Financial development and economic growth in BRICS and G-7 countries: a comparative analysis

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Dissertation submitted in partial fulfillment of the requirements for the degree Magister Commercii in Economics at the Vaal Triangle Campus of the North-West University

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November 2015
DECLARATION

I declare that the dissertation entitled “Financial development and economic growth in BRICS and G-7 countries: a comparative analysis” is my own work, that all the sources used or quoted have been identified and acknowledged by means of complete references, and that this dissertation has not previously been submitted by me for a degree at any other university.

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To whom it may concern

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Financial development and economic growth in BRICS and G-7 countries: a comparative analysis

The responsibility of implementing the recommended language changes rests with the author of the dissertation.

Yours truly,

Linda Scott
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DEDICATION

I dedicate this research paper to my mother JANE STIGLINGH and late dad JAN STIGLINGH (16/01/2014). I know you are surely proud of me daddy. STIGLINGH family I hope I made you proud.
ABSTRACT

The relationship between financial development and economic growth is an important issue for both developed and developing countries through which the extent of economic growth and the sophistication of the country’s financial markets are linked. The research studies the existence of a relationship between financial development and economic growth using a sample of BRICS and G-7 countries for the period of 1996 to 2013. The study objective was to conduct a comparative analysis of the relationship between financial development and economic growth within BRICS and G-7 countries. A panel data analysis was used to analyse secondary data from 5 BRICS countries (Brazil, Russia, India, China and South Africa) and G-7 countries (Canada, France, Germany, Great Britain, Italy, Japan and United States). Variables used include, economic growth, stock market capitalisation, total investment growth, interest rates and population growth. This study found that real interest rates and total investment is positively related to economic growth in both BRICS and G-7; while other variables such as stock market size, do play a significant role in explaining economic growth in both BRICS and G-7 countries and insignificant variables such as population growth. Findings of this study suggests there are no major difference between developed and developing countries with regards to their financial development and economic growth. This study may assist BRICS and G-7 countries to improve their economic growth structure and financial development systems over time.

Keywords: Financial development, economic growth, relationship, panel data, BRICS, G-7, comparative analysis.
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<td>de Depots et Consignations</td>
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CHAPTER 1: INTRODUCTION, PROBLEM STATEMENT AND OBJECTIVE

1.1 INTRODUCTION

The relationship between financial development and economic growth is essential for development of many countries. Levine (2005) suggested that if countries have a strong financial system this leads to a stronger outlook for economic growth. This may refer to financial development having a positive impact on economic growth and can be related vice versa that when financial development is in a downturn the same result would be visual in economic growth trends. This relationship between financial development and economic growth is also contentious as it leads to different views regarding the part that any financial tool or system or even structure plays in the economy (Kenourgios & Samitas, 2007:40). In this regard, financial development is considered to be a mediator that produces economic efficiency, which may eventually lead to economic growth (Levine, 1997:712).

Financial development can be defined as the guidelines, factors, and the associations that lead to the proficient intermediation and effective financial markets. A strong financial system offers risk diversification and effective capital allocation. The greater the financial development, the higher would be the mobilization of savings and its allocation to high return projects. Levine (1993) emphasized to consider the importance of financial sector in economic growth. Financial development can be measured by a number of factors including the depth, size, access, and soundness of financial system. It can be measured by examining the performance and activities of the financial markets, banks, bond markets and financial institutions. It is observed that higher the degree of financial development in a country, the wider will be the availability of financial services. A developed financial system offers higher returns with less risk (Adnan, 2011).

Financial development is regarded as a multidimensional principle, which establishes a potentially significant instrument for long-term economic growth (Adamopoulos, 2010:79).

Economic growth, as stated by Mohr (1998:45), is a rise in the capacity of an economy to create goods and services, comparing one period of time to another. Economic growth can be measured in nominal terms, which comprise inflation, or in real terms, which are adjusted for inflation. Likewise, economic growth can be used to equate one country’s economic growth to another, through measurements such as GDP or more commonly,
GDP per capita as these take on the explanation of population differences between countries (International Monetary Fund, 2014).

When critically analysing the relationship between financial development and economic growth one will be able to tell if these economic concepts complement each other and if financial development stimulates growth. On the other hand, Djoumessi (2009:3) states that the establishment of a suitable financial sector policy is of utmost importance for economic growth, and as such, if the factors underlying differences in financial development can be identified, the financial sectors can provide more effective public policy advice to those countries and, therefore, potentially improve living standards (Panizza, 2013:154).

It is within this context that it is important to understand how financial development affects economic growth and how the different attributes of financial development influence economic growth within the BRICS and G-7 countries. Most importantly, it is essential to establish if there is a relationship between financial development and economic growth between these two economic blocks.

The BRICS countries (Brazil, Russia, India, China and South Africa) are considered as innovative building blocks in the global economy and amongst the leading emerging economies. This acronym came into existence in 2001 to highlight the remarkable role and importance of emerging and developing economies and only included Brazil, Russia, India and China (BRIC). In that time it showed a great amount of growth within their specific grouping economies. According to the International Monetary Fund (2012:1), these four countries only began to meet up in 2006 due to their geographic and demographic dimensions. The group invited South Africa to join them in 2010 and, henceforth, became known as the BRICS countries. When comparing the BRICS nations, it was found that South Africa is by far the smallest in their economic output. Even though South Africa shows clear indications of slow economic growth, it makes up for its influence by accounting for a third of local production in sub-Saharan Africa, and allows them to supply BRICS members with better-quality access to Africa’s 1.1 billion population, in addition also minerals and other resources (Statistics South Africa, 2013).

The G-7 refers to the structure of the world’s seven most technologically advanced economies, formed in 1975. It primarily consists of six nations, namely, France, Germany,
Italy, Japan, the U.S., and U.K. Thereafter, Canada was requested to join the group in 1976. G-7 representatives meet occasionally to deliberate international economic and budgetary matters, with the semi-annual gatherings being the main motivation of much mass media attention. Although the G-7 countries all together constitute over more than half of the global GDP, the group has lost its significance since it does not comprise the world’s leading developing economies such as Brazil, China and India, which form part of the BRICS countries. This suggests that BRICS may be the new global economic trend.

Goldsmith (1969:116) stated that the previous studies empirically showed the significance of a positive relationship between financial development and GDP per capita. This was followed by King and Levine (1993:723) who made use of cost-effective indicators and measures which forms part of the magnitude and relative significance of banking organisations and also established a positive and substantial relationship between numerous financial development indicators and GDP per capita growth. Levine and Zervos (1996:11) encompassed measures of stock market capitalisation and found a positive partial association between both the stock market and banking development. GDP per capita growth studies have been done on the relationship between financial development and economic growth and this relationship may vary between developed and developing countries because the level of both financial and economic development within developed countries tends to differ to that of developing countries.

Thus, there should be a comparison of how various instruments of financial development drive economic growth in developed and developing countries. In this study, priority will be given to the relationship between financial development and economic growth in BRICS, which represents emerging economies, and the G-7, which represents developed countries.

1.2 PROBLEM STATEMENT

Many regions across the world are in dire need of financial development and economic growth. In relation to financial development and economic growth, even though it has been established if there is an existing relationship between the two concepts, the results were still inconsistent. At the same time, whether or not financial development precedes economic growth or economic growth precedes financial development, is still a debatable topic for both developed and developing countries.
According to Bettin and Zazzaro (2012) financial development in developed countries tends to be more progressive than that of developing countries. Developed countries tend to have stronger financial and growth policies and developed financial structuring than developing countries. In most developing countries, there seems to be a lack of strong financial systems and policies to deliver the required economic results.

However, BRICS emerging economies have proven themselves effective in competing with developed countries such as those of the G-7. It is widely apparent that over the next few years the growth generated by the biggest developing countries, for the most part BRICS, possibly will become a much more important force in the world economy (World Bank, 2011:7).

Among the BRICS, India and Brazil are moderately more domestic demand-driven economies. Therefore as a group, they have witnessed quicker economic recovery from the 2008 financial crisis than progressive and other emerging market economies (EMEs). Even though they have strong external relations, they have nonetheless undergone significant trendy steadiness of their economies towards their domestic sectors in the post financial crisis period. Thus, the BRICS have the prospective to form an influential economic bloc to the segregation of the current G-7 status (Chang & Caudill, 2005:1333). This accelerated economic growth of BRICS, therefore, poses a question of whether the relationship between financial development and economic growth within the BRICS is comparable to that of the G-7 countries. Yet in most countries, financial sectors are still immature and ponder mainly on the banking sectors. In addition, they are undertaking difficulty in assembling domestic savings and appealing to foreign private capital. Through this, the quest of sustainable and inclusive economic growth and development and greater affluence in all countries remains a foundational commitment that ties our people and our countries. The aim is to continue striving towards a stronger sustainable economy and most importantly focusing on financial reforms building better development structures within the countries.

Therefore, Mosesov and Sahawneh (2003) argued that quantitative and qualitative indicators that are more detailed to provide a better description of a country’s financial development should augment the basic measurements for financial development. These effects can mainly lead to drawbacks from investors, technological downturns and sluggish economic growth. Through this, a greater strain is placed on economic progress
or development within a country, which may influence economic and financial patterns (De Haas, 2001).

