the other hypothesis that broad money supply $m2$ as a ratio to GDP does granger cause stock market capitalization as a ratio to GDP is not rejected. Therefore, it can be said that the banking sector development indicator, broad money supply $m2$ as a ratio to GDP granger cause the stock market development indicator, stock market capitalization as a ratio to GDP, however, the stock market development indicator, stock market capitalization as a ratio to GDP does not granger cause the banking sector development indicator, broad money supply $m2$ as a ratio to GDP. This suggests that the causal

relationship between these two development indicators is unidirectional, and it runs towards stock market development indicator.

4. Regarding the casual relationship among the stock market development measure turnover ratio and the banking sector development measure broad money supply $m2$ as a ratio to GDP. The obtained results suggest that the null hypothesis that turnover ratio does not granger cause broad money supply $m2$ to GDP ratio cannot be accepted, instead, the alternate hypothesis that turnover ratio does granger cause the variable broad money supply $m2$ to GDP a ratio is accepted. Nevertheless, the outcomes of granger causality test accept the null hypothesis that the banking sector development indicator, broad money supply $m2$ to GDP ratio does not granger cause the indicator of stock market development, turnover ratio, and reject the alternative hypothesis that broad money supply $m2$ as a ratio to GDP does granger cause turnover ratio. Thus, the casual relationship between them runs from turnover ratio to broad money supply as a ratio to GDP, but not vice versa.

The results indicate that the presence of bidirectional causality runs only among stock market capitalization to GDP and credit to private sector to GDP. However, the direction of causality between turnover ratio and the credit to private sector to GDP, turnover ratio and broad money, and between broad money to GDP and stock market capitalization ratio to GDP are unidirectional. More specifically the unidirectional causality relation runs as following: *(1)* From turnover ratio to the credit to private sector as a ratio to GDP. *(2)* From turnover ratio to broad money supply as a ratio to GDP. *(3)* From the broad money supply as a ratio to GDP to stock market capitalization to GDP. This implies that the direction of causality between banking sector development and stock market development relies on the their employed indictors.

Table (5. 6)

Pairwise Granger Causality Tests

Null Hypothesis:	F-Statistic	Prob.
LNSMC does not Granger Cause LNCPS	4.172	0.042
LNCPS does not Granger Cause LNSMC	24.590	0.000
LNTOR does not Granger Cause LNCPS	7.983	0.005
LNCPS does not Granger Cause LNTOR	1.214	0.271
LNSMC does not Granger Cause LNM2	0.006	0.936
LNM2 does not Granger Cause LNSMC	5.093	0.024
LNTOR does not Granger Cause LNM2	16.505	0.000
LNM2 does not Granger Cause LNTOR	0.109	0.741

Source: Author's calculations

5.6 Correlation Test

In this section the correlation technique is followed in order to examine whether the complementary relationship is exist between the banking sector development and stock market development. Table (5.7) presents the results of correlation test between two indictors of banking sector development (credit to private sector to GDP and broad money to GDP) and two indicators of stock market development (stock market capitalization to GDP and turnover ratio). The outcomes indicate the following:

1.There is very high and significant positive correlation (77.8%) among banking sector development indicator, credit to private sector to GDP and stock market capitalization to GDP

2.There is a quite high and significant positive correlation (63.6%) between banking sector development indicator, broad money to GDP and stock market development indicator, stock market cartelization to GDP ratio.

3. There is low, and significant positive correlation (24.9) between credit to private sector to GDP and turnover ratio.

4. There is a relatively low, and significant positive correlation (30%) between broad money to GDP and turnover ratio.

Despite there is low correlation among some measures of banking sector development and stock market development, however, this correlation is still significantly positive. Therefore, banking sector and stock market can be considered complementary rather than substitutes in facilitating economic growth and providing financial service.

Table (5. 7)

Correlation Matrix

Variable	$lncps$	$lnm2$	$lnsmc$	$lntor$
$lncps$	1.000			
$lnm2$	0.836 (0.000)	1.000		
$lnsmc$	0.778 (0.000)	0.636 (0.000)	1.000	
$lntor$	0.249 (0.000)	0.300 (0.000)	0.143 (0.000)	1.000

Source: Author's calculations

5.7 Conclusion

A growing body of finance-growth literature provided an evidence regarding the presence of relationship between banking sector development and stock market development. However, this relationship has not independently examined. This study examines the relationship

between banking sector development and stock market development, for ten countries of *G20* countries over the period 1989-2014. The ratio of credit to private sector to GDP, and broad money $m2$ to GDP are used to indicate banking system efficiency and size respectively. Whereas, stock market capitalization to GDP and turnover ratio are used to indicate stock market efficiency and the size, respectively. *Pedroni* for panel data co-integration test, fully modified ordinary least square panel data estimator, and Granger causality method are performed for empirical analysis.

For data stationary properties check, Levin, Lin and Chu, and Im Pesaran and Shin panel unit root tests were employed to check that our employed time series are free of unit root at their level and first difference. The findings indicated that the variables $lncps$, $lngdp$, and $lnm2$ have unit root at their level. However, all of our variables were found stationary at the first difference, and that by using both panel unit root tests.

Second, *Pedroni* co-integration test is applied to test that whether the variables that involved in our models are co-integrated and hold long run relationship. *Padroni* co-integration test is relying on using eleven statistics. Each employed statistic test should have statistically significant value to reject the null hypothesis of no co-integration. The decision of the presence of the co-integration relationship among the variables was taken based on how many statistic tests confirm the presence of co-integration relationship. If six or more statistics out of elven statistics adopted by *Pedroni* reject the null hypothesis that there is no co-integration among the underlying variables in a specific model, then we decide that the variables in that model are co-integrated and have long run relationship. The findings from Padroni co-integration test found that six out of eleven statistics confirm the existing of co-integration relationship between the variables of the suggested models (1) to (5). Moreover, eight of eleven statistics confirm the presence of co-integration relationship among the variables in the model (6), and (7). Finally, seven out of eleven statistics found a co-integration relationship between the variables of the model (8). To sum up, the co-integration relationship between the variables was found in each model of our employed eight models.

Results from long run estimation indicate that, firstly; regarding the impact of stock market development indicators on banking sector development indicator, both stock market development measures turnover ratio and stock market capitalization as a ratio to GDP have insignificant positive impact on credit to private sector. Moreover, while turnover ratio has a significant positive impact on broad money supply as a ratio to GDP, stock market

capitalization has insignificant negative effect in broad money supply as a ratio to GDP. Secondly, regarding the impact of banking sector development indicator on stock market development indicators, both financial indicators broad money to GDP ratio, and credit to private sector to GDP ratio have significant positive impact on stock market capitalization. However, both banking sector development measures broad money supply as a ratio to GDP, and credit to private sector as a ratio to GDP has insignificant positive impact on turnover ratio. Lastly, the macroeconomic variables total investment and real income show significant positive impact banking sector and stock market development measures.

The results of Engle Granger test show that first; there is unidirectional relationship run from turnover ratio to credit to private sector. Second, there is unidirectional relationship runs from turnover ratio to money supply $m2$. Third, there is unidirectional relationship runs from money supply $m2$ towards stock market capitalization. However, the bidirectional causal relationship has only found between credit tom private sector and stock market capitalization.

Finally, the correlation matrix between stock market development and banking sector development indicators shows that the correlation between the employed financial indicators is positively significant, and this suggests the complementarity relationship among them.

Chapter Six: Financial Development, Domestic Investment, Foreign Direct Investment, and Economic Growth

6.1 Introduction

Achieving higher levels of economic growth and improving social welfare levels for the individuals are the central goals of both developed and developing countries. However, the process of economic growth is affected by a number of factors. Among these factors domestic investment and foreign direct investment which they have an important constructive role that cannot be disregarded. For example, in neoclassic growth theory foreign direct investment impacts economic growth process via promoting investment volume and efficiency. Endogenous growth theory suggests that foreign direct investment promoting the growth through conduits of international technology diffusion (Borensztein, De Gregorio, & Lee, 1998). These conduits involve modern technologies and new ideas transmission, for instance, embracing new technology products and adopting human capital acquisition. Therefore, foreign direct investment influences economic growth directly via high rate of capital stock and high level of technology, and indirectly via increasing the quality of human capital and improving spill overs (Iamsiraroj & Ulubaşoğlu, 2015). Azam, Ibrahim, and Bakhtyar (2014) asserted that foreign direct investment impacts economic growth process in developing countries via filling saving-investment gap in these countries. Empirical studies, for example, Agbloyor, Gyeke-Dako, Kuipo, and Abor (2016) revealed that human capital quality, trade openness, macroeconomic stability, institutions, good infrastructure and financial development are significant conditions to benefit from foreign direct investment in host countries. This implies that the role of foreign direct investment in promoting economic growth of a country is preconditioned by the absorptive capacity in that country.

Furthermore, it is claimed that domestic investment is another significant source of the entire growth and it is a reliable instrument in providing jobs for economies (Lean & Tan, 2011). Firebaugh (1992) argues that domestic investment improves the relationships among the local industries. Tang, Selvanathan, and Selvanathan (2008) found that there is a positive correlation among domestic investment and foreign direct investment and domestic investment has more influence on economic growth than foreign direct investment. Besides, it is debated that financial system development has a significant role in mobilizing resources, thereby boosting

economic growth (Calderón & Liu, 2003; Christopoulos & Tsionas, 2004; Levine, 2005; Valickova, Havranek, & Horvath, 2015).

Although there are several studies have investigated the linkage between domestic investment, foreign direct investment and economic growth, on one hand, and the linkage between financial system development and economic growth on the other hand. However, there is a few studies that investigate the role of financial system in boosting domestic investment and foreign direct investment to have positive impact on economic growth. Additionally, none of them have considered this case within *G20* countries. Moreover, these studies suffer from a number of shortages. First, they do not provide a convinced evidence that foreign direct investment has beneficial or detrimental effect on economic growth. Second, the issue of how financial system development influences the relationship between foreign direct investment and economic growth yet has not declared. Therefore, this study is conducted to fill out this slit in the literature.

Besides the empirical investigation of whether or not the positive relationship between foreign direct investment and the growth rate exists, this study aims to investigate the channels through which domestic investment and foreign direct investment highlight economic growth. Particularly the development of the financial sector. In other words, the study examines that whether domestic investment and foreign direct investment and financial system development are complementary in promoting the growth rate. In addition, this study aims to measure the importance of this channel in relative to another significant channel, namely; human capital channel. And it does so by employing a set of panel data for (14) countries from the *G20* countries over relatively longer period (1989-2015) than other research which have studied regional cases.

This study introduces new additional insights by examining financial system development as a string under which foreign direct investment may have positive influence on economic growth. By examining the channels through which foreign direct investment and domestic investment promote the growth rate, this research add three significant contributions to the existing literature; First, modelling a number of separate regressions rather than one or two models and including the interactive terms enables to separate other effects rather than financial development, and this provides accurate analysis for a deeper comprehensive understanding of the mechanism through which domestic and foreign investment may positively impact the economic growth. Second, adopting *G20* countries as a context for this study gives the

opportunity to investigate the role of financial development in enhancing the relationship between foreign direct investment and economic growth in mixture of developing and developed countries, and this enables to make comparison with similar studies those on developing and/or developed countries. Finally, Using panel data technique eliminates simultaneity bias that may found in prior studies. This econometric issue made by using lagged dependent variable as explanatory variable in growth models and the oversight of a country a specific effect. Moreover, panel data techniques permits to exploit time series of the panel data instead of using just cross sectional estimators (Batten & Vo, 2009).