1.3 RESEARCH OBJECTIVES

The following objectives have been formulated for the study.

1.3.1 Primary objectives

The objective of the study is to conduct a comparative analysis of the relationship between financial development and economic growth within BRICS and G-7 countries.

1.3.1.1 Theoretical objectives

In order to achieve the primary objective, the following theoretical objectives were formulated for the study:

- Understand what is financial development and economic growth and what it entails;
- Determinants of economic growth;
- Rostow’s stages of economic growth;
- Understand growth policies;
- Explain the key indicators of financial development;
- Measures of different determinants of financial development;
- Explain the relationship between financial development and economic growth; and
- Review the empirical studies on the relationship between financial development and economic growth in BRICS and G-7 countries.

1.3.1.2 Empirical objectives

In accordance with the primary objective of the study, the following empirical objectives were formulated:

- Identify the relationship between financial development and economic growth within the BRICS countries;
- Identify the relationship between financial development and economic growth within the G-7 countries;
- Compare the relationship between financial development and economic growth between BRICS and G7 countries.
1.4 RESEARCH DESIGN AND METHODOLOGY

1.4.1 Literature review

This study consists of secondary sources through means of previous studies, such as publications, internet sources, textbooks, newspaper articles and journal articles. All of these secondary sources provide theoretical backgrounds to financial development, economic growth, and the relationship between financial development and economic growth. This study also makes use of an empirical study which consists of secondary sources.

1.4.2 Empirical study

The empirical portion of this study comprises the following methodology dimensions:

1.4.2.1 Target population

The targeted population consists of developed and developing countries. The geographical area is widespread as it uses country groupings formed from various regions of the world.

1.4.2.2 Sample size

For the study, a sample size of 12 countries consisting of the BRICS and G-7 countries was used to analyse the relationship between financial development and economic growth and to measure if there is a link between developing and developed countries.

1.4.2.3 Data collection method

This study uses secondary panel data, which consists of time series of the variables of financial development and economic growth. The time series data are obtained from international financial statistics, World Bank and International Monetary Funds. The sample period consists of annual observations starting from 1996 till 2013 with a total of 216 observations for BRICS (90) and G-7 (126) countries. This is a time range of seventeen years and is the time before and after the 2009 financial crisis. The various changes in financial development and economic growth patterns will be noticed throughout this given period.
1.4.2.4 Statistical analysis

To determine the relationship between financial development and economic growth, a panel data analysis, including panel regression and panel co-integration, was conducted. Generally, the link between financial development and economic growth is analysed by the following regression:

\[ RGDP_{it} = \alpha_0 + \gamma FD_{it} + \beta X_{it} + e_{it} \]  

(1)

Where: \( RGDP_{it} \) is growth in the real GDP per capita for country \( i \) at period \( t \),

\( FD_{it} \) are financial development variables for county \( i \) at period \( t \)

\( X_{it} \) is a vector of control variables for country \( i \) at period \( t \), and

\( \alpha_0 \) and \( e_{it} \) represent the intercept and error term respectively.

Economic growth (RGDP) is GDP per capita for BRICS and G-7 countries, which was calculated as a percentage growth of GDP. Financial development (FD) consists of the variables namely total investment and total investment as a percentage of GDP. \( X \) is a presentation of the control variables namely population growth and interest rate as a percentage of growth and lastly \( t \) which is the time period which range from 1996 to 2013 for this specific study. Other variables could be included but for the country groups this data was found to be complete and therefore used to analyse the comparison between BRICS and G-7.

The stationarity test was conducted to the test whether the variables are stationary. If the variables are stationary, the panel regression is estimated but if variables are non-stationary then the panel co-integration test is conducted to test for the long-run relationship between financial development and economic growth. As all the variables were found to be stationary; this study continued with panel regressions. Since panel regression involves pooled, Fixed Effect (FE), Random Effect (RE); the redundant fixed rate effect and Hausman tests were used to select the appropriate model for this study.

1.5 ETHICAL CONSIDERATIONS

In this study, ethical clearance is not needed, due to the use of public secondary data. Recognition is given to all the relevant sources.
1.6 CHAPTER CLASSIFICATION

Chapter 1: Introduction, problem statement and objective: Chapter 1 provides an introduction to the research project, and introduces the research problem. The aims of the research project are clarified. It highlights the motivation for undertaking such research and provides an overview of the remainder of the studies. It also entails an introduction to the study of financial development and economic growth.

Chapter 2: Literature review: Chapter 2 provides a review of the theoretical and empirical literature related to financial development and economic growth. This consists of an analysis on the theoretical background of the literature underlying the study of economic growth. Additionally, it will be based on a review of Rostow’s stages of growth and the various types of theories on economic growth. The aim is to identify the measures of financial development as well as to assess the components of financial development, which include stock markets, bond markets and banks.

Chapter 3: Data and research methodology: Chapter 3 describes the conceptual method and research methodology adopted and followed by this study. A review of the empirical analytical frameworks was also conducted to determine the most appropriate econometric tests and to identify the most appropriate variable to be used in the analytical framework.

Chapter 4: Results and discussions: Chapter 4 provides the conceptual research method and methodology results that have been done, followed by the research model used to find the relationship between financial development and economic growth. To test the results a panel regression was used which involves pooled, Fixed Effect (FE), Random Effect (RE); the redundant fixed rate effect and Hausman tests were used to select the appropriate model for this study Following the literature review in Chapter 2, the gaps in the literature may be explained.

Chapter 5: Summary, conclusion and recommendations: Chapter 5 presents the summary of findings together and concludes the research project and provides recommendations for future work.
CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

The relationship between financial development and economic growth has been the subject of much debate both at theoretical and empirical levels. Financial systems have long been recognised for their important role in economic growth and development. As stated by Arestis et al., (2001), Hassan et al., (2011), Liang and Jian-Zhou (2006), the relationship between financial development and economic growth has been studied extensively.

Earlier economic growth theories argued that economic growth is a process of innovations whereby the interactions of innovations in both financial and real sectors provide a driving force for dynamic economic growth. In other words, the exogenous technological progress determines the long-term growth rate while financial intermediaries were not modelled explicitly to affect the long-term growth (Smith, 1904). According to Levine (1997), in order for economic growth to take place, it is necessary to increase labour productivity, followed by the size of the workforce and improved technology. In other words, economic growth requires an increase in all aspects of growth.

In this chapter, the focus will be on economic growth theories. This consists of the theoretical background of the literature underlying the study of economic growth. In addition, it will be based on a review of Rostow’s stages of growth and the various types of theories on economic growth.

2.2 THE THEORY OF ECONOMIC GROWTH: A BRIEF REVIEW

The economic growth of an economy is not only thought of as an increase in a productive capacity but also as an improvement in the quality of life to the people of that economy. The endogenous growth theory suggested that financial intermediation has a positive effect on steady-state growth but the government intervention in the financial system has a negative effect on economic growth (Adamopoulos, 2010:83).

Economic growth can be defined as an increase in real GDP, which is GDP adjusted for inflation. Economic growth is a complex problem because several factors contribute to the growth process. In the economic literature, several factors drive economic growth.
These include the investment ratio as it the Harrod-Domar model; (Marx, 1867); (Pagano, 1993); (Greenwood & Jovanovic, 1990); (Weber, 1905), human capital (Romer, 1986), research development and trade openness (Lewis, 1980; Bhagwati, 2004; Rodrik, 1999) and others.

Although there is a lack of joining theory, there are a number of partial theories that discuss the role of various factors in determining economic growth and what can ultimately increase economic growth. Pagano (1993) also suggests three ways in which the development of the financial sector might affect economic growth under the basic endogenous growth model. First, it can increase the productivity of investments. Secondly, an efficient financial sector reduces transaction costs and thus increases the share of savings channelled into productive investments. An efficient financial sector improves the liquidity of investments. Lastly, financial sector development can either promote or decrease savings.

In the early growth theories, a country’s budgetary development might have been viewed as a continuous utilisation of rates set through claiming use of the factors for production and capital and in addition labour and the effectiveness for their utilization (Tridico, 2010). A continuing rise in per capita income had proceeded and every capita wage henceforth may be attributed on proceeding advancement done strategies about handling. Similarly as such, large portions theorist of economic and social development have asserted that investment in labour and social advancements causes the long-term economic growth therefor, machines makes the long haul financial development necessary to improvement.

The theories of Marx and Weber give the impression to be in disapproval to one another, they both rest upon the idea that the economic growth give rise to and from speculation in labour and machines. Recent theories of economic growth have been premised on the same hypothesis about speculation and saving as sources of economic growth. One model of development in specific, by Domar (1946) and Harrod (1939), designed the fundamental principle of most economic growth approaches employed in Latin America, Africa and Asia after World War II. The Harrod-Domar model indicated the dimension of savings and efficiency of investment as the keys to stimulating economic growth. The Harrod-Domar model has been comprehensively evaluated and extended by Solow.
(1956), who adapted some new factors of production, which include labour, technological change and some other conventions into the model.

A growing number of empirical studies have accompanied theoretical developments (Smith, 1904; Ricardo, 1815). Adam Smith’s growth model continued the principal model of Classical Growth but in another conventional study Ricardo highlighted two significant properties for growth (Ricardo, 1815). Firstly, increasing property-owner’s rents over time due to the restricted supply of land should cut into the revenues of capitalists and secondly, wage goods from cultivation would cause an escalation in price over time which would then diminish the profits of corporations as workers have need of higher wages. Primarily research focused on the concern of economic convergence and divergence, since this possibly will provide a test of soundness between the two main growth theories like the neoclassical and the endogenous growth theory. In the end, focus moved to causes determining economic growth.

2.2.1 The Solow neoclassical growth model

Ramsey (1928) introduced the neoclassical growth theory but Solow (1956) put into view its most common model. Supposing exogenous technological change, constant returns to scale, substitutability between capital and labour and diminishing marginal productivity of capital, the neoclassical growth models have made three important claims. Firstly, the increase in the capital-to-labour ratio, for example the investment and savings ratio, is the key source of economic growth. Secondly, economies will eventually reach a state at which no new increase in capital will create economic growth, known as the steady state, unless there are technological improvements to enable production with fewer resources (Sachs & Warner, 1997). Lastly, for the same amount of capital available, the less advanced economies would grow faster than the more advanced ones until a steady state is reached, and as such economic convergence is achieved.

The Solow neoclassical growth model in precise embodied the formative contribution to the neoclassical theory of growth. It expanded on the Harrod-Domar formulation by adding a second factor, labour, and introducing a third independent variable, technology, to the growth equation. According to Domar (1946) and Harrod (1939) unlike the fixed-coefficient, constant-returns-to-scale assumption of the Harrod-Domar model, Solow’s neoclassical growth model demonstrated diminishing returns to labour and capital separately and constant returns to both factors jointly.
When they empirically evaluated the production function and quantified it in this way, then the involvement of A to the growth in total productivity is termed Solow residual which indicates that total factor efficiency really measures the upturn in productivity which is not accounted for by variations in factors, capital and labour (Lucas, 1988).

According to Harrod (1939) contrasting the fixed quantity production function of Harrod-Domar model of economic growth, neoclassical growth model uses variable quantity production function, that is, it ruminates boundless possibilities of replacements between capital and labour in the production procedure.

This is called neoclassical growth model as the formerly neoclassical considered such a variable quantity production function. The second important withdrawal made by neoclassical growth theory from Harrod-Domar growth model is that it adopts that planned investment and saving are always equivalent because of instantaneous adjustments in price which consist of interest (Solow, 1956).

With these expectations, neo-classical growth theory emphases its devotion on the supply side factors such as capital and technological advancements for defining the rate of economic growth of a country. Therefore, unlike Harrod-Domar growth model, it does not deliberate aggregate demand for goods restraining economic growth (Romer, 1994).

The growth of the amount produced in this model is accomplished at least in the short run through higher rate of saving and therefore higher rate of capital formation. However, diminishing returns to capital is a boundary to economic growth in this model. Nonetheless the neoclassical growth model take on the constant returns to scale which exhibits diminishing returns to capital and labour separately.

Figure 2.1, shows that technological growth befitted the remaining factor in explaining long-term growth and its level was presumed by Solow (1956) and other growth academics to be resulted exogenously, that is, self-reliantly of all other factors.

\[ Y = f(L, K, T) \]  

(2.1)

In the case of the Solow growth model, the key variable is labour productivity: output per worker, how much the average worker in the economy is able to produce. The output per worker is calculated by simply taking the economy’s level of real GDP or output Y, and dividing it by the economy’s labour force L (Solow, 1956). This quantity, output per worker,
Y/L, is the best simple substitute for the standard of living and level of prosperity of the economy. Neoclassical theories argue that governments should not intervene in the economy.

**Figure 2.1: The neoclassical growth theory**

Source: Stein (1969:154)

### 2.2.2 Various key results of Solow’s neoclassical growth model

The following results are presented from Solow’s neoclassical growth model (Solow, 1956):

- The neoclassical growth theory demonstrates that gainfulness will be a utility about the development on variable productions, especially towards capital, labour and innovative advancement.
- Commitment of building labour forces may yield to be the most important to increase growth in output.
- Growth rate of output yield over steady-state may be equivalent to those growth rates of population or labour force and is exogenous of the saving rate; it doesn't rely on those rate of saving.
• In spite of the fact that saving rate doesn't focus on those steady-state development rates for output, it can reason an expansion over steady-state level for every capita wage and in additionally downright income through raising money for every leader.

• Enduring state rate of development for per capita income, that is, long-run development rate may be dictated and eventually perusing the advance on innovation organization.

• Assuming that there will be no specialized foul progress, afterward yield for per capita income will at last meet will unfa}tering state level.

• A noteworthy decision about neoclassical development principle will be that assuming that those two nations have the same rate from claiming saving and the same rate from claiming population growth need entry of the same engineering organization.

2.2.3 The endogenous growth model

In divergence to the neoclassical view, the endogenous growth theories, recognised by Romer (1994), and Lucas (1988), point out that the overview of new growth factors, such as knowledge and innovation, will reassure self-sustained economic growth, driving towards different growth outlines. The dynamic property of these models is continual or increasing returns to capital, initiated by the endogenous appeal of production technology. Work contained by this context highlighted three substantial sources of growth: new knowledge (Romer, 1994), innovation (Aghion & Howitt, 1998), and public infrastructure (Barro, 1996).

Endogenous growth theory enlightens long-run growth as deriving from economic activities that construct new technological advancements. Therefore, the endogenous growth is long-run economic growth at a rate unwavering by forces that are centred to the economic system, for the most part those forces governing the prospects and encouragements to create technological advancement (Freeman, 2002).

As stated by Barro (1996) the new classical growth is considered exogenous growth because the technological advancements that cause the economy to grow occur outside of the theorised objective of the economy: to maintain wages at the subsistence level. Thus, technology grows the economy exogenous growth and the population increases to return wages to the subsistence level endogenous response. According to Freeman (2002), unlike the Solow model, the endogenous growth theorists alleged that the sources of economic growth are endogenous. Until recent times, endogenous growth theorists
have assembled a model in mandate to demonstrate analytically the instruments by which savings can affect economic growth.

Foreign direct investment (FDI) has lately played a necessary role in internationalising economic movement and it is a principal source of technology transmission and economic growth. This key character is stressed in more than a few models of endogenous growth theories. The empirical literature examining the control of FDI on growth has delivered more-or-less dependable findings supporting a significant positive relation between the two (Freeman, 2002; Dornbusch et al., 1998).

Adam Smith explained economic growth as an endogenous phenomenon. The growth rate depends on the decisions and activities of agents. Special emphasis is placed on the endogenous creation of new knowledge that can be used economically. New technical knowledge is treated as a good, which is, or in the long-run tends to become, a public good (Ray, 2010). There are no clear and obvious limits to growth. According to the additional work force required in the process the accumulation is generated by that process itself: labour power is a commodity the quantity of which is regulated by the effectual demand for it.

Figure 2.2 the endogenous growth theory mainly relies on constant returns to scale. The reason for this is to accumulate factors of production and to generate on-going growth. This means that if production increases it will also lead to a higher output (Dornbusch et al., 1998:81). In the long run, the rate of economic growth, as measured by the growth rate of output per person, depends on the growth rate of total factor productivity (TFP), which is determined in turn by the rate of technological progress. The neoclassical growth theory of Solow (1956) argued that the rate of technological progress should be determined by a scientific process that is separate from, and independent of, economic forces.

Neoclassical theory thus implies that economists can take the long-run growth rate as given exogenously from outside the economic system. Endogenous growth theory challenges this neoclassical view by proposing channels through which the rate of technological progress, and hence the long-run rate of economic growth, can be influenced by economic factors (Aghion & Howitt, 1992).
Figure 2.2: Endogenous growth model

Source: Mino (1996)

From a diverse perspective, another recent element of economic study known as new economic geography (NEG) emphasises that economic growth inclines to be an unbalanced procedure favouring the primarily advantaged economies (Krugman, 1991). Emerging a courteous system of descriptions, places obvious emphasis on the compound effects of increasing returns to scale, lacking competition and non-zero transportation costs, these studies have reasoned that economic movement tends to agglomerate in detailed urban areas which is categorised by large local demand.

This course is considered to be self-reinforcing, in line to increase positive externalities, backward and forward associations between practises and scaled economies. Even though negative externalities, transport costs and strengthening of competition can give rise to centrifugal special effects and the distribution of activities, these services are unlikely to persuade a balanced configuration of growth. Therefore, economic strategy has to derive into play to alleviate dissimilarities. It is reasonable to state that the NEG is largely concerned with the position of economic activity, gathering and specialisation at a
provincial scale, relatively than with economic growth per scale. However, growth results can be secondary from its models (Krugman, 1991).

From a command perspective, other theoretical approaches have emphasised the significant role non-economic factors play on economic performance. Thus, new institutional economics have underlined the substantial role of institutions. Economic sociology stressed the importance of socio-cultural factors. Political knowledge is focused on its details on political contributing factor (Lipset, 1959; Brunetti, 1997) and others lean-to the role played by geography (Gallup et al., 1999) and demography (Brander & Dowrick, 1994; Kalemli-Ozcan, 2002).