This study argues that financial system development is a significant prerequisite for foreign direct investment and domestic investment to positively influence economic growth. The empirical analysis in this study is motivated by endogenous growth model, which is our focus is on foreign direct investment and its interaction with financial development and human capital, and domestic investment and its interaction with financial development. Wang and Wong (2009) argue that the advantage of using interaction terms is to specify if there is any complementarity among foreign direct investment and these variables. Tow stage Least Square (*2SLS*) estimation with valid instrument variables in addition to *GMM* estimation approach are preformed to estimate the suggested models. The ultimate objective of this study is to benefit from the empirical findings in drafting conclusions that can be used to enrich the information that contributes to modernization of economic policies that support foreign direct investment and domestic investment positive implications. In particular the economic policies that related to financial system development.

6.2 Empirical Literature

While there are several studies that have been conducted on the direct relationship between foreign direct investment and economic growth, some of these studies focused on the indirect relationship. Precisely, have been focused on the channels through which foreign direct investment may affect economic growth, for example, financial development and human capital. Thus, the literature on Foreign direct investment – Growth nexus can be classified into two main categories; Firstly, direct relationship between foreign direct investment and economic growth. Secondly, the relationship between foreign direct investment, financial development, and economic growth. Based on these categories we will review some previous empirical studies as following:

6.2.1 Direct relationship between foreign direct investment and economic growth

Abu and Karim (2016) used a panel VAR model and Granger causality test to examine the causality among the variables, foreign direct investment, domestic investment, domestic saving, and economic growth in (16) sub-Saharan African economies. The findings illustrate that foreign direct investment utilizes more impact on the entire growth. Moreover, a unidirectional causality relationship from foreign direct investment to economic growth was observed in the employed sample over the period of (1981-2011).

Simionescu (2016) conducted a research on European Union countries during the crisis period 2008-2014. The study employs Panel Vector Autoregressive Model and Bayesian techniques to identify the relationship between economic growth and foreign direct investment in EU-28 countries. his study is unique and distinct from other prior studies on FDI-Growth nexus as it conducted on both overall and individual level. Regarding the overall level, the results from this study indicate that foreign direct investment has very slow positive influence on economic growth. However, the results were mixed and different at individual level. While the reciprocal relation between foreign direct investment and economic growth was found positive in 19 countries, it was found negative in 7 countries of European Union countries. Moreover, these results indicate that foreign direct investment does not generate the growth in Malta and Netherland.

Albassam (2015) uses time series econometric analysis to identify the power of foreign direct investment on employment and economic growth in Saudi Arabia during 1999-2012. The results display that although there is positive effect of foreign direct investment on employment, the relation between the growth and foreign direct investment is not exist. This result is predicated in a such economy with modest financial sector as the financial regulations have not developed enough to absorb this huge amount of the foreign investment.

Istaiteyeh and Ismail (2015) attempt to find out the connection between foreign direct investment, income growth, and exports in Jordan's economy. The study uses quarterly data for the period Q1: 2003 - Q4: 2013 and apply Johansen co-integration and Error Correction Model. The findings of this research indicate log run relationship between the adopted variables. In addition, it was suggested that foreign direct investment has negative influence on economic growth.

Albassam (2014) uses a large data set from 189 countries around the world, and panel data multi-regression procedure to explore the effect of foreign direct investment on GDP per capita and the rate of employment, over the period of 1999-2012. The findings from his study supports the view that foreign direct investment has a positive influence on economic growth. This study has characterized by presenting its results from a global perspective. However, One of its shortcoming it has covered relatively short time period.

(Curwin & Mahutga, 2014) investigate FDI-growth nexus in 29 countries represent central and Eastern European and Eurasian post-transition countries. The study uses data covering the period 1990-2010, and employs Two-stage Ordinary Least Square estimation method to deal with endogeneity. The results suggest that domestic direct investment and foreign direct investment have negative impact on economic growth. They justify this findings to the probability of model misspecification as the employed a model which ignores the conditional relationship between foreign direct investment and the growth rate.

Yusoff and Febrina (2014) have undertaken Trace, and maximum Eigen Value statistics of Johansen co-integration approach alongside with Granger causality technique to recognize the link among internal investment, economic growth, trade openness, and real exchange rate in the economy of Indonesia for 1970-2009. According to their findings, all variables are holding a long-term relationship, and the causality between local investment and the total growth is bidirectional.

Iqbal, Mehmood, and Saqib (2013) conducted research on China economy regarding the relationship between foreign direct investment and the growth rate. They used annual time series data over the period 1985-2009, and ARDL approach to co-integration. The results of their study show that the relationship between foreign direct investment and the entire growth is significant and positive in short and long run terms. This study is characterized by employing the most dominating growth factors and controlling the government expenditure as it is the most important factor can be used to attract foreign direct investment in China.

Li and Ng (2013) use annual time series data from South Africa economy from 1980 to 2009 and employ co-integration test of Johansen followed by VAR model estimation to test long and short run association between foreign direct investment and economic growth. The out comes from this study indicate short run relationship among the two variables However, long run relationship has not existed.

Behname (2012) collected a panel data on 6 Southern Asian countries to empirically investigate foreign direct investment and economic growth relationship. It was presented that the influence of foreign direct investment on economic growth is significantly positive in these countries during 1977-2009. Despite the main focus of this study is on the direct link among foreign direct investment and economic growth, It was detected that capital formation and economic infrastructures are significant factors of attracting foreign direct investment.

The main purpose of econometric analysis by Chakraborty and Mukherjee (2012) over Q1:1996 - Q2:2009 of Indian economy was to address the natural of connection among gross fixed formation, foreign direct investment, gross domestic product. They employed Gregory and Hansen co-integration approach for specifying endogenous structural breaks, and Toda Yamamoto for identifying the causality relationship. Additionally, the academics employed ARDL to co-integration process in a dynamic time series framework. The investigation reported an endorsement for the presence of Gregory and Hansen co-integration relationship among the studied macroeconomic variables. Furthermore, the study reported one-way causality form that is from foreign direct investment to gross domestic formation, and from gross domestic product to foreign direct investment. However, the study did not find any effect of foreign and domestic investment on gross domestic product.

Herzer (2012) uses panel data from 44 developing economies, and heterogeneous co-integration approach to detect the impact of foreign direct investment on growth during the years of 1970-2005. The outcomes suggest that the impact of foreign direct investment on growth is distinct from country to another. Moreover, the researcher investigated the connection between the two variables in the long run period, and found that foreign direct investment declines growth in 60% of the sample. Generally, the findings fortify the view is that the influence of foreign direct investment on overall growth is on medium or even negative.

Roy and Mandal (2012) applied Error Correction mechanism along with co-integration technique to assess the linkage among foreign direct investment and economic growth in three groups of selected Asian countries during 1975-2010. It is revealed that the long run relationship between the variables is exist in the selected economies with exceptional of Indonesia and South Korea. The researchers justified this result to the basic nature of foreign direct investment in these two countries. However, grouping the countries on industrialization policy biases can be morphologic. For example, Japan and South Korea are grouped together.

The Johansen co-integration analysis of Tan and Tang (2012) has noted that private domestic investment is co-integrated with economic growth and the user cost of capital in Malaysia during 1970-2009. In addition, the results of Granger causality test and variance decomposition analysis reported two-way relation between private domestic investment and Malaysian economic growth.

Lean and Tan (2011), used annual time series data from Malaysian economy over forty years beginning from 1970 to investigate the dynamic relation among domestic investment, foreign direct investment and economic growth. Johansen co-integration test, and Granger Methodology based on Vector Error Correction Model were used for empirical investigation purpose. The researchers abridge that firstly; foreign direct investment has positive influence on the entire growth. Secondly, local investment has negative impact on the entire growth. Third, Local investment is crowded by foreign direct investment. Lastly, there is unidirectional relation runs from economic growth towards foreign direct investment.

Tang, et al. (2008) used time series quarterly data, and VAR system alongside with ECM to consider the probable connection among foreign direct investment, local total investment, and Chines gross industrial output, during the period (Q1:1988 - Q:2003). The study's empirical findings suggest a solid positive correlation among domestic investment, direct foreign investment and Chines economic growth. Furthermore, the researchers conclude that foreign direct investment enhances economic growth via complementing local investment.

Li and Liu (2005) used an endogenous growth model with a panel data set from 84 developed and developing countries during the years 1979-1999 to examine the direct and indirect relationship between foreign direct investment and economic growth. They found direct positive effect, and indirect positive effect of foreign direct investment on economic growth through human capital channel. However, their study does not address the issue of whether the interactive term improves the direct link between foreign direct investment and economic growth.

Focusing on 80 countries, Choe (2003) through a penal VAR system, and Granger causality analysis has observed that economic growth and foreign direct investment cause each other, However, the causality among economic growth and national investment is found an unidirectional and towards national investment.

6.2.2 Relationship between foreign direct investment, financial development, and economic growth

Sbia and Alrousan (2016) include foreign direct investment and gross capital information in the right side of the production equation to scrutinize the association among financial system (represented by credit to private sector) and the total growth (represented by GDP per capita) in UAE for the period 1975.Q1-2012.Q4. They conclude that foreign direct investment indirectly leads the whole growth in UAE through financial system development.

Adeniyi, Ajide, and Salisu (2015) examine the connection between foreign direct investment and economic progress in 11 Sub-Saharan African nations for the years 1970-2005. The study considers three alternative financial system development indicators, and interactive term of foreign direct investment with financial expansion. They found extraneous association among growth and foreign direct investment. In addition, they presented evidence that the prevailing role of financial sector in enhancing the relationship between foreign direct investment and growth become perceived only when it accomplishes a considerable altitude of development.

For Jordan Suliman and Elian (2014) by means of structural co-integration approach, and Vector Error Correction VEC model attained evidence of short run causal relationship between foreign direct investment and stock market size, on one hand, and between stock market size and economic growth, on the other hand. They argued that settled financial markets are a significant prerequisite for optimistic influence of foreign direct investment on the growth rate.

Choong (2012) employed GMM panel data estimation method to test the interrelationship among foreign direct investment and economic growth in the presence of financial system improvement. The researcher adopted large panel data set covering 95 countries, during the years 1983-2006. He presented that the correlation between foreign direct investment and whole growth is positive, and the improvement in financial sector is needed to gain further from foreign direct investment during the process of economic growth.

Choong and Lam (2011) studied 70 developing and developed countries between 1988 and 2002. They used panel data analysis and Generalized Method of Moments GMM estimator to evaluate the relationship between foreign direct investment, financial sector development, and economic growth. They reported that there is ambiguous effect of foreign direct investment on economic growth. This effect depends on which indicator is used to capture financial development, and the advancing degree of development in financial system. They argue that

the negative impact of foreign direct investment on GDP per capita in developing economies is due to the weakens in the financial regulations and in financial scheme as whole. Their results imply that a assured level of improvement in financial structure is essential to have optimistic advantages from foreign direct investment in the economic expansion process.

Lee and Chang (2009) conducted a study on 37 countries to investigate the dynamic long run relationship between financial development, foreign direct investment and economic growth, for the period 1970-2002. They reported a long run causal relationship between the three variables, and bidirectional causal relationship between financial development and foreign direct investment. This finding provide sign that there is a complementarity among the three variables. Likewise, financial system development endogenously impacts the relationship between foreign direct investment and the growth rate.