2.3 DETERMINANTS OF ECONOMIC GROWTH

There has been numerous of studies that have analysed the factors underlying economic performance (Chen, 1997; Klein & Olivei, 2008; Williamson, 1980). Using opposing intangible and methodological frameworks, these studies have retained emphasis on a diverse set of explanatory constraints and presented various insights to the bases of economic growth (Masanjala, 2003:35).

According to Bloch and Tang (2004), human capital is the focal source of growth in more than a few endogenous growth models as well as one of the key additions of the neoclassical model. Since the duration of human capital mentions mainly workers gaining expertise and knowledge through education and training, the majority of studies have measured the eminence of human capital by means of proxies related to learning such as school-enrolment duties. A great number of studies have established evidence proposing that educated population is a crucial determinant of economic growth (Barro, 1996).

Investment is the most fundamental determinant of economic growth identified by both neoclassical and endogenous growth theories. However, in the neoclassical model, investment has impact on the transitional period, while the endogenous growth models argue for effects that are more permanent (Rostow, 1960). The importance attached to investment has led to an enormous amount of empirical studies examining the relationship between investment and economic growth. In addition to investment, openness to trade is another potentially significant determinant of growth performance.
Openness enables the exploitation of comparative advantage, technology transfer and diffusion of knowledge, increasing scale economies and exposure to competition.

Another important determinant of economic growth that has received much attention is geography. The effects of geography on long-run economic growth are multidimensional. Health, population growth, food productivity, resources endowment and mobility of factors of production are all characteristics of geography that play important roles in affecting long-run economic growth. According to Arvanitidis et al., (2009), tropical climate has adverse effects on human health and agricultural productivity, which result in lower levels of per capita income. If geography is of utmost importance, then we expect that resource-rich countries should experience a faster growth and a higher per capita income relative to those countries that are resource-poor. It has been observed, however, that the opposite is closer to reality.

Innovation and research and development activities can play a major role in economic progress, increasing productivity and growth. This is due to the increasing use of technology that enables the introduction of new and superior products and processes. Various endogenous growth models have stressed this role, and the strong relation between innovation, research and development, and economic growth has been affirmed empirically by many studies (Reinganum, 1989).

Openness to trade has been used extensively in the economic growth literature as a major determinant of growth performance. There are sound theoretical reasons for believing that there is a strong and positive link between openness and growth. Openness affects economic growth through several channels such as exploitation of comparative advantage, technology transfer and diffusion of knowledge, increasing scale economies and exposure to competition. Openness is usually measured by the ratio of exports to GDP (Yanikkaya, 2003).

There is substantial and growing empirical literature investigating the relationship between openness and growth. On the one hand, a large part of the literature has found that economies that are more open to trade and capital flows have higher GDP per capita and grow faster, (Sachs & Warner, 1995; Dollar & Kraay, 2003).

Lastly, Rodrik (2002) highlights five key institutions (property rights, regulatory institutions, institutions for macroeconomic stabilisation, institutions for social insurance
and institutions for conflict management), which not only exert direct influence on economic growth, but also affect other determinants of growth such as the physical and human capital, investment, technical changes and economic growth processes. It is on these grounds that Easterly (2001) argued that none of the traditional factors would have any impact on economic performance if there had not been a stable and trustworthy institutional environment developed.

Throughout the different determinants, models came into existence to generate growth in the most effective manner. Rostow (1960) argued that economic growth initially must be led by a few individual sectors. This belief echoes with David Ricardo's comparative advantage thesis and analyses Marxist revolutionaries push for economic self-reliance in that they push for the initial development of only one or two sectors over the development of all sectors equally (Zipfel, 2004).

2.4 ROSTOW'S STAGES OF ECONOMIC GROWTH

This growth model represents the sequence of development experienced by the developed societies and the less developed countries must create a necessary pre-condition to take off to the self-sustaining economic development stage – the condition through which the advanced countries have passed (Rostow, 1959:6). The model postulates that economic modernisation occurs in five basic stages of varying length, which are as discussed below (Rostow, 1959:1; Bloch & Tang, 2004:246; Chen & Feng, 2000).

2.4.1 Traditional society

Traditional society mainly refers to the understanding and use of technology. The economy is dominated by subsistence activity. Producers consume output that is not traded. Trade is barter where goods are exchanged directly for other goods. Agriculture is the most important industry. Production is labour intensive using only limited quantities of capital. Technology is limited, and resource allocation is determined very much by traditional methods of production (Rostow, 1956, Olson, 1963).

2.4.2 Preconditions for take-off

It's the educational and capital mobilisation establishment of banks and currency, through entrepreneurial and manufacturing developments. Increased specialisation generates
surpluses for trading. There is an emergence of a transport infrastructure to support trade. Entrepreneurs emerge as incomes, savings and investment grow. External trade also occurs, concentrating on primary products. A strong central government encourages private enterprise (Bloch & Tang, 2004:246).

2.4.3 Take-off

Take-off occurs when sector-led growth becomes common and society is driven more by economic processes than traditions. Industrialisation increases with workers switching from the agricultural sector to the manufacturing sector. Growth is concentrated in a few regions of the country and within one or two manufacturing industries. The level of investment reaches over 10 percent of gross national product (GNP) which is a broad measure of countries’ total economic activity. It also refers to the value of all finished goods and services produced in a given country in a period of one year by its nationals. The economic transitions are accompanied by the evolution of new political and social institutions that support industrialisation. The growth is self-sustaining as investment leads to increasing incomes in turn generating more savings to finance further investments.

Rostow (1960) and others defined the take-off stage in precisely this way. Countries that were able to save 15 percent to 20 percent of GNP could grow and develop at a much faster rate than those that saved less. Moreover, this growth would then be self-sustaining.

The mechanisms of economic growth and development, therefore, are simply a matter of increasing national savings and investment. The main obstacle to, or constraint on, development, according to this theory, was relatively low levels of new capital formation in most poor countries. If a country wanted to grow at a rate of 7 percent per year, and if it could not generate savings and investment at a rate of 21 percent of national income; assuming that $k$, the final aggregate capital-output ratio, is 3, but could only manage to save 15 percent, it could seek to fill this savings gap of 6 percent through either foreign aid or private foreign investment (Gaibraith, 1982; Penrose, 1956).

Thus, the capital constraint stages approach to growth became a rationale in terms of cold war politics and an opportunistic tool for justifying massive transfers of capital and technical assistance from the developed to the less developed nations. It was to be the
Marshall Plan all over again, but this time for the underdeveloped nations of the developing world.

2.4.4 Drive to maturity

The economy is diversifying into new areas. Technological innovation is providing a diverse range of investment opportunities. The economy is producing a wide range of goods and services and there is less reliance on imports. Urbanisation increases. Technology is used more widely.

2.4.5 Age of high mass consumption

This refers to the period of contemporary comfort afforded many western nations, where consumers concentrate on durable goods and hardly remember the subsistence concerns of previous stages.

The economy is geared towards mass consumption, and the level of economic activity is very high. Technology is extensively used but its expansion slows. The service sector becomes increasingly dominant. Urbanisation is complete. Now, multinationals emerge. Income for large numbers of persons transcends basic food, shelter and clothing (Rostow, 1959).

Rostow (1960) asserts that countries go through each of these stages linearly, and sets out a number of conditions that were likely to occur in investment, consumption and social trends at each stage. Not all of the conditions were certain to occur at each stage, however, and the stages and transition periods may occur at varying lengths from country to country, and even from region to region.

2.4.6 Criticisms of Rostow’s stages of growth model

Some mechanisms of development embodied in the theory of stages of growth do not always work. This is not because more saving and investment is not a necessary condition for accelerated rates of economic growth – in fact it is – but rather because it is not a sufficient condition (Thirlwall, 2006).

The Marshall Plan introduced by Rostow (1959:7) worked for Europe because the European countries receiving aid possessed the necessary structural, institutional, and attitudinal conditions. For example, well-integrated commodity and money markets, highly
developed transport facilities, a well-trained and educated workforce, the motivation to succeed, an efficient government bureaucracy to convert new capital effectively into higher levels of output.

According to Rostow (1960), the Rostow and Harrod-Domar models implicitly assume the existence of these same attitudes and arrangements in underdeveloped nations. Yet in many cases, they are lacking, as are complementary factors such as managerial competence, skilled labour and the ability to plan and administer a wide assortment of development projects. But at an even more fundamental level, the stages theory failed to take into account the crucial fact that contemporary developing nations are part of a highly integrated and complex international system in which even the best and most intelligent development strategies can be nullified by external forces beyond the countries’ control.

2.5 GROWTH POLICIES

Economic conditions can effect several growth patterns of an economy through investment in human capital and infrastructure and enhancement of political and legal institutions, even if there is disparity in relation of which procedures are more conducive to growth. An understanding of the effects of economic growth produces insights about what categories of strategies will be growth enhancing and what distortionary strategies may block growth when they are implemented. Researchers’ attention may then be to scrutinise a comprehensive spectrum of strategies critically, such as public infrastructure, regulatory framework, direct government intervention in industrial policies and financial development. In the next section, the focus is on fiscal policy, monetary policy and lastly exchange rate policy, which influences growth (Mellet, 2012:35).

2.5.1 Fiscal policy

The belief that expansionary and contractionary fiscal policies can be used to influence macroeconomic performance is most closely associated with Keynes and his believers (Easterly & Rebelo, 1993). The classical view of expansionary or contractionary fiscal policies is that such policies are unnecessary because there are market mechanisms, for example, the flexible adjustment of prices and wages, which serve to keep the economy at or near the natural level of real GDP at all times. Due to the economic state, classical economists believe that the government should run a balanced budget every year.
Fiscal policy involves the use of government spending, taxation and borrowing to influence the pattern of economic activities and the level and growth of aggregate demand, output and employment. Fiscal policy entails government's management of the economy through the manipulation of its income and spending power to achieve certain desired macroeconomic objectives or goals amongst which is economic growth (Medee & Nembee, 2011:1). Olawunmi and Tajudeen (2007:1) opine that fiscal policy has conventionally been associated with the use of taxation and public expenditure to influence the level of economic activities.

The implementation of fiscal policy essentially is routed through government's budget. Fiscal policy is mostly used to achieve macroeconomic policies; it is to reconcile the changes which government modifies in taxation and expenditure, programmes or to regulate the full employment price and total demand to be used through instruments such as government expenditures, taxation and debt management (Hottz-Eakin, Lovely & Tosin, 2009:16). As noted by Anyanwu (1993:1), the objective of fiscal policy is to promote economic conditions conducive to business growth while ensuring that any such government actions are consistent with economic stability.

In principle, fiscal dominance occurs when fiscal policy is set exogenously to monetary policy in an environment where there is a limit to the amount of government debt that can be held by the public. In countries with shallow financial systems, monetary policy is the reverse side of the coin of fiscal policy and can only play an accommodative role. In such low-income countries, government securities markets are underdeveloped; central banks do not hold sufficient amounts of tangible securities and the central bank's lack of suitable and adequate instruments of monetary control constitute one of the factors that induce fiscal dominance. Where fiscal dominance applies, the country's economic policy is only as good as its fiscal policy and institutionalised central bank independence may not necessarily bring about an independent monetary policy (Oyejide, 2003).

The impact of fiscal policy on growth has generated large volumes of empirical studies with mixed findings using cross sectional, time series and panel data. Fiscal policy generally is believed to be associated with growth, or more precisely, it is held that appropriate fiscal measures in particular circumstances can be used to stimulate economic growth and development (Khosravi & Karimi, 2010:421).
2.5.2 Monetary policy

According to Laubscher (2009:1), the new view of monetary policy, called monetarism, has emerged that disputes with the Keynesian view that monetary policy is relatively unsuccessful. Those believers of monetarism argued that the demand for money is stable and not very sensitive to changes in the rate of interest. On the other hand, Keynes view is contrary. The expansionary monetary policies only serve to create a surplus of money that households will quickly spend, thereby increasing aggregate demand. According to Friedman (1968) this theory states that an increase or decrease in the quantity of money leads to a proportional increase or decrease in the price level. However, that does not compliment the view of other economists, who regard it as a sign of economic failure in the future.

Monetary policy is the deliberate use of monetary instruments (direct and indirect) at the disposal of monetary authorities such as central bank in order to achieve macroeconomic stability. Monetary policy is the tool for executing the mandate of monetary and price stability. Monetary policy is a programme of action undertaken by the monetary authorities, generally the central bank, to control and regulate the supply of money with the public and the flow of credit with a view to achieving predetermined macroeconomic goals (Dwivedi, 2005).

Monetary policy is one of the tools that control money supply in an economy of a nation by the monetary authorities in order to achieve a desirable economic growth. Monetary policies are effective only when economies are characterised by well-developed money and financial markets like developed economies of the world. This is where a deliberate change in monetary variable influences the movement of many other variables in the monetary sector (Friedman, 1968).

2.6 THE THEORY OF FINANCIAL DEVELOPMENT: A BRIEF REVIEW

Economists have different views regarding the importance of financial development for economic growth. According to Levine (1997) and Hicks (1969), it can be argued that financial development played an important role in forming industrialisation in England through means of facilitating the mobilisation of capital for immense works. Besides, Schumpeter (1934) opposed that some well-functioning banks tend to spur technological modernisation, through identifying and even funding some entrepreneurs with better
opportunities of successfully applying those innovative products and production processors. This may make banks one of the most effective engines invented to spur up economic growth.

As suggested by Adamopoulos (2009) financial development could be defined as the policies, factors and institutions, which lead to efficient intermediation and effective financial markets.

According to Levine (1997:688), the relationship between financial development and economic growth has become a subject of considerable empirical and theoretical research on a global scale. Commonly, countries need to improve or increase the efficiency of their current financial sectors. By doing this, it allows financial sectors to regulate and adjust the appropriate policy reforms, which will stimulate faster economic growth. As stated by Djoumessi (2009:3), an important fact of financial development is that it aims to improve the allocation of capital, through means of allocating funds to specific developments, which enables marginal productivity to be higher. Thus focusing the role of intermediaries on financial institutions may eventually increase the productivity of capital, which will contribute to growth by means of gathering information that places them in a position to evaluate alternative investment developments and encouraging individuals to invest in risky projects (Wurgler, 2000).

Further, according to Djoumessi (2009:3), to establish a suitable financial sector policy is important for economic growth. Many organisations or financial intermediaries need to be in place to provide services such as risk management, monitoring borrowers, mobilisation of savings, exerting corporate control, and acquiring information about investment opportunities and facilitating the exchange of goods and services.

It is important that economists and global economies discover factors that form part of the development of financial systems; this will lead to an improvement in the world’s understanding of the astonishing differences in economic long-run growth rates, which can be observed all around the world. If those factors’ underlying differences in financial development can be identified, the financial sectors can provide more effective public policy advice to those countries and potentially improve living standards (Levine, 2001:2).

Due to the importance of identifying the determinants and measures of financial development, there can be a notable increase in research into the fundamental
determinants of functioning financial systems (Levine, 1999). Technology seems to be one of the central factors underlying divergence.

Pagano (1993) suggests there are three ways in which the development of the financial sector might affect economic growth under the basic endogenous growth model. First, it can increase the productivity of investments. Secondly, an efficient financial sector reduces transaction costs and thus increases the share of savings channelled into productive investments. An efficient financial sector improves the liquidity of investments. Lastly, financial sector development can either promote or decline savings.

In this chapter, the aim is to identify the measures of financial development as well as to assess the components of financial development, which include stock markets, bond markets and banks.

2.7 FINANCIAL SYSTEM

According to Hermes and Lensink (2003), financial systems are crucial to the allocation of resources in a modern economy. Financial systems channel household savings to the business sector and allocate investment funds among organisations; they also further allows inter-temporal conditioning of consumption by households and expenditures by firms, and enable households and firms to share risks. These functions are common to the financial systems of most developed economies. Yet the structure of these financial systems differs widely.

Financial systems are governed on the countries viewpoint on freedom of trade. Some countries like the Soviet Union had socialist financial systems because they valued centralised organised government funded trading rather than freedom of trade by everyone (Levine, 1999).

2.8 MEASURES ENABLING FINANCIAL DEVELOPMENT SYSTEMS

A number of factors including the depth, size, access, and soundness of financial system can measure financial development. It can be measured by examining the performance and activities of the financial markets, banks, bond markets and financial institutions (Arestic et al., 2001).
It is observed that the higher the degree of financial development in a country, the wider will be the availability of financial services. A developed financial system offers higher returns with less risk. In this paper, it is attempted to collect determinants of financial development including bank systems, financial markets, institution and business environment, and capital availability and access (Beck & Levine, 1999). This index can be used to assess the financial strength of an economy and further can be related to growth.

2.9 MEASURES OF DIFFERENT DETERMINANTS OF FINANCIAL DEVELOPMENT

2.9.1 Institutional environment

The institutional environment of a developed financial system involves policies, regulations, laws and supervision. Ram (1999) found that in some cases dysfunctional institutions are one of the main obstacles in financial development. However, countries with strong institutional environments and investors safeguard and achieve high levels of financial development (Wood, 1993). Thus, through constant monitoring of the financial system it is possible to achieve higher levels of financial development with certified international audits.

Beck (2002) suggested that banks should be evaluated on international standards, and by international rating organisations. Many countries are following the Basel rule to strengthen their capital regulations. These measures can help to improve financial health of an economy. Capital account openness and domestic financial liberalisation play a significant role in increasing the depth of the financial system. It also helps to increase intermediation between investors and savers. Additionally, this helps to increase the level of financial mobilisation in the economy (De Haas & Van Horen, 2013).

2.9.2 Business environment

The second important determinant of financial development is considered the business environment. This is important for an improved financial system in terms of the availability of skilled labourers, physical and technological infrastructure and especially the cost of doing business. The availability of skilled workers helps to develop the quality of financial services. According to Levine (1999), an examination was done on the relationship between human development index and financial development in 57 countries and it has
been found that human capital and financial development are positively correlated. It simply means that the degree of training, research and development, availability of good quality management schools, as well as quality education of mathematics and science, are important factors for the production of skilled workers. Conjointly, it is an allocation, which measures the strength of the business environment in an economy and is referred to as an important indicator of financial development (World Bank, 2006).