Alfaro, et al. (2004) used five different proxies of financial development to find out the role of financial system development in augmenting the positive correlation between foreign direct investment and economic growth throughout the period of 1975-1995. They established that well-functioning financial scheme allow the nations to benefit substantially from foreign direct investment. The findings from this study was robust to endogeneity consideration as it employs IV regressions.

Hermes and Lensink (2003) modified Barro's growth model by considering more variables. Foreign direct investment, foreign direct investment interacted with credit private sector, and foreign direct investment interacted with secondary school enrollment were used as explanatory variables. They used their new model to investigate that if there is a significant role of financial system development in enhancing the positive linkage among the flow of foreign direct investment and the entire growth. Their result indicates that the impact of foreign direct investment on economic growth works through the level of efficiency. They conclude that well developed financial system is important for foreign direct investment to have positive influence on the growth rate in the searched sample during the period 1970-1995. However, foreign direct investment alone does not impact the entire growth.

Omran and Bolbol (2003) calculated the response of economic growth to foreign direct investment in 17 Arab countries over the period 1975-1999. They concluded that no independent effect of foreign direct investment on economic growth. However, the growth can be achieved when foreign direct investment is interacted with financial development indicators.

This finding reflects the argument that well-functioning financial system is highly recommended before hosting foreign direct investment.

6.3 Variables

6.3.1 Dependent variable

Following the existing literature of economic growth, for example, Fauzel, Seetanah, and Sannassee (2015); Iqbal , et al. (2013); and Jugurnath, Chuckun, and Fauzel (2016), *GDP* per capita in current US Dollars is used as a dependent variable in our model to represent the economic growth.

6.3.2 Explanatory variables

Although there is no clear theoretical guidance regarding what is the appropriate set of variables could be used in the growth model, some studies such as, (Anwar and Nguyen (2010); Hermes and Lensink (2003); Iamsiraroj and Ulubaşoğlu (2015); and King and Levine (1993b) have pointed out to few variables with a robust impact on the growth rate. Accordingly, with relying on the objectives of this study and the researcher insights, and to avoid misspecification of employed model a number of variables have derived from the growth literature and would be as explanatory variables in our model. These variables are following:

6.3.2.1 Foreign direct investment to GDP

In the FDI- growth nexus there is two forms of foreign direct investment. First, net foreign direct investment inflow. Second, net foreign direct investment outflow. This study will use net foreign direct investment inflow as a ratio to *GDP*, as our interest in the impact of foreign direct investment in the receipt countries.

6.3.2.2 General government expenditures as a ratio to GDP

General government consumption includes all government existing expenditures for purchases of goods and services. There are two opposite opinions regarding the responses of growth rate to the government expenditure. On one hand, government consumption expenditure may have positive impact on economic growth. This view originally was generated from Expending State Expenditure Law as introduced by Adolph Wagner in 1890 (Wagner & Weber, 1977; Wahab,

2004). The advocates of this view attribute this relationship to three reasons; Firstly, there will be a need for protectionism and administrative functions of the government, Secondly, there is a need to increase the flow of goods and social services. Finally there will be a need for a bureaucratic management maintains market forces to operate smoothly (Wahab, 2004; Wogbe Agbola, 2014). There are some empirical studies, for example, Devarajan, Swaroop, and Zou (1996); Ghosh and Gregoriou (2008); and Gyles (1991) have found a positive link among government expenditures and the growth rate. On the other hand, government expenditure may negatively affects economic growth through the crowd-out effect when this variable is used as a counter cyclical instrument aim to inspire economic growth (Wogbe Agbola, 2014). Anaman (2004) among others found that the relationship between government expenditure and economic growth is negative. Iqbal, et al. (2013) suggest that this variable is an important variable to attract foreign direct investment.

6.3.2.3 Financial development indicator

Obtaining an appropriate indicator for financial development is a significant empirical subject related with the empirical analysis of financial- growth literature. The main reason of this issue is that there are several financial agents and institutions provide the financial services such as banks and stock markets (Samargandi, et al., 2014). Therefore, a number of financial development measures have been suggested by financial-growth literature. For example, $M2$ as a ratio to GDP, liquid liabilities, credit to private sector, stock market capitalization, and stock market turnover ratio. However, the ratio of financial intermediation which measured by credit to private sector is the common used indicator for the financial development (Ghimire & Giorgioni, 2013; Kazar & Kazar, 2016). Following Beck, Levine, and Loayza (2000; Bogdan and OPRIȘ (2013); Carkovic and Levine (2005); Khan (2008); and Sbia and Alrousan (2016), we use credit to private sector as a ratio to GDP to measure the financial system development. This indicator indicates the general activates that provided to private sector by the financial institutions (Huang, 2011). (Khan (2008) argues that this ratio reflects banking sector efficiency and it has advantages over credit to public sector in making investment decisions.

6.3.2.4 Gross fixed capital formation

This proxy would be used to indicate the gross local investment, consistent with preceding studies, for instance, Tsitouras and Nikas (2016). Jugurnath, et al., (2016) and Levine and Renelt (1992) argue that Gross Fixed Capital Formation impacts the growth indirectly through

promoting technology. This ratio is suggested to be has an optimistic influence on a country economic growth.

6.3.2.5 Human capital

Anwar and Nguyen (2010) argue that Human capital influences the economic growth via its interaction with foreign direct investment. Unluckily, the existing literature have not identified a specific variable to be used as a proxy representing the human capital. For example, some studies such as Ghimire and Giorgioni (2013) have used the total number of students enrolled to public and private schools. Whereas, other studies such as Omri & Kahouli (2014) have employed total labour force as percentage to the total population to capture the human capital. However, on one hand, the former proxy is quite stable at closely 100 present for several countries, especially for developed countries (Ghimire & Giorgioni, 2013). On the other hand, the later proxy excluded all individuals under age 18 which may have a key role in production process. Thus, this study introduces a new indicator to be used as representative for human capital, which is the population group aged between 15-64. This proxy involves all residents in a country regardless of legal status or citizenship, where most of individuals of this age group have a key role in the production process. The impact of human capital on the growth rate is expected to be positive, as foreign direct investment is related to technological advance and diffusion (Curwin and Mahutga, 2014; Romer, 1990). Some empirical studies have confirmed this relation, for example, Behname (2012) found that human capital has a significant positive influence on the growth in southern Asia countries over the period of 1977-2009. Behname (2012, p. 8) said that *"When human capital is high the labour force adapts easily new technology and production process improved"*.

6.4 Empirical investigation and Econometric Analysis

The empirical investigation in the current chapter involves an estimation for each of the following eleven regression equations:

$$lnGDP = lnFDI + lnHC \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (6.1)$$

$$lnGDP = lnGFF + lnHC \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (6.2)$$

$$lnGDP = lnSPS + lnHC \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (6.3)$$

$$lnGDP = lnGFE + lnhc \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (6.4)$$

$$lngGDP = lnFDI + lnCPS + lnGFE + lnHC \ldots\ldots\ldots\ldots\ldots (6.5)$$

$$lnGDP = lnFDI + lnGFF + lnHC + lnFDI * lnCPS \ldots\ldots (6.6)$$

$$lnGDP = lnFDI + lnGFF + lnGFE + lnFDI * lnCPS \ldots (6.7)$$

$$lnGDP = lnFDI + lnHC + lnFDI * lnCPS \ldots\ldots\ldots\ldots\ldots\ldots (6.8)$$

$$lnGDP = lnGFF + lnHC + lnGFF * lnCPS \ldots\ldots\ldots\ldots\ldots\ldots (6.9)$$

$$lnGDP = lnFDI + lnGFE + lnHC + lnFDI * lnHC \ldots\ldots\ldots (6.10)$$

$$lnGDP = lnFDI + lnGFE + lnHC + lnFDI * lnCPS + lnFDI * lnHC. (6.11)$$

five base regression models (Equations 6.1 to 6.5), that is, the interaction terms $lnFDI * lnCPS$, $lnGFF * lnCPS$, and $lnFDI * lnHC$ are not included within these equations. The main purpose of these regressions is to identify the economic growth determinates behavior with more focusing on the impact of foreign direct investment and domestic investment on economic growth in order to empirically test whether they have positive effect on the growth in *G20* countries.

Equations (6.6), (6.7), and (6.8) are constructed with including the logarithm of foreign direct investment and the interactive term $lnFDI * lnCPS$. Besides, three macroeconomic variables ($lnGFF$, $lnGFE$, and $lnHC$) were used in these regressions. The purpose of these three regressions is to empirically test the hypothesis that, financial system development enhances the positive impact of foreign direct investment on economic growth in *G20* countries.

The main focus of this empirical investigation is on two variables. First, foreign direct investment. Second, the interactive term foreign direct investment and financial system development (indicated by credit to private sector). In these three regressions the coefficient of foreign direct investment will represent its separate impact on the dependent variable. However, the coefficient of the interactive term $lnFDI * lnCPS$ will explain the role of financial development in improving the relationship among foreign direct investment and economic growth. If we obtain insignificant and/or negative sign for foreign direct investment coefficient on one hand, and significant positive sign interactive term coefficient, on the other

hand, this means that financial sector development is appropriate channel through which foreign direct investment enhancing economic growth.

In the equation (6.9) the interactive term $lnGFF * lnCPS$ is added to find out whether domestic investment can benefit from the development in financial sector to have positive impact on the growth rate. A significant coefficient of the interactive term with a positive sign reflects a positive role of financial system development in stimulating the positive link between the domestic investment and economic growth. However, insignificant and/or negative sign coefficient of the interactive term means there is no role of the financial development in enhancing the relationship between the local investment and the whole growth or even this role is negative.

To examine that whether human capital is a good channel through which foreign direct investment positively affect economic growth, the interactive term $lnFDI * lnHC$ is included in equation (6.10) (regression 10). Similar to the above interpretation regarding the significance and the sign of the coefficient of the interactive term, if the obtaining coefficient is positive and significant then human capital can be considered as a good channel for the positive relation between foreign direct investment and the entire growth. Nevertheless, if this coefficient is negative and /or insignificant then the channel of human capital is inappropriate to improve the relation among foreign direct investment and the growth rate.

Finally, two interactive terms $lnFDI * lnCPS$ and $lnFDI * lnHC$ are included in Equation (6.11) (regression (11)) to test the hypothesis that financial development is the most important factor that linking foreign direct investment and overall growth in the host countries. The best interaction can be easily specified by comparing the coefficients of both interactive terms. Hence, the most important channel is that channel where its interactive term coefficient has a significant highest positive value.

The econometric analysis followed in this study goes through four main stage; First, time series stationary tests. Two unit root tests were widely used in related literature are applied to determine the characteristics of variables time series, namely; Levin, Lin and Chu panel unit root test by Levin, et al. (2002), and Im, Pesaran and Shin panel unit root test by Im, et al. (2003). These two tests have similar null and alternative hypotheses. The null hypothesis says that time series has unit root. However, the alternative hypothesis states that time series has no unit root.

The second stage involves applying a co-integration procedure to check out whether the involved variables hold a long run relationship. Her, *Kao* co-integration test will be used.

Finally, two instrumental variable estimation methods are used for estimation which are *GMM* system method and *2SLS*. Both methods are highly efficient in dealing with endogeneity issue, and revers causality and controlling country fixed effect. In both methods we employ the lagged explanatory variables as instrument variables.

The following two remarks have been made regarding the analysis of our regression models; First, this study follows Agbloyor, et al. (2016) in averaging the panel data over three years in order to avoid business cycle impact and to obtain more data points. Thus, we have obtained nine-time periods from our data, starting from 1989 to 2015. Second, a one period lag for each explanatory variable were used as instrument variable.

6.5 Results

6.5.1 Unit Root Test

Prior of preforming co-integration test, and estimation, it is a paramount to check that weather the employed data are stationary or not. Therefore, both Levin, Lin and Chu (2002) panel unit root test, and Im, Pesaran and Shin (2003) panel unit root tests are adopted to check the stationary characteristics of the time series of our panel data at their level and first difference. The null hypothesis of both panel unit root tests suggests that the time series is not stationary and contains unit root. Im, Pesaran and Shin panel unit root test is performed as confirmatory test of the findings of Levin, Lin and Chu panel unit root test. The results of panel unit root tests are presented in the table (6.1).

The results of Levin, Lin and Chu panel unit root test show that; First, at level all the resulted t-statistic values range between (-1.477) for the interaction term $lnGFF * lnCPS$ and (-8.174) for the time series $lnHC$, and are all significant at (0.05) level for all the used variables except the resulted t-statistic value of interaction term $lnGFF * lnCPS$ is significant at (0.10) level. Therefore, the null hypothesis that the time series is not stationary is rejected and accept the alternative hypothesis that the time series are stationary for all variables. Second, when the time series has differenced for one-time period the obtained t-statistic values range between (-4.996) for $lnCPS$ and (-9.474) for $lnGDP$, and all are exceedingly significant at (0.05) level for

all the employed time series. Thus, the null hypothesis that time series is has unit root is unaccepted for all variables. Instead, we accept the alternative hypothesis that the time series is stationary for all the variables. To conclude, the results from using Levin, Lin and Chu panel unit root test show that all the adopted time series are stationary at their level and at first difference form.

The results of Im, Pesaran and Shin panel unit root test indicate that; Firstly, at level all the time series in our panel data set have insignificant t-statistic value except the time series $lnHC$ and $lnFDI$ are significant at levels of (0.05) and (0.10), respectively. Thus, the null hypothesis of a panel unit root cannot be rejected for the variables $lnGDP$, $lnCPS$, $lnGFF$, and $lnGFE$. However, the null hypothesis can be rejected for the variables $lnHC$ and $lnFDI$. Secondly, at the first difference all the obtained t-statistic values are limited between (-1.557) for $lnCPS$ and (-4.477) for $lnGDP$, and all the values are significant at (0.05) level except the t-statistic value of $lnCPS$ is found significant at level of (0.10). Consequently, we reject the null hypothesis that the time series comprises unit root and accept the alternative hypothesis of time series has no unit root for all the tested variables. To sum up, the results from preforming Im, Pesaran and Shin panel unit root test show that all variables are not stationary at their level form except $lnFDI$ and $lnHC$ are stationary at level. However, all the variables are stationary at their first difference form.

Table (6. 1)

Unit Root Test

Series	*Levin, Lin & Chu t**		*Iam paseran*		*Decision*
	I(0)	I(1)	I (0)	I (1)	
$Lngdp$	7.95844- (0.000)	9.47493- (0.000)	0.16501 (0.565)	4.47792- (0.000)	*I (1)*
$Lnfdi$	-5.33816 (0.000)	-7.72304 (0.000)	-1.34342 (0.0896)	-2.91736 (0.0018)	*I (1)*
$Lngff$	-2.74408 (0.0030)	-8.17355 (0.000)	-0.21220 (0.5840)	-3.3957 (0.0003)	*I (1)*
$Lngfe$	-2.20728 (0.0136)	-9.67335 (0.000)	-0.44286 (0.3289)	-3.07875 (0.0010)	*I (1)*
$Lncps$	-2.98751 (0.0014)	-4.99628 (0.000)	-2.5386 (0.6002)	-1.55781 (0.0596)	*I (1)*
$Lnhc$	-8.17421 (0.000)	-4.92852 (0.000)	-5.33388 (0.000)	-2.61163 (0.0045)	*I (1)*
$Lnfdi * lncps$	-3.57127 (0.0002)	-6.68065 (0.000)	0.20397 (0.5808)	-2.37917 (0.0087)	*I (1)*
$Lnfdi * lnhc$	-4.22444 (0.000)	-8.78057 (0.000)	-0.32968 (0.3708)	-2.93118 (0.0017)	I (1)
$Lngff * lncps$	-1.47717 (0.0698)	-7.44167 (0.000)	1.15419 (0.8758)	-2.64951 (0.0040)	I (1)

Source: Author's calculations

6.5.2 Co-integration Test

Kao (Engle-Granger based) co-integration test is applied to test that whether there is a long run relationship between the variables in our models. It might be argued that including interactive terms in a model may affect the long run relationship between the employed variable. Therefore, the co-integration test is performed once again with including the interactive terms. The co-integration test is performed with Individual intercept where it is the only deterministic

trend specification available for this type of co-integration test. Also, we use Hannan-Quinn Criterion to select the number of lags, and Newey-West automatic to select the Bandwidth. Finally, *Parzen Kernel* is used for spectral estimation. The null hypothesis of *Kao* co-integration test assumes that the included variables are not co-integrated, but, the alternative hypothesis accepts that the involved time series are co-integrated and suggests that they have long-run association. The results of Kao co-integration test are presented in table (6.2).

The results show that; First, when the co-integration test has performed without considering the interaction terms the attained value of t-statistic from Kao co-integration test is (-3.232) and highly significant at (0.05) level. Second, when the interaction terms has considered in the co-integration test the obtained t-statistic value becomes (-2.968), and also, extremely significant at level of (0.05). Therefore, in both cases, we reject the null hypothesis that the employed variables are not co-integrated, and accept the alternative hypothesis that the time series are co-integrated. Consequently, the decision is that there is long run relationship among the used variables.

Table (6. 2)

Kao Residual Co-Integration Test

Model	*Included Variables*	*t-statistic*	*probability*	*Decision*
Without interaction terms	*Lngdp-lnfdi-lngff-lngfe-lncps-lnhc*	*-3.23295*	*0.0006*	*Variables are co-integrated*
With interaction terms	*Lngdp-lnfdi-lngff-lngfe-lncps-lnhc-lnfdi ∗ lncps-lnfdi ∗ lnhc-lngff ∗ lncps*	*- 2.96803*	*0.0015*	*Variables are co-integrated*

Source: Author's calculations.

6.5.3 Estimation Findings

Table (6.3) displays the estimation findings of using *GMM* estimation method (similar findings were obtained by using two stage- Least square Estimation approach, please see appendix two).

Regression (1) aims to identify the impact of foreign direct investment FDI on economic growth. Table (6.3) column (1) shows that the logarithm of foreign direct investment coefficient is negative and insignificant (-0.235). This finding is consistent with other studies, for example, (Curwin & Mahutga (2014); Hermes and Lensink (2003) and Istaiteyeh and Ismail (2015). This finding may be construed as foreign direct investment may not enhance the growth unless supplementary requirements are involved. Curwin and Mahutga (2014, p. 1180) argue that *" our model may be miss-specified by ignoring a conditional relationship between FDI and economic growth that depends on human capital "*. The estimated coefficient of $lnHC$ has a positive sign (2.488) and highly significant at (0.01) level. Where one unit increase in human capital increases the growth by (2.488) units.

In regression (2) the logarithm of gross fixed formation is used instead of the logarithm of foreign direct investment in regression (1) to detect the effect of domestic investment on economic growth. Column (2) in table (6.3) indicates that the coefficient of $lnGFF$ (-0.571) is insignificantly negative. This finding is expected in this regression as the interactive term of financial development is required to obtain the positive impact of domestic investment on the growth. In column (3) in table (6.3) continued, it can be noticed that the coefficient of $lnGFF$ has a significant negative sign (-1.702). However, when the domestic investment ($lnGFF$) has interacted with financial development indicator ($lnCPS$) the impact of domestic investment on economic growth has become significant and positive. Where one unit increase in domestic investment contributes to increase in economic growth by (0.228) units at (0.01) level. This result suggests that the domestic investment has positive impact on economic growth if the financial sector has reached a definite level of development. Also, it can be noticed that $lnHC$ coefficient (2.884) is positive and very significant. This implies that one-point increase in human capital leads to the improvement in the growth by (2.884) points.

regression (3) aims to find out the impact of financial development (measured by credit to private sector) on economic growth, human capital is used as control variable in this regression. The result of estimation is presented in column (3) of table (6.3). The result shows that the impact of financial development level on the growth is positive (0.709) and significant at (0.01) level. Moreover, human capital has a significant positive effect on economic growth, where

one unit rise in the human capital is estimated to increase the growth by (1.626) at (0.01) significance level.

Regression (4) is accomplished to specify the influence of government expenditure on the growth. Therefore, the logarithm of government fixed expenditure $lnGFE$ has included instead the logarithm of foreign direct investment lnfdi in the model (1). Column (4) in the table (6.3) demonstrates that the coefficient of $lnGFE$ (1.777) is positive at significance level of (0.01). This suggests that as government fixed expenditure increases by a one unit the economic growth is projected to be increased by (1.777) units. Likewise, the regression finding reports that the impact of human capital on economic growth is positive and significant (1.161) at (0.01) level.

Regression (5) considers the logarithm of foreign direct investment $lnFDI$ as interest variable. However, the logarithms of credit to private sector, government expenditures, and human capital are treated as control variables to find out if there is a necessity to involve additional requirements to the model and to confirm the results of regressions (1), (2), (3), and (4). The outcome of this estimation is in column (5) of table (6.3) which displays that the coefficient of $lnFDI$ (-0.081) is again negative and insignificant. This finding can be interpreted as the interpretation of the outcomes in regression (1). However, the coefficients of $lnCPS$, $lnGFE$, and $lnHC$ are significantly positive (0.528), 1.326), (0.971), respectively. This finding supports the suggestion of involving the interaction term $lnFDI * lnCPS$ within the model. Thus, regression (5) result confirms the estimation results that have obtained from the base regressions (1), (2), (3), and (4).

Regressions (1), (2), (3), (4), and (5) present an initial indication on the behavior of the adopted economic growth determinants. Such base analysis can be useful for further investigation to introduce logical interpretation for the obtained findings.

Regressions (6), (7), and (8) are implemented to empirically examine whether foreign direct investment and financial development level (measured by credit to private sector) are complementary, thus improving the economic growth. Therefore, to achieve this aim the interaction term $lnFDI * lnCPS$ is comprised in each of these regressions. In addition, it might be noticed that different economic growth factors were used as control variables in these regressions. For example, logarithm of domestic investment $lnGFF$ and the logarithm of human capital were used as control variables in regression (6), and the logarithm of government

expenditure is added as control variable in regression (7). However, the logarithm of domestic investment $lnGFF$ and the logarithm of government expenditures $lnGFE$ were excluded from regression (8) and we include only the logarithm of human capital as a control variable. The main concept of doing this is that it might argued that the estimation results of regressions (6), (7), and (8) are due to the presence of high multi-collinearity among some of economic growth determinants. This might mean that the obtained findings from these estimations are in fact because of the impact of another determinant of economic growth, rather than financial development level. Therefore, to investigate this apprehension it is essential to consider different economic growth determinants.