2.9.3 Financial stability

Financial stability can be referred to as the trade-off between risks and returns. The stability and soundness of a financial system is important for measuring financial development, which makes the financial regulation a key element in this regard. This system protects against systemic risks, namely those risks that involve the factors that have chain effects and can cause the financial system to collapse. For example, the failure of one entity can lead to the failure of the financial system or market (Diamond & Dybvig, 1983). Financial regulations safeguard consumers from opportunist behaviours, which occur when sellers try to take the benefit of their understanding or knowledge and attempt to conceal information from the buyer that can have a negative effect on buying behaviours.

Financial regulations also help to improve the efficiency of the financial system. A highly supervised and regulated financial system may be very stable; however, such a controlled system may equally hamper financial development and innovation. In contrast, a financial system that is innovative and has high supervision and regulation can also become unbalanced and trigger credit booms causing a severe negative effect on growth. Financial soundness involves the risk related to the currency crises, systematic banking crises, and sovereign debt crises (Wurgler, 2000).

2.9.4 Bank systems

Banks are one of the important elements of financial development. Most countries are still completely reliant on their banking sector rather than financial markets. Banks serve as a bridge between the savers and borrowers. They offer insurance to savers by providing them with a portfolio of less risky liquid returns and high risky illiquid investments. In this way, investors can get higher returns on their investments as they hold diversified portfolios. Banks offer full insurance to their clients by offering long-term investments
against liquidity risk (Levine, 1997). Liquidity risk can be defined as the risk that banks may sell their assets at a loss to meet the cash demand.

Strong financial systems banks offer low transaction and information costs. Efficient allocation of credit to the private sector and potential businesses will lead to an increase in industrial growth and in turn boost economic growth. The allocation of credit to potential projects enhances the innovation in the country and increases the confidence of prospective businesses (Vazakidis & Adamopoulos, 2009). Non-bank financial institutions do not accept the demand deposits but provide a number of financial instruments. Non-banks and banks compete in strong financial systems, especially for the lending opportunities. The lending by non-banks does not affect the money supply but increases the amount of credit in market debt. Non-banks borrow at low rates for the short term and lend at high rates for the long term. There is a need to maintain excellent ratings for bank operations (Brealey & Kaplanis, 1996). The competition between banks and non-banks improves the efficiencies in both, which contributes further in the development of the financial system.

2.9.5 Financial markets

Financial markets are one of the most important measures of financial development. It is considered that countries with developed financial systems are more focused towards the development of financial markets as compare to banks. The four types of financial markets are discussed below (Levine, 2001; Levine, 1999; Schumpeter, 1934).

A capital market is one in which individuals and institutions trade financial securities. Organizations and institutions in the public and private sectors also often sell securities on the capital markets in order to raise funds. Thus, this type of market is composed of both the primary and secondary markets. Stock markets allow investors to buy and sell shares in publicly traded companies. They are one of the most vital areas of a market economy as they provide companies with access to capital and investors with a slice of ownership in the company and the potential of gains based on the company's future performance (Vazakidis & Adamopoulos, 2009).

In addition, the money market is a segment of the financial market in which financial instruments with high liquidity and very short maturities are traded. The money market is used by participants as a means for borrowing and lending in the short term, from several
days to just under a year. Money market securities consist of negotiable certificates of deposit (CDs), banker's acceptances, U.S. Treasury bills, commercial paper, municipal notes, euro dollars, federal funds and repurchase agreements (repos). Money market investments are also called cash investments because of their short maturities. Investing in the cash or "spot" market is highly sophisticated, with opportunities for both big losses and big gains. In the cash market, goods are sold for cash and are delivered immediately. By the same token, contracts bought and sold on the spot market are immediately effective (Schumpeter, 1934).

The derivative is named so for a reason: its value is derived from its underlying asset or assets. A derivative is a contract, but in this case the contract price is determined by the market price of the core asset. If that sounds complicated, it's because it is. The derivatives market adds yet another layer of complexity and is therefore not ideal for inexperienced traders looking to speculate. However, it can be used quite effectively as part of a risk management program. The interbank market is the financial system and trading of currencies among banks and financial institutions, excluding retail investors and smaller trading parties. While some interbank trading is performed by banks on behalf of large customers, most interbank trading takes place from the banks' own accounts (Levine, 2001).

The forex market is where currencies are traded. The forex market is the largest, most liquid market in the world with an average traded value that exceeds $1.9 trillion per day and includes all of the currencies in the world. The forex is the largest market in the world in terms of the total cash value traded, and any person, firm or country may participate in this market.

A primary market issues new securities on an exchange. Companies, governments and other groups obtain financing through debt or equity based securities. Primary markets, also known as "new issue markets," are facilitated by underwriting groups, which consist of investment banks that will set a beginning price range for a given security and then oversee its sale directly to investors. The primary markets are where investors have their first chance to participate in a new security issuance. The issuing company or group receives cash proceeds from the sale, which is then used to fund operations or expand the business (Allen & Gale, 2001).
Bond markets are places where investors borrow money to government or some company in return for a pre-settled interest rate. There are two types of bond markets; the primary bond market and secondary bond market. The primary markets are markets in which bonds are traded for the first time after their issuance, whereas in secondary markets the preceding transactions of bonds are carried out (Wood, 1993).

2.9.6 **Stock markets as important components of an economy**

Stock markets provide a policy to buyers and sellers to have an encounter and trade. The investments in turn help the traders to produce more funds and increase their businesses. Stock markets are considered an important source to enhance funds by the companies. Liquidity is also considered as an important element of stock markets, which attracts the investors to invest their funds. Liquid stock markets facilitate firms to obtain much needed capital quickly (Allen & Gale, 2001). The foreign exchange market is an economic environment where trading of currencies takes place. Usually trading in this market takes place over the counter. Relative values of currencies are also determined through this market. Thus, this market enables the traders to exchange certain currencies for another currency (Brealey & Kaplanis, 1996).

2.9.7 **Capital availability and access**

The measure of size, depth and access reflects the output of a financial system; it measures how large and deep is the financial system. The size and depth of the financial system reflects the size of savings and investments. Large financial systems reduce the limitation related to credit. It improves the process of savings and efficient allocation of credit is the main feature of a developed financial system (De la Torre & Schmukler, 2007).

According to Allen and Gale (2001) the larger the size of the banking sector, the greater would be the services offered to its clients. To study the depth of financial systems, the proxy of liquid liabilities to GDP is employed. The access of financial system refers to the greater availability to financial services. If a financial system offers greater accessibility to financial services it is considered as one of the important steps towards financial development.

The World Economic Forum’s Alternative Investments 2015 project will explore what the private equity, hedge fund and venture capital industries might look like in 2015. The
future could include reduced leverage, growing importance of emerging markets, increasing pressure for returns by limited partners and a variety of social and political demands on firms (Huang & Ratnovski, 2011).

2.10 FISCAL AND EXCHANGE RATE POLICY

According to De Kock and Grilli (1993) a number of modern, emerging economies are finding that the existence of well-organised capital markets and financial structures can greatly assist in the pursuit of their objectives with regard to fiscal policies and exchange rate regimes. An example from the past was the establishment of the Caisse de Dépôts et Consignations (CDC) in France in 1816. Effectively, the CDC was set up to distance government from borrowing from the household sector by empowering it to collect all the small deposits of post banks, savings banks, notaries, and others and use them for the purchase of government securities. The CDC became the dominant player in this market (Lane & Perotti, 2003).

It could be argued that by opening more financing to market forces as opposed to imposition of more bureaucratic rationing mechanisms, a country would improve the economic efficiency of its capital usage. A counterargument is that at certain stages of development, it makes sense for a country that has embarked on one path of development to apply a degree of financial repression, since a rapid move to too much market openness may leave the system open to abuse (Williamson, 2000).

Recent studies emphasised the need to think carefully about the sequencing of financial reforms as part of a liberalisation process, particularly in connection with exchange rates and tax policies.

2.11 INDIRECT IMPACT OF FINANCIAL DEVELOPMENT ON ECONOMIC GROWTH

According to Adampolous (2010), liberalisation of financial markets allows financial deepening, which reflects an increasing use of financial intermediation by savers and investors and the monetisation of the economy, and allows efficient flow of resources among people and institutions over time. This encourages savings, reduces constraint on capital accumulation and improves allocated efficiency of investment by transferring capital from less productive to more productive sectors (Adu et al., 2013).
According to Lucas (1988), the level of investment and the quality of investment will directly influence the rate of economic growth. The efficiency of the labour force and the other factors of production will depend upon the amount and quality of capital. In less developed countries (LDCs), some investment comes from abroad in the form of foreign direct investment. There has been criticism of some investment in LDCs as to whether it is appropriate. If production moves from being labour intensive to capital intensive, unemployment and poverty increases.

Economic growth is caused by improvements in the quantity and quality of the factors of production that a country has available, *inter alia* land, labour, capital and enterprise. So, to promote economic growth, these factors should be financed in the right manner to contribute to overall production success. On the contrary, economic decline may occur if the quantity and quality of any of the factors of production falls (Levine, 1998).