Results are reported in columns (6) of table (6.3), and column (7), and (8) of table (6.3) continued, respectively. The results indicate that the coefficients of $lnFDI$ (-0.402), (-0.308), and (-0.340), respectively are negative and insignificant. However, the coefficients of the interactive term $lnFDI * lnCPS$ (0.287), (0.203), and (0.290) are all positive and significant, respectively at (0.01) levels. This finding suggest that the impact of foreign direct investment can be significantly positive only if there is a confident level of financial development. Thus, we found a convinced support for our hypothesis that financial development boosting the positive relationship between foreign direct investment and economic growth rate. This result is dispute the broadly spread view that more foreign direct investment may significant to boost the growth rate in host countries. This is can be true if these countries work to develop their local financial system. This result is online with (Alfaro, et al., 2004; Choong & Lam, 2011; Hermes & Lensink, 2003; Sbia & Alrousan, 2016).

Regression (10) aims to identify another important channel through which foreign direct investment may has positive impact on economic growth. Specifically, through the impact of human capital (measured by the group of population aged between 15 and 64 years). To accomplish this aim, the interactive term $lnFDI * lnHC$ is included in the regression equation. Here, the logarithm of government expenditures was used as a control variable. The result of regression (10) is presented in column (4) of table (6.3) continued. The result signposts that the coefficients of logarithm of foreign direct investment alone is still negative (-14.422) and significant at (0.01) level. However, It has become positive (3.386) and very significant when it has interacted with human capital. It becomes higher by (2,258) than the coefficient of the logarithm of human capital $lnHC$. The result present indication that foreign direct investment and human capital level are complementary, thereby improving economic growth rate. This

reflects the importance of human capital as a channel through which foreign direct investment may play a positive role in augmenting the economic growth. This finding is online with (Anwar & Nguyen, 2010).

Finally, as the current study, also aims to measure the importance of financial development as a channel through which foreign direct investment enhancing economic growth in relative to the human capital channel. Now, it becomes possible to achieve this aim, especially after we have found that human capital is a significant channel. For this purpose, regression (11) is implemented. This regression involves two interactive terms. First, foreign direct investment interacted with financial development $lnFDI * lnCPS$. Second, foreign direct investment interacted with human capital. The logarithm of government expenses, again is used as a control variable in this model.

The outcomes from regression (11) is introduced in column (5) of table (6.3) continued. The results demonstrations are while the coefficient of foreign direct investment alone is significantly negative (-9.854), it become positive and very significant when it has interacted with financial development (0.135), and with human capital (2.216). This implies that the complementarity again exists between foreign direct investment and financial development, on one hand, and between foreign direct investment and human capital, on the other hand. This finding can be interpreted as following. On one hand, financial development and human capital are both good channels through which foreign direct investment positively affect economic growth. This finding supports the findings from regressions (6), (7), (8), and (10). On the other hand, it can be noticed that the coefficient of the interactive term foreign direct investment with financial development $lnFDI * lnCPS$ (0.135) is less than the coefficient of the interactive term foreign direct investment with human capital (2.216) by approximately (2.080). This finding suggests that although financial development is a significant channel through which foreign direct investment positively affect economic growth. However, it seems that the channel of human capital is more significant than the financial development channel.

Table (6. 3)

GMM Estimation

Independent Variable	*Reg. (1)*	*Reg. (2)*	*Reg. (3)*	*Reg. (4)*	*Reg. (5)*	*Reg. (6)*
$lnFDI$	*-0.23510* *-0.20299* *0.8395*				*-0.08141* *-0.09257* *0.9264*	*-0.40242* *-0.37479* *0.7085*
$lnGFF$		*-0.57139* *-0.97040* *0.3340*				*-0.40436* *-0.69477* *0.4887*
$lnCPS$			*0.709872* *7.697660* *0.0000*		*0.528906* *5.773155* *0.0000*	
$lnGFE$				*1.777957* *8.075262* *0.0000*	*1.326309* *5.854800* *0.0000*	
$lnHC$	*2.488931* *3.657917* *0.0004*	*2.771146* *6.391529* *0.0000*	*1.626003* *17.0403* *0.0000*	*1.161793* *7.848428* *0.0000*	*0.971610* *1.924977* *0.0569*	*2.164020* *2.297748* *0.0235*
$LnFDI * lnCPS$						*0.287435* *7.771799* *0.0000*
$LnGFF * lnCPS$						
$LnFDI * lnHC$						
R^2			*0.411876*	*0.426254*	*0.581637*	*0.430534*

Source: Author's calculations.

Table (6. 3) - continued

GMM Estimation

Independent variable	*Reg. (7)*	*Reg. (8)*	*Reg. (9)*	*Reg. (10)*	*Reg. (11)*
$lnFDI$	*-0.308839* *-0.668115* *0.5055*	*-0.340114* *-0.373617* *0.7094*		*-14.42208* *-6.744330* *0.0000*	*-9.8540* *-4.3152* *0.0000*
$lnGFF$	*1.243634* *4.554236* *0.0000*		*-1.702895* *-3.521392* *0.0006*		
$lnGFE$	*1.656861* *7.612657* *0.0000*			*2.055951* *10.08823* *0.0000*	*1.67708* *7.71883* *0.0000*
$lnHC$		*1.822736* *3.487139* *0.0007*	*2.884073* *8.406777* *0.0000*	*1.128665* *3.766006* *0.0003*	*1.23441* *4.42314* *0.0000*
$LnFDI * lnCPS$	*0.203081* *6.068881* *0.0000*	*0.290329* *7.824939* *0.0000*			*0.13545* *3.5154* *0.0006*
$LnGFF * lnCPS$			*0.228904* *7.969385* *7.969385*		
$LnFDI * lnHC$				*3.386649* *6.618669* *0.0000*	*2.21610* *3.96970* *0.0001*
R. square	*0.591043*	*0.421779*	*0.437542*	*0.544889*	*0.61409*

Source: Author's calculations.

6.6 Conclusion

The current empirical chapter investigated the role of financial system development in boosting the positive relationship among foreign direct investment and economic growth, and among domestic investment and economic growth. For further investigation, this empirical chapter investigates the role of human capital in boosting the relationship between foreign direct investment and economic growth, and then investigates the importance of financial system development as a channel through which foreign direct investment enhances economic growth in comparing with human capital. The main contribution of this chapter introduces is that it debates that the advancement of financial scheme in host countries is a significant prerequisite for both domestic and foreign investment to have constructive influence on the total growth. Several growth regression equations were estimated. Gross Domestic product per capita GDP was used as a dependent variable in each regression equation. Macroeconomic variables such as foreign direct investment, gross domestic formation, total government expenditure, interaction terms were used as independent variables. This chapter uses balanced data from members of *G20* countries, and econometric technique involves testing the presence of panel unit root in the employed data, *Kao* co-integration test, and using two methods of instrumental estimation which are *GMM* estimation method and two-stage *OLS* estimation method.

The empirical analysis relies on including a number of interaction terms in our main regression equations. In particular, foreign direct investment was interacted with the financial development indicator, credit to private sector, to investigate the role of financial system development in affecting the positive relationship between foreign direct investment and the whole growth. Moreover, domestic investment was interacted with the financial development indicator, credit to private sector, in order to investigate the role played by financial system development in boosting the relationship between domestic investment and economic growth. Furthermore, foreign direct investment was interacted with human capital in order to find out whether human capital is another important channel, in addition to financial system development, that improving the association among foreign direct investment and the growth rate. Finally, we include two interaction terms in one regression equation which are the interaction term foreign direct investment with financial development indicator, and foreign direct investment with human capital in order to find out whether the financial development is more important channel than human capital in boosting the relationship between foreign direct investment and growth.

To confirm that our employed time series are free of unit root at their level or first difference, two panel unit root tests were used which are Im, Pesaran and Shin panel unit root tests, and Levin, Lin and Chu (2002) panel unit root test. The results show that some time series have unit root at their level form such as the logarithm of gross domestic product $lngdp$, the logarithm of gross fixed formation $lngff$, the logarithm of total government expenses lngfe, and the logarithm of credit to private sector $lncps$. However, all the time series were free of unit root at their first difference form.

To test the existing long run association between the underlying variables. Kao co-integration test was preformed twice, with and without considering the interaction terms. And the results in both cases indicate that the employed variables were co-integrated and have long run relationship.

Finally, we obtained similar findings from using *GMM*, and *2-SOLS* estimation methods. The obtained results show that, in one hand, while foreign direct investment, and domestic investment has insignificant negative impact on economic growth, financial development, total government expenditure, and human capital have significant positive impact on economic growth. On the other hand, the estimation results indicate that the impact of foreign direct investment on economic growth can be significantly positive if it interacted with the financial development indicator, credit to private sector or with human capital indicator, the population in an economy who aged between 15-65 years. Furthermore, domestic investment can be significantly positive if interacted with the financial development indicator, credit to private sector. Finally, foreign direct investment has a higher significant positive coefficient when interacted with human capital indicator than that when it interacted with financial development indicator.

Chapter Seven: Discussion and Conclusions

7.1 introduction

By using panel data technique and three different econometric methodologies, this thesis investigated the connection between financial development and economic growth from three different aspects in a number of developed and developing countries, particularly, in *G20* countries. More specifically, three main questions related with finance-growth nexuses were addressed in three separated empirical chapters. Where, the first empirical chapter has conducted to investigate the connection between the development in three main components of financial system and economic growth. Precisely, this empirical chapter empirically examined the relationship between; *(1)* banking sector development and economic growth. *(2)* stock market development and economic growth. *(3)* Insurance sector development and economic growth. The followed empirical chapter considered the relationship between two indicators of banking sector development and two indicators od stock market development. Lastly, the third empirical chapter studied the channels through which financial development may influences the whole growth.

The purpose of the current chapter is to summarize the thesis, conclude the empirical finding, and evaluate the hypotheses of this study. Moreover, it presents the most important contributions to the related literature. Furthermore, the current chapter provides policy implications, and presents suggestions in order to motivate further researches in this area.

7.2 Research Findings:

7.2.1 The impact of financial development on economic growth

The impact of financial development on the entire growth has been extensively investigated by a various of empirical studies. However, one of the limitations of these studies is that only one or two components of financial system is considered. Furthermore, these studies have reported different conclusions regarding the role of financial development in augmenting the economic growth. Therefore, the main objective of the first empirical chapter (chapter 4) was to explore the short and long run relationship between financial development and economic growth. This relation was explored through investigating the impact of banking sector development on

economic growth, stock market development on economic growth, and insurance sector on economic growth.

Mainly, our empirical investigation was based on developing three endogenous growth models inspired from endogenous growth theory. The entire economic growth was measured by gross domestic product per capita GDP. With regard to the impact of banking sector development on the growth rate, the development of banking sector was indicated by credit to private sector to *GDP* ratio, and broad money supply *M2* to GDP ratio. These two variables, respectively, were able to capture the depth and size of banking sector. The employed panel data covers (14) economies of *G20* countries over the period 1990-2014. With regard to stock market development, stock market capitalization to GDP ratio, and turnover ratio were selected to capture the development of stock market. Precisely, these two financial indicators were utilized to indicate the size and liquidity of financial stock market, respectively. The empirical analysis involved (16) countries of *G20* countries over the years 1990-2012. For insurance sector development, we relied on life premium, and non-life premium as financial development indicators. Here, 16 countries of our whole sample were considered for the years 1993-2010. In addition to our interesting variables, human capital, costumer price index, and investment rate were suggested as control variables in order to elude the econometric issue of excluded variables.

The developed models and the employed econometric technique in this chapter overcome most of difficulties encountered by the previous researches in this area where *(1)* the indicators of financial development were carefully identified and selected to reflect the theory's requirements. *(2)* Each time series has tested for the presence of unit root, and that was by using ADF-Fisher and PP-Fisher unit root tests. *(3)* The time scope of this research was appropriate to obtain reliable results where the time span covers time periods before and after financial crisis, and the sample size was enough for econometric analysis. *(4)* The issues of serial correlation and endogeneity were tackled by using *ARDL* to co-integration approach with using suitable number of lags based on three information criterions which are Bayesian Information Criterion, Akaike Information Criterion, and Hannan and Quinn Criterion. *(5)* Short and long run relationship between financial development and growth rate were independently considered. *(6)* Each employed model has examined for the existing of long relationship among the suggested variables, and that was by adopting an appropriate technique that uses F-statistics called Bounds co-integration test.

For unit root test, both $ADF - Fisher$ panel unit root test, and $PP - Fisher$ panel unit root test were used. The results revealed that the level of the time series (in a logarithm form) of banking sector development model are $I(0)$. However, the level variables (in a logarithm form) of stock market, and insurance sector development models are mixture of $I(0)$ and $I(1)$.

Given the obtained outcomes from tests of unit root, bounds test for co-integration with appropriate number of lags was employed on our three models to test of the presence of a steady long run association among banking sector, stock market, insurance sector development, and economic growth. The results of co-integration tests indicated that the obtained values of $F - statistic$ were higher than the lower and upper critical values $I(0)$ and $I(1)$ for all the tested models. Accordingly, the null hypothesis that there is no co-integration among the variables was rejected in these models. Therefore, the final decision was that the involved variables were co-integrated and have long run relationship in each model of the three models.

The subsequent step to the co-integration test was computing the short, and long run impact of the banking sector, stock market, and insurance sector on the whole growth, This step involved estimating the short and long run coefficients of the suggested financial indicators, and that by using *ARDL* method. Our findings were as the following:

1. The banking sector development indicator, credit to private sector as a ratio to GDP has insignificant positive influence on economic growth in both short and long run periods. This suggests that banking sector development via credit to private sector does not have significant role in enhancing economic growth in *G20* countries. This result is in line with results of Rousseau and Wachtel (2011), and the empirical investigation by Gantman and Dabós (2012) Who also questioned the strength of this association. As our sample involves many industrial countries, credit to private sector showed weak effect on economic growth. De Gregorio and Guidotti (1995) argue that the financial indicator credit to private sector is subject to caveats and will show smaller coefficient in industrial economies where the most of financial development occurs outside the banking sector. This finding may be due to the fact that credits to private sector have being directed to non-lucrative investment instead of being directed to productive investment that can stimulate or lead to economic growth. Therefore, it seems that there was a kind of inefficiency in resources allocation by banks in *G20* countries during the investigated period. Coming to the banking sector development indicator, broad money supply as a ratio to GDP has significant negative influence on economic growth. This result is consistent with other empirical researches such as Hassan, and Kalim, (2017) and Yan Wang,

et al. (2015). Yan Wang, et al. (2015) argue that the negative impact of financial development indicator $m2$ to GDP ratio on economic growth is due to the capital market in China is under developed. In our case the deficit in financing could be the main reason. Hassan, and Kalim (2017) contend that the long run financing deficit could not be in favor of economic growth.

2. Both stock market development indicators have significantly positive influence on economic growth in short and long run periods. This results are in line with Beck & Levine, (2004); Valickova, et al. (2015); and Beck, and Levine (2004). Valickova, et al. (2015) analysed 1334 estimation from 67 empirical studies that investigated the link among financial development and economic growth, and they found that stock market development supports faster the growth rate than banking sector development. Also, Beck and Levine (2004) found that stock market development via stock market liquidity is significantly related to economic growth regardless of what control variables were used.

3. The insurance sector development indicator, life premium has significant negative influence on economic growth in the short run period, and insignificant negative impact on economic growth in the long run period. Lastly, the insurance sector development indicator, non-life premium negatively impacts the economic growth in the short and long period. However, this effect is significant in the long run, and it is insignificant in the short run period. On one hand, this result is partially consistent with Adams, et al. (2009) who reported that the development of insurance sector via life, and non-life premiums did not precede Sweden economy during the nineteenth century. Moreover, they concluded that the development of insurance sector is driven by the pace of economic growth rather than leads to economic growth. On the other hand, our findings is in disagreement with (Oke (2012); Vucetich, Perry, and Dean (2014); Webb and Martin (2017) and Webb et al. (2005). (Vucetich, et al. (2014) argue that disruption of the insurance sector have adverse impact on economic growth. (Oke (2012) found that both indicators of insurance sector development life, and non-life premiums are independently have significant positive impact on Nigerian economic growth over the period of 1986-2009. (Webb and Martin (2017) argue that higher levels of life insurance premium predict higher economic growth rates.

Thus, we answered the abovementioned research questions. Moreover, our econometric investigation showed that the other aggregate variables such as investment rate and human capital provide more evidence in explaining the entire growth in *G20* countries. Whereas, other

macroeconomic variables such as the inflation rate has minor negative influence on economic growth.

7.2.2 The relationship between banking sector development and stock market development

The impact of financial system development on economic growth was investigated in the empirical chapter four, and that was through examining the direct impact of the three main components of financial scheme. To develop more understanding about this relation, it was crucial to investigate the indirect impact of the development of financial components on economic growth, and that through investigating the impact of the components of financial system on each other, and to examine the casual relationship between these components during the process of economic growth. The empirical chapter five, therefore, was designed to achieve this goal. However, due to the limited study time, we have only addressed the casual relationship between the development of banking sector and financial stock market as the two main sectors of the financial system. To link the results of this chapter with those obtained in the previous one, we used the same financial indicators that used in chapter four, while stock market development was presented by stock market capitalization and turnover ratio, banking sector development was captured by broad money supply $m2$ as a ratio to GDP and credit to private sector as a ratio to GDP. The investigation aims to find out if these indicators affect each other, thereby effect the total growth, and whether there is casual relationship between the development indicators of banking sector and stock market. In addition, it aims to find out whether the investigated financial sectors are complimentary or substitute each other, and that during the economic growth process.

Based on Calderon-Russell model, we developed eight models in order to answer the abovementioned questions. Firstly, models (1) and (2) were utilized to examine the long run influence of stock market capitalization and turnover ratio on credit to private sector, respectively. In both models. the dependent variable was the banking sector development indicator, credit to private sector to GDP ratio. However, we used stock market capitalization and turnover ratio in the right side of the models, respectively. Secondly, models (3), and (4) were constructed to indicate the long run effect of stock market capitalization and turnover ratio on broad money supply $m2$ to GDP ratio. Thus, we employed broad money supply as a dependent variable and we kept the same independent variables that were used in models (1), and (2). Third, to test the impact of credit to private sector and broad money supply $m2$ to GDP

ratio on stock market capitalization to GDP ratio, models (5), and (6) were developed with considering that stock market capitalization represents the dependent variable in both models, whereas, credit to private sector as a ratio to GDP, and broad money as a ratio to GDP represent the independent variables, respectively. Finally, again we used credit to private sector as a ratio to GDP, and broad money as a ratio to GDP as independent variables in models (7), and (8), but the reason here to indicate their impact on another measure of stock market development which is turnover ratio. Furthermore, other macroeconomic variables derived from the related literature such as, consumer price index, total investment to GDP, real income, and total saving to GDP, were included in the suggested models to control the econometric regressions. Our empirical analysis followed panel data technique where the data covered ten memberships of *G20* economies for the period of 1989-2014.

The econometric methodology followed in this chapter was based on panel data unit root tests, co-integration test, long run relationship estimation, causal relationship test, and to find the correlation matrix for the investigated variables. More precisely, the study used Im Pesaran and Shin, and Levin, Lin and Chu unit root tests to make sure that our panel data are appropriate for further econometric investigation. Then, Pedroni residual co-integration test carried out to examine whether there is long association between the selected time series in our panel data. Afterward, *FMOLS* method was used for estimation purpose. This estimation technique is suggested to be appropriate to address the issues of simultaneity bias and the variables with unit root, and considers semi-parametric correction of OLS method to avoid the bias of second order caused by the presence of endogeneity issue among the involved repressors (I. Chakraborty & Ghosh, 2011). Thereafter, pairwise Granger causality test was implemented, and finally, we found the correlation matrix.

The results from Levin Lin and Chu panel unit root test, and Im Pesaran and Shin unit root Test indicated that all the variables have no unit root except credit to private sector to GDP ratio, real income, and money supply $m2$ to GDP ratio were not stationary at level form, however, became stationary at first level form.

The results from Pedroni co-integration tests showed that most of the employed statistics tests reject the null hypothesis of no co-integration relationship between the proxies of finical system development and the proxies of stock market development within the model, instead accept the alternative hypothesis that the included indicators are co-integrated, and the long run relationship is exist, and that was true for each model of our eight models. This finding was in

line with (Rudra P Pradhan, Arvin, Hall, et al., 2014) who found that banking sector indicators are co-integrated with stock market indicators at different levels of significance in 26 Asian economies during the years 1961-2012.

Afterwards, the results of *FMOLS* estimation revealed that *(1)* stock market capitalization to GDP ratio has long run impact on credit to private sector as a ratio to GDP. This finding is partially consistent with (Rudra P Pradhan, Arvin, Norman, et al., 2014) who found long run equilibrium relationship between banking sector maturity and stock market maturity, however, they used principle components analysis in their study, therefore, it was difficult to attribute this effect to a particular financial indicator. *(2)* the stock market indicator Turnover ratio has no impact on credit to private sector as a ratio to GDP. *(3)* Stock market capitalization has long run negative impact on broad money supply $m2$ to GDP ratio. *(4)* Turnover ratio has long run positive impact on broad money supply to GDP ratio. (5) credit to private sector has long run positive impact on stock market capitalization. This result is in line with other studies, for instance, (Evrim-Mandaci, et al., 2013; Odhiambo, 2010; Quartey & Gaddah, 2007). Evrim-Mandaci, et al. (2013) studied the determinants of stock market development in 30 countries during the years 1960-2007, and they found that credit to private sector to GDP ratio and other macroeconomic factors contribute to stock market capitalization. Also, Odhiambo (2010) found that stock market capitalization is positively affected by credit to private sector in south Africa between the years 1969-2008. (6) broad money supply to GDP ratio has long run positive impact on stock market capitalization. (7) Credit to private sector to GDP ratio has no long run impact on turnover. *(8)* broad money supply to GDP ratio has no long run impact on turnover.

To find the causality pattern between the adopted financial proxies, Granger test for causality was used. The attained outcomes presented that; Firstly, there is bidirectional causality between stock market capitalization and credit to private sector. Secondly, there is unidirectional causality relationship from turnover ratio to credit to private sector. Thirdly, there is unidirectional causality relationship from broad money supply $m2$ to stock market capitalization. Finally, there is unidirectional causality relationship from turnover ratio to broad money supply. Our result is partially in line with Rudra P Pradhan, Arvin, Norman, et al. (2014) who found that there unidirectional causality relationship runs from banking sector development to stock market development in three groups of Asian countries during a long period from 1961 to 2012. However, they used composite measures of both stock market and

banking sector development by using several financial indicators, and this prevents the causal relationship between these indicators being determined separately.