### 2.12 RELEVANT EMPIRICAL LITERATURE

The empirical literature on the financial development and economic growth relationship is widespread, but a good starting point would be the important work conducted by King and Levine (1993), on which most recent studies on the topic are built (Kilimani, 2009; Hassan *et al.*, 2011; Hafer, 2013; Misati & Nyamongo, 2012; Sunde, 2012). Beck *et al.*, (2000) conducted additional innovative work that was built on King and Levine (1993). In addition, there has been widespread research conducted on the financial development and economic growth relationship in emerging or developing economies. This will also form part of this review. Finally, the work conducted by Allen and Ndikumana (2000) will be reviewed, as it forms the starting point of this research and it focuses on the BRICS and G-7 countries.

The large body of empirical evidence to support the relationship between financial development and economic growth includes firm-level, industry-wide, individual country and regional cross-country analysis (Pradhan, 2011:115). However, the three dominant analysis frameworks, which emanate from the literature, include cross-country, time series and panel data analysis, which will be used to test if there is a relationship between financial development and economic growth. The literature enables the use of the most relevant framework for the specific data to gain the best results. Some studies done by Levine *et al.*, (2000), Patrick, (1966) and Khan, (2001) have shown the beneficial effects of the relationship between financial development and economic growth, but others show
a decline in the relationship and that financial development might be negatively associated with growth.

This section of the study will be introduced through the relevant literature. In addition, the study is followed by a description of research parameters that can be used and the methodology adopted in the research design. It concludes with the financial development and economic growth models used in this research study.

2.12.1 Cross-country studies

Cross-country studies encompass the average data for each country over the time period under research and performing simple regression analyses (King & Levine, 1993:723). Likewise, it also includes coexistent regression where country data is pooled or averaged over a five or ten year interval during the time period under analysis. According to Khan and Senhadji (2000:11), this allows for the smoothing out of business cycle fluctuations in output growth.

King and Levine (1993) used cross-country effects to study the empirical relationship between financial development and economic growth using data on 80 countries for the period 1960 to 1989. The authors used of the rate of capital accumulation, improvements in economic efficiency and per capita growth rates as growth measurements. The aim of their study was to investigate whether higher levels of financial development are correlated significantly with fast current and future growth measures.

King and Levine (1993) found that the financial development indicators include indicators such as financial depth, domestic asset distribution and importance of specific financial institutions, were correlated strongly with the growth indicators. Beck et al., (2000:263) state that one of the shortcomings of the King and Levine (1993) study is that financial development may be a leading indicator of economic growth but not an essential cause thereof.

However, the later study by Levine et al., (2000)(in Beck et al., 2000), which used more robust techniques, including pure cross-country instrumental variables and dynamic panels, showed that there is a strong positive relationship between the level of financial development and long run economic growth. These strong relations are not due to prejudice created by endogeneity or unobserved country-specific effects (Beck et al., 2000:265).
Rosseau and Wachtel (2011) re-examined the relationship between financial development and economic growth conducted by King and Levine (1993) and used similar techniques to extend the data set to 2004. It was found that the financial development and economic growth relationship that was proposed by King and Levine (1993) was not apparent in the subsequent 15 years. Rosseau and Wachtel (2011:277) found that financial deepening has a positive impact on economic growth as long as it is not done in excess.

This hypothesis is tested by looking at countries that have and have not experienced financial sector crises. Rosseau and Wachtel (2011:277) found that the financial development and economic growth relationship remains intact as long as the crisis episodes are removed. For that reason, the weakening of financial development and economic growth over time seems to be the result of an increased occurrence of financial crises in the later years of the data sample. Rosseau and Wachtel (2011:287) highlighted the need for the systematic study of the financial development experiences of individual countries as the next step in furthering research on the relationship between financial development and economic growth.

However, previous studies have found insufficiencies in using the pure cross-country framework to examine the relationship between financial development and economic growth. Demetriades and Hussein (1996:390) identified some of these shortcomings in the context of the King and Levine (1993) study as the unrealistic assumption that each economy has a stable growth path, omitted variable bias, sample selection bias and unsuitable weighting of countries. In addition, Thangavelu and James (2004:249) highlighted the fact that cross-country analysis failed to effectively control for cross-country heterogeneity and for the endogeneity of the explanatory variables and that, these lead to large biases in the results.

Finally, Hassan et al., (2011:88) added that conclusions based on cross-country analysis are sensitive to estimation methods, data frequency, functional form of the relationship, and proxy measures selected in the research, all of which raise doubts about the reliability of cross-country regression analysis. Therefore, cross-country analysis has not been widely used by authors in the last decade, to investigate the finance-growth relationship.
2.12.2 Panel data regression

Panel data, which is also known as longitudinal or cross-sectional time-series data, is a dataset in which the behaviour of a unit can be observed over time and will be used in this specific study (Torres-Ryna, 2003:2). Pooled regression models could be generated for the ordinary least squares (OLS) which is a statistical technique that uses sample data to estimate the true population relationship between two variables and the simplest method of linear regression, but it assumes that intercepts are the same for all countries (Kim, 2012:2).

To overcome this, the fixed effects model (FEM) is one of many models used to analyse pooled panel data (Torres-Ryna, 2003). The least squares dummy variable (LSDV) model is a good way to understand fixed effects. Dummy variables are used to represent country-specific effects in the model and are a way of controlling for heterogeneity. According to Kim (2012:2), this dummy technique is called the least-squares dummy variable (LSDV) technique because it is simply the OLS estimator with plenty of dummy variables.

The coefficients from the LSDV model will be used to estimate statistically significant differences in the dependent variable and the three explanatory variables for the different countries in the sample.

The recent literature emphasises that panel unit root tests are more accurate than univariate unit root tests. For many countries, heterogeneity arises because of the differences in the economic conditions and the degree of development in each country (Apergis et al., 2007). Therefore, two recently developed heterogeneous panel unit root tests are employed to check whether the variables in the model are stationary or non-stationary. These tests are the Fisher Augmented Dickey-Fuller. It takes heterogeneity into account using individual effects and individual linear trends.

2.12.3 Stationary test/unit root test

The stationary process or test is one whose statistical properties do not change over time. Consequently, parameters such as the mean and variance, if they are present, also do not change over time and do not follow any trends. According to Chang (2002) stationarity is used as a tool in time-series analysis, where the raw data is often transformed to become stationary; for example, economic data are often seasonal and/or dependent on
a non-stationary price level. An important type of non-stationary process that does not include a trend-like behaviour is the cyclostationary process (Chang & Caudill, 2005) which refers to cycle behaviour of stationary data.

Therefore a common example of a non-stationary series is the random walk:

\[ Y_t = Y_{t-1} + \varepsilon_t \]  

(2.2)

where \( \varepsilon \) is a stationary random disturbance term. Along with the series \( Y \) that has a constant forecast value, conditional on \( t \), and the variance is increasing over a time period. The random walk is a difference stationary series since the first difference of is stationary:

\[ Y_t - Y_{t-1} = (1 - L) Y_t = \varepsilon_t \]  

(2.3)

A difference stationary series is said to be integrated and is denoted as \( I(d) \) where \( d \) is the order of integration (Augmented Dickey-Fuller, 1979 & Phillips-Perron, 1988). The order of integration is the number of unit roots contained in the series, or the number of differencing operations it takes to make the series stationary. For the random walk above, there is one unit root, so it is an \( I(1) \) series. Similarly, a stationary series is \( I(0) \).

Standard inference procedures do not apply to regressions which contain an integrated dependent variable or integrated regressors. Therefore, it is important to check whether a series is stationary or not before using it in a regression. The formal method to test the stationarity of a series is the unit root test.

2.12.4 Pooled regression

According to Xu, (2000) pooled regression is usually carried out on time-series cross-sectional data, which is data that has observations over time for several different units or cross-sections. For example, concatenating monthly net income data for different companies with quarterly GDP information allows an analyst to model the relationship between net income and GDP even with limited quarters of data per company, since concatenating across companies increases observations, yielding greater degrees of freedom. Thus, it is important to remember that the pooled regression coefficients do not measure demand effect separately for each, but yield an overall measure of demand.
2.12.5 Fixed effects model

As stated by Allison (2009) the fixed effect model explores the relationship between analysis and result variables within a unit, for example a country, person or a company. Each unit has its own individual characteristics that may or may not influence the analysis variables. This may be, being a male or female could influence the opinion toward certain issues, or the political system of a particular country could have some effect on population or GDP, or the finance practices of a corporation may influence its stock market or price.

The equation for the fixed effects model becomes (Allison, 2009):

\[
Y_{it} = \beta_1 X_{it} + \alpha_i + u_{it} \tag{2.4}
\]

\[
gdppp = c \text{ smc } ti \text{ ir } \text{ pop} \tag{2.5}
\]

When using the fixed effect, assume that something within the country may impact or bias the unit or outcome variables and needs to control for this. This is the rationale behind the assumption of the correlation between the unit’s error term and analyst variables. Fixed effect removes the effect of those time-invariant characteristics so there can be an assessment of the net effect of the analysis on the outcome variable. A fixed effect is used whenever there is an interest in analysing the impact of variables that vary over time. Equation 2.5 refers to the model used for the specific data within the study; gdppp (economic growth), smc (stock market capitalisation), ti (total investment, ir (interest rate) and pop (population growth).