Additionally, the correlation matrix between the financial measures, credit to private sector, broad money supply $m2$, stock market capitalization, and turnover ratio showed that all these financial indicators are significantly positive correlated with each other. This finding indicated the following key points; *(1)* The significant positive correlation between credit to private sector and broad money supply implies that as the size of banking sector increase it becomes more efficient. *(2)* The significant positive correlation coefficient of stock market capitalization and turnover ratio means that when the stock market size increase, its liquidity an efficiency, also, increase. This result agrees with those of Demirgüç-Kunt & Levine (1996); and Masoud and Hardaker (2012) who argue that huge financial markets have huge liquidity. *(3)* The significant positive correlation between banking sector development and stock market development indicators implies that these two financial sectors are complementary instead of substituting each other. Our outcomes are consistent with several studies, for example, Garcia and Liu, (1999); Levine and Zervos (1996); and Masoud and Hardaker (2012).

7.2.3 Financial development, foreign direct investment, Domestic investment, and economic growth

To evaluate the relationship between financial system development, foreign direct investment, domestic investment, and economic growth, the empirical investigation was based on developing eleven regressions with more focusing on the interaction between the interested variables. The interaction terms were used to measure the role of a specific variable in improving the positive relationship between the interacted and dependent variables. For example, to measure the role of credit to private sector in enhancing the positive relationship among foreign direct investment and GDP per capita, in such case credit to private sector and foreign direct investment was interacted together. In this chapter of the thesis, GDP per capita was used to capture the economic growth, while credit to private sector was used to capture the development in the financial system. Moreover, net inflow of direct foreign investment, gross fixed capital formation, and the group of population who aged between 15-64 were used as indicators for foreign direct investment, domestic investment, and human capital, respectively. Furthermore, general expenditures of government was added to specific models in order to control the regressions. With regard testing the stationary properties and determining the co-

integration degree of our used panel data, we relied on preforming two panel unit root tests namely; Levin, Lin and Chu panel unit root test, and Im, Pesaran and Shin panel unit root tests. Regarding with the existence of long run association among variables within our suggested regressions, we applied *Kao (Engle-Granger based)* co-integration technique. With regard the econometric estimation, 2-*SOLS* and *GMM* methods were jointly used. Both methods are based on using instrumental variables, in our study we used the lagged independent variables as efficient instruments. The main reasons of employing these two estimation techniques are; These two estimators are appropriate in case of presence of endogeneity problem, and both are efficiently capable to manage country fixed influence and revers causality.

The results of unit root tests exposed that four variables were not stationary at the level form namely; financial indicator, economic growth indicator, government expenditures, and domestic investment. However, at the first difference form, none of our used variables was not stationary.

Given the findings of panel unit root tests, *Kao* co-integration test was utilized. The results of co-integration confirmed the existence of a steady long run relationship among the underlying data. This finding is in agreement with findings of Pradhan, Arvin, Hall, and Bennett (2017) who used *Pedroni* panel co-integration approach and found that there is a long run relationship between financial development, the diffusion of mobile phones, ICT goods imports, foreign direct investment, and economic growth in *G20* countries during the period 1990-2014.

The estimation result of *GMM*, and *2-SOLS* showed that *(1)* Financial development has significant positive impact on economic growth. This result in agree with the result of Levine, (1997). *(2)* Foreign direct investment has unexpected and initial insignificant impact on economic growth. This finding is in line with the result of Shakar and Aslam (2015). This is may be due to excessive volatility of foreign direct investment in some countries of our sample. Shakar and Aslam (2015) argue that the influence of foreign direct investment can be changed from time to time. *(3)* Domestic investment has significant negative impact on economic growth. This result is inconsistent with the result of Adams, et al. (2009) who found a positive and significant effect of domestic investment on the entire growth in 42 sub-Saharan African countries during the years 1990-2003. *(4)* Human capital has significant positive impact on economic growth This result is in line with many earlier studies, for example, Park (2006); Wang and Liu (2016); and Zhu and Li (2017). *(5)* The interaction term of fixed capital formation and financial system indicator has significant positive coefficient. This implies that

financial system development boosts the positive link among domestic investment and economic growth. This result is in line with results of Xu (2000) who found that financial development indirectly and through domestic investment has a significant impact on the whole growth in a sample of 41 countries during the years 1960-1993. *(6)* The interaction term of foreign direct investment and financial system indicator has significant positive coefficient. This implies that financial system development boosts the positive link among foreign direct investment and economic growth. This result supports the results of Hermes and Lensink, (2003). *(7)* The interaction term of foreign direct investment and human capital indicator has significant positive coefficient. This implies that human capital boosts the positive link among foreign direct investment and economic growth. This finding is in line with Borensztein, et al. (1998). *(8)* The interaction term of foreign direct investment and human capital indicator has a greater significant positive coefficient than that of the interaction term of foreign direct investment and financial system development. This implies that financial system development is not more important than human capital in boosting the positive relationship between foreign direct investment and the entire growth in the recipient countries. To this end, our empirical results challenge widely spread notion that an improvement in domestic and foreign investment may essential to boost economic growth. However, this is only true if there was a sufficient development in the financial system.

Overall, the outcomes of our empirical investigation highlighted the importance of financial system development in promoting economic growth. The results showed that financial system development can directly and indirectly impacts the whole growth. For example, the findings of the first empirical chapter showed that financial system can directly impacts economic growth through the development of its main components such as stock market, banking sector, and insurance sector. Moreover, the findings from the second empirical chapter presented that financial system can be indirectly impacts economic growth through the collaboration among the advancement of banking sector and stock market during the economic growth process. Finally, the results from the third empirical chapter revealed that financial system development can indirectly effects economic growth, and that by augmenting the positive link among local and foreign investment, and economic growth.

7.3 Contributions to the existing literature

The contribution of this thesis to the finance-growth literature is that it concentrates on three main themes all are related to the issue of the relationship between financial system

development and economic growth. First of all, chapter four was precedent effort in investigating the impact of three components of financial development on the entire growth, where the study was unlike other studies that focus on a specific component of the financial system and ignore the other important components, or those that give importance to a particular indicator of financial development. Instead, this study gives an equal importance to these components, and employs more than one important financial development indicator for each component. By doing so, the obtained findings from this study are able to be compared with the findings of most studies in this area, regardless of which financial component or financial indicator these studies focus on.

Secondly, chapter five examined the relationships between the development of banking sector and stock market. This highlights the importance of these two sectors in the process of economic growth. Therefore, chapter five contributes to the existing literature by providing an opportunity to identify the interaction between these two main components of the financial system, and to determine the indirect impact of both components on economic growth through impacting each other, and this may exaggerate the final impact of financial system on economic growth. In addition, Studying the relationship between the main components of the financial system will provide well understanding of how financial system development enhances the whole growth.

Thirdly, this thesis, in chapter six considers the role of financial system development in motivating the positive effect of both local and foreign investments on the total growth. The contribution of such investigation to the literature lies in reaching the debate regarding the channels through which financial system increasing the growth rate.

Fourthly, the thesis contributes to existing literature on financial development and economic growth by studying the connection among financial system development and economic growth with using panel data from *G20* members, hence this provides an opportunity to involve both developing and developed countries in one single study. Therefore, the outcomes of this study can be generalized to suit developing and developed economies a like.

Finally, This study contributes to the literature by employing three different econometric methodologies to avoid the country specific effect and endogeneity issues that usually exist in case of using endogenous growth models.

7.4 Policy implications

Based on the empirical investigation, in this suction we will provide some policy implications as following:

1.The results of the empirical chapter four provided indications regarding the direct impact of banking sector, stock marker, and insurance sector on economic growth. Generally, the results showed that only stock market development has significant influence on economic growth. However, the development in the other two financial sectors have no or even have negative influence on economic growth. Therefore, it is paramount for governments and policy makers to give the priority of development to stock market, but it should not rule out its exertions to develop the other financial sectors.

With respect to banking sector, the findings showed insignificant positive impact of credit to private sector on growth. This means that the credits were not channeled to productive investment. Therefore, policy makers should establish economic plans that impact the credits directed to private sector. For example, collecting more useful information on borrowers, conducting more studies on private projects, more focusing on how to control risk management. This efforts should be supported by institutional reforms. In addition, the policies of financial liberalization are required through reducing the interference of governments in the banking sector in order to relax the constraints of liquidity and increase the share of credits to private sector.

With respect to stock market, the coefficients of stock market development measures, stock market capitalization and turnover ratio were found positive and highly significant. This reflects the important role of stock market in enhancing economic growth in *G20* countries. Therefore, there is a need to support the depth and size of stock markets, thereby to improve economic growth, and that can be through implementing several ways, such as *(1)* Develop the operational system of the local stock markets via adjusting the current regulatory legislation, and expanding the liberalization process. *(2)* Motivate the private firms to invest in the domestic financial markets rather than investing in abroad markets. *(3)* Facilitating the entry of foreign investors into local financial markets *(4)* protect new investors from speculates to provide more savings channeled to stock market. *(5)* Motivate the cooperation between small companies and encourage them to merge with each other to increase their capital and avoid the competition and the issue of market saturation.

With respect to insurance sector, the results showed that insurance sector have no significant role in promoting the entire growth or even can constrain this growth in *G20* countries. This may be due to deficiency of insurance companies in these economies. Thus, to improve the role of this sector in the economic growth process, some policies and regulations that govern the work of insurance companies are required. For example, increase the efficiency of these companies by restructuring them and carrying out some institutional reforms, and encourage the insurance companies to provide healthcare support.

2.The results of the empirical chapter five showed that there is a strong relationship among banking sector and stock market development indicators, implying that these sectors complement each other in the economic growth process. As these sectors effecting each other, it is possible that each sector can indirectly effect the economic growth through its effect on the other sector. Therefore, the governments should reinforce policies that stimulate all aspects of financial system development in order to promote economic growth.

3.The finding of the empirical chapter six implied that foreign direct investment cannot be the main factor in upholding economic growth, and the positive effect of local and foreign direct investment on economic growth is preconditioned by the levels of financial system development and stock of human capital. Accordingly, both financial system development and human capital should be taken in account while formulating the economic policies that related to whole growth and its relation with domestic and foreign investment.

7.5 Study Limitations

This thesis has two limitations which are; Firstly, this study uses three panels of data to investigate the impact of the main components of financial system on the growth rate. However, these panels involve different groups of countries of *G20* members, in addition of covering different periods of time. The main reason behind this choice was the availability of data. Where, there is deficiencies and a lack of harmony in the availability of time series for all countries and time periods in the data that obtained from the World Bank and the International Monetary Fund.

Secondly, The study uses only one indicator to capture the deepening of financial system while investigating the role of financial system in enhancing the positive association between each

of domestic investment, and foreign direct investment, and economic growth. Also, the reason is related to the availability of the sufficient data that suitable for econometric analysis.

Thirdly, another issue related to the used data is that our empirical analysis was based on aggregate data. However, this can be a subject to many features which may impact the obtained results. It is argued that using disaggregate data is more helpful in analyzing the influence of financial system on economic growth Kassimatis (2000). Unfortunately, this data are not obtainable yet.

7.6 Recommendations for Further Studies

This thesis presented a new substantiation regarding the linkage among financial deepening and the whole growth, and that by using a new data, models, and analysis. However, due to some limitations of the current study, further researches are required in this field.

This study used data from *G20* countries during various periods ranging from 1989 to 2014. However, due to data availability, not all members were included in our investigation such as Russia, and European Union, and the recent years were not covered. Therefore, further researches could cover those members, and more recent periods if such data are available in the future.

This thesis, in chapter four, concentrated on three components of financial system, and used only two financial measures to capture the development in each sector. Therefore, we recommend a further work which considers another financial system component such as bond market, and more financial development indicators such as total deposits in the financial as a ratio to GDP as this indicator is a suitable to indicate the general size of financial system (Zhang, et al., 2012).

In chapter five, the relationship between stock market and banking sector was investigated in order to find out the interrelation among them. However, the insurance sector was not considered in our study. Hence, it is interesting and more advantageous to implicate all the three sectors in the future researches.

In the empirical chapter six, we investigated the role of financial system in promoting the positive link between domestic and foreign investment, and economic growth. The financial system was captured by credit to private sector. Nevertheless, this indicator cannot indicate the expansion of financial system as whole. Therefore, another research can use a composite index

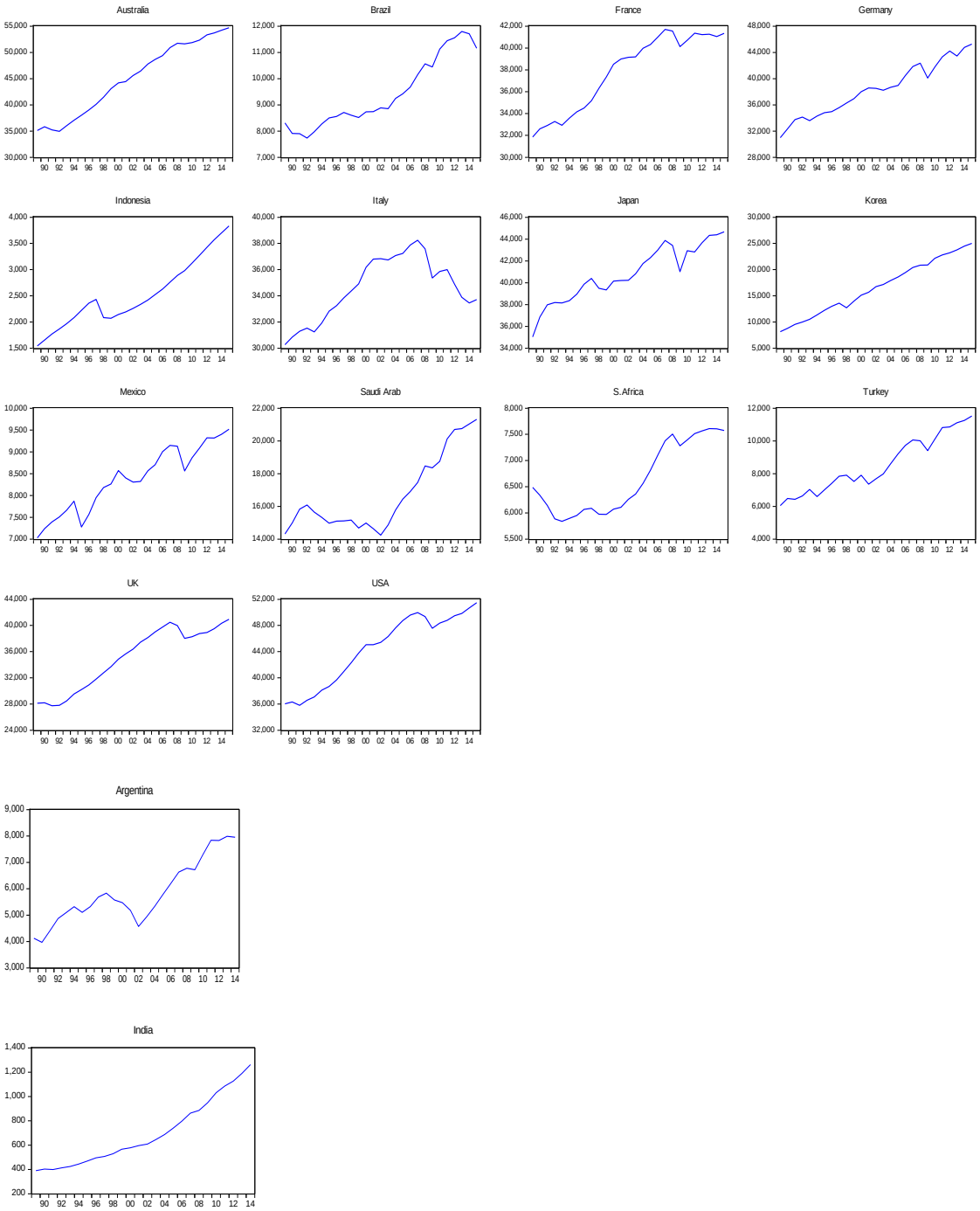
of financial system development t. Furthermore, the results of chapter six revealed that the sock of human capital has a significant role in enhancing the relationship between foreign direct investment and economic growth. Thus, further study is suggested to investigate this issue in different group of countries such as the Middle East Countries.

Lastly. Even though this study has some limitations, we contented that it has provided a significant contribution to finance-growth analysis in developing and developed economies. Such studies are important to improve economic growth in these economies. This work shaded light on the importance of financial development in promoting the entire growth, and added to this expanding literature.

Appendices

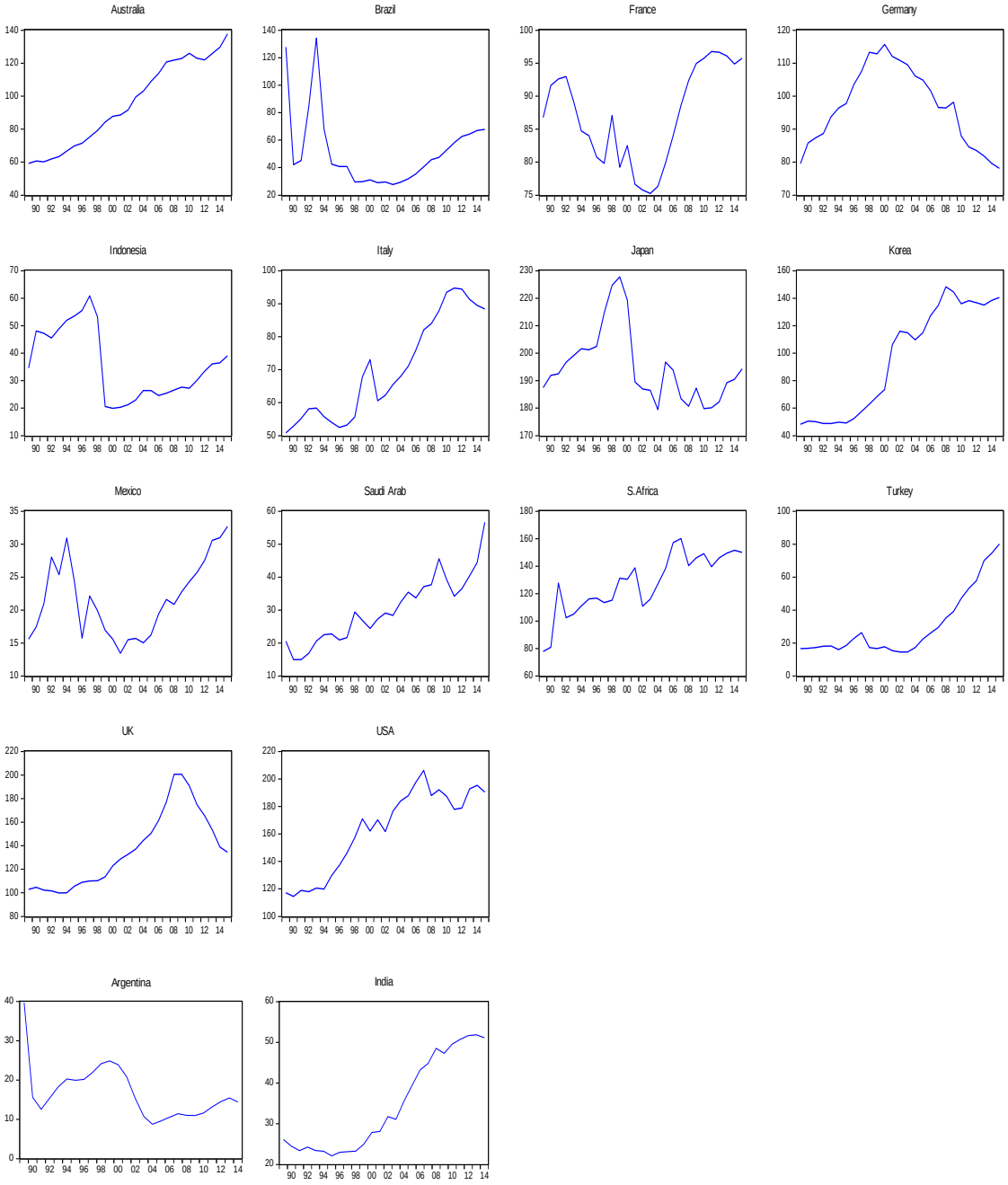
Appendix 1 (A)

Economic Growth Trend in G20 Countries



Appendix 1 (B)

Financial Development Trend in G20 Countries



Appendix 2

Two-stages OLS estimation

Independent Variable	*Reg. (1)*	*Reg. (2)*	*Reg. (3)*	*Reg. (4)*	*Reg. (5)*	*Reg. (6)*
$lnFDI$	*-0.23510* *-0.20299* *0.8395*				*-0.08141* *-0.09257* *0.9264*	*-0.40242* *-0.37479* *0.7085*
$lnGFF$		*-0.57139* *-0.97040* *0.3340*				*-0.40436* *-0.69477* *0.4887*
$lnCPS$			*0.709872* *7.697660* *0.0000*		*0.528906* *5.773155* *0.0000*	
$lnGFE$				*1.777957* *8.075262* *0.0000*	*1.326309* *5.854800* *0.0000*	
$lnHC$	*2.488931* *3.657917* *0.0004*	*2.771146* *6.391529* *0.0000*	*1.626003* *17.0403* *0.0000*	*1.161793* *7.848428* *0.0000*	*0.971610* *1.924977* *0.0569*	*2.164020* *2.297748* *0.0235*
$LnFDI * lnCPS$						*0.287435* *7.771799* *0.0000*
$LnGFF * lnCPS$						
$LnFDI * lnHC$						
R^2			*0.411876*	*0.426254*	*0.581637*	*0.430534*

Source: Author's calculations

Appendix 2 (continue)

Two-stages OLS Estimation (continue)

Independent variable	*Reg. (7)*	*Reg. (8)*	*Reg. (9)*	*Reg. (10)*	*Reg. (11)*
$lnFDI$	*-0.308839* *-0.668115* *0.5055*	*-0.340114* *-0.373617* *0.7094*		*-14.42208* *-6.744330* *0.0000*	*-9.8540* *-4.3152* *0.0000*
$lnGFF$	*1.243634* *4.554236* *0.0000*		*-1.702895* *-3.521392* *0.0006*		
$lnCPS$					
$lnGFE$	*1.656861* *7.612657* *0.0000*			*2.055951* *10.08823* *0.0000*	*1.67708* *7.71883* *0.0000*
$lnHC$		*1.822736* *3.487139* *0.0007*	*2.884073* *8.406777* *0.0000*	*1.128665* *3.766006* *0.0003*	*1.23441* *4.42314* *0.0000*
$LnFDI * lnCPS$	*0.203081* *6.068881* *0.0000*	*0.290329* *7.824939* *0.0000*			*0.13545* *3.5154* *0.0006*
$LnGFF * lnCPS$			*0.228904* *7.969385* *7.969385*		
$LnFDI * lnHC$				*3.386649* *6.618669* *0.0000*	*2.21610* *3.96970* *0.0001*
R. square	*0.591043*	*0.421779*	*0.437542*	*0.544889*	*0.61409*

Source: Author's calculations

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