In this formulation the intercept cross-section fixed (dummy variables) of coefficient is considered completely separately, because there is no pooling of information between them (Wooldridge, 2010). Besides, the fixed-effect model only estimates within effects, it cannot suffer from heterogeneity bias.

2.12.6 Random effects model

The rationale behind random effects model is that, unlike the fixed effects model, the variation across entities is assumed to be random and uncorrelated with the analyst or independent variables included in the model (Rousseau & Wachtel, 2000).

An advantage of random effects is that you can include time invariant variables (i.e. gender). In the fixed effects model these variables are absorbed by the intercept.
The random effects model is:

\[ Y_{it} = \beta X_{it} + \alpha + u_{it} + \epsilon_{it} \]  \hspace{1cm} (2.6)

Where:

- \( \alpha_i (i=1,...,n) \) is the unknown intercept for each entity (n entity-specific intercepts).
- \( Y_{it} \) is the dependent variable (DV) where \( i = \) entity and \( t = \) time.
- \( X_{it} \) represents one independent variable (IV),
- \( \beta_1 \) is the coefficient for that IV,
- \( u_{it} \) is the error term

Baillie (2000) stated that random effects assume that the entity’s error term is not correlated with the predictors, which allows for time-invariant variables to play a role as explanatory variables. In random-effects, it specifies those individual characteristics that may or may not influence the predictor variables. The problem with this is that some variables may not be available, thereby leading to omitted variable bias in the model.

Random effect allows generalising the inferences beyond the sample used in the model. Therefore, the random effects model assumes that the random effects are uncorrelated with the explanatory variables; otherwise there would be an endogeneity problem, which in turn would make the estimators inconsistent (Xu, 2000).

Hassan et al., (2011:91) used the forecast error variance decomposition (FEVD) to examine which proxy measures are most important in economic growth over time and how much they contribute to economic growth. However, the method used in this research study was panel data test.

2.13 SUMMARY

Economic growth has various theories, which can be aligned to different economies. Implementing the right policies and theory into a certain economy can lead to sustainability and that will produce an outcome of growth throughout and be beneficial to financial systems. Additionally, the manner in which determinants of economic growth are used should be our driving force to set aside those that do not encourage economic growth or financial development in that specific economy. Throughout the literature of the
endogenous growth theory, it could be concluded that financial intermediation has a positive effect on steady-state growth, but the government intervention in the financial system has a negative effect on economic growth. Thus, endogenous growth may not be the best theory to elevate economic growth.

Early Neoclassical growth models highlighted the importance of capital accumulation. In the Solow model, output is described as the production by capital and labour. Neoclassical growth models, therefore, attentive on the role of savings, investment and technology. Economic growth is compatible with a labour expanding technical progress, which acts as if it were increasing the available amount of labour. In the long-term, output per capita and labour productivity grow at an exogenously given rate of technical progress.

Even though there is not a single policy or theory that is ultimately successful in the economy, there is a tendency to move to mixed policies and a theory, which helps to set new foundations for growth theories that, might be applicable to current economic conditions. The government should avoid unnecessary borrowings and ensure that existing debts are properly serviced when due. The government should ensure that policy inconsistency is minimised and policy reversals are properly checked for both short- and long-run effects on the economy.

According to new researchers, financial development is not only good for economic growth, but it is one of the causes of economic growth. Even though they provide an understanding of the role and importance of financial development in economic growth, there are economists who provide different opinions on the relationship between the two variables. An understanding of the causes of economic growth generates insights about what type of policies will be growth enhancing and what distortionary policies may block growth when these distortionary policies are adopted.

Researchers focus may then be to scrutinise a broad spectrum of policies, such as public infrastructure, regulatory framework, direct government intervention in industrial policies and financial development.
CHAPTER 3: DATA AND RESEARCH METHODOLOGY

3.1 INTRODUCTION

Prior to recent research, much uncertainty did exist regarding the relationship between financial development and economic growth. Financial development and economic growth have been studied intensively in developed and developing countries, with most results indicating a positive relation between financial development and economic growth. This indicates a need to understand the various perceptions of growth and finance that exists among these countries (Sunde, 2012). The study includes both financial development and economic growth variables to assess whether an improvement in these variables would lead to a rise in economic growth or even if financial development influences economic growth when financial systems are of a better quality.

The empirical analysis is concerned with the examination of the effect of financial development on economic growth. The economic growth is mostly measured by real GDP growth or the growth in real GDP per capita (Alfaro et al., 2004) and this used the growth in real GDP per capita. Financial development is a multidimensional concept which constitutes a potential important instrument to measure the improvements in generating information about potential investments and allocating capital (Levine, 2005). Thus, there are many variables used to measure financial development. Due to the availability of data, this study used the stock market capitalisation, real exchange rate and real interest rate as a measure of financial development. In addition to these variables; investment growth and population growth were used as a control variables (Levine, 1997:696).

Therefore, Chapter 3 focuses on the research use to analyse the relationship between financial development and economic growth. The various sections includes; an oversight of the potential of BRICS and G-7, the research design, sample selection and description of the variables, model data analysis and the steps to follow and to conclude a summary overview of the chapter.

3.2 An oversight of the potential of the BRICS and G-7 countries

The spheres of the economy are in an on-going cycle of change and transformation. Respectively every step taken by civilisation in world economic development had
conquests and failures (Dindire, 2012:6-32). At this time, another stage of change is marking its history, producing magnitudes in the world formation space.

The financial crisis, which started in 2007, opened the door for the emerging countries that, after 2008, contributed significantly to global economic recovery. Although in the previous years they suffered from the imposing policies practiced by developed countries. Table 3.1 shows the up-turn of BRICS and G-7 countries after the financial crisis, showing that BRICS countries had a greater GDP (PPP) growth and their overall growth was greater than those of the developed countries. In addition, the analysis will try to explain why this is the case of developing countries having a stronger up-turn than developed countries.

Table 3.1: Country groupings of BRICS and G-7

<table>
<thead>
<tr>
<th>G-7: Country grouping</th>
<th>BRICS: Country grouping</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>313</td>
</tr>
<tr>
<td>Japan</td>
<td>127</td>
</tr>
<tr>
<td>Germany</td>
<td>82</td>
</tr>
<tr>
<td>Great Britain</td>
<td>62</td>
</tr>
<tr>
<td>France</td>
<td>65</td>
</tr>
<tr>
<td>Italy</td>
<td>61</td>
</tr>
<tr>
<td>Canada</td>
<td>34</td>
</tr>
<tr>
<td>Total</td>
<td>744</td>
</tr>
</tbody>
</table>

Source: World Bank (2011)
After four years post to the financial crisis, the economic growth for BRICS has been greater than those of G-7 countries. While BRICS has a far bigger population demographic than G-7, in theory it would have been expected that with the high population growth that the BRICS economic growth should be less than that of G-7. These emerging economies have shown a strong up-turn in growth over the past years and are still continuing to grow.

In countries like USA, UK and France between the period of 2010 and 2011 there was only an average growth of 0.8 percent which is very little in comparison to SA, China and Russia with an average growth of 3.8 percent which equates to a 3 percent difference in both these country groupings.

Table 3.2: Developed and developing country contribution to global economic growth

<table>
<thead>
<tr>
<th></th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012 (estimated)</th>
</tr>
</thead>
<tbody>
<tr>
<td>World economic growth percent</td>
<td>-0.7</td>
<td>5.1</td>
<td>4.0</td>
<td>4.0</td>
</tr>
<tr>
<td>Developed countries percent</td>
<td>-3.7</td>
<td>3.1</td>
<td>1.6</td>
<td>1.9</td>
</tr>
<tr>
<td>Emerging and developing countries percent</td>
<td>2.8</td>
<td>7.3</td>
<td>6.4</td>
<td>6.1</td>
</tr>
</tbody>
</table>


From Table 3.2, it is clear that BRICS emerging economies showed greater growth than those of developed countries and this is post the financial crisis. Generally, that is the type of growth that would have been expected from developed countries. Emerging and developing countries also add more weight to the world’s economic growth in this regard, according to the data provided above.

In addition, in recent years the emerging economies of industrial production started to slow down and are in line with the slowdown trend of 2013. Brazilian production deteriorated significantly. China distribution decelerating growth figures for the first quarter due to the housing market crisis and Russia is dropping into recession, regardless of increased military spending. This outcome is strongly driven by the weakness of China, Brazil and Russia.
In contrast, countries like India, Mexico and Central Europe show a positive industrial activity performance. The Eurozone’s industrial production increased and G-7 industrialized economies have enhanced their growth. However, the overall real growth of emerging countries should stand around 4.0 percent versus 4.5 percent. Moreover, emerging currencies depreciated, on average, by 20 percent in 2013, contributing to a rise in inflation by 4.9 percent year-over-year, versus 4.6 percent year-to-year of the previous year. As a result of these influences, the contribution of emerging economies to world growth has decreased.

This is relatively a consequence of the significant decrease in oil prices and other commodities, as well as the smaller contribution to the global economic growth through world trade.

### 3.3 DATA ANALYSIS

A quantitative method was implemented for this research study. Quantitative research is defined as research that relies on quantitative information that is numbers and figures (Blumberg et al., 2008:191). The reason that this study was quantitative is because the purpose of the research is to explain if there is a relationship between financial development and economic growth. Quantitative econometric data was used and statistical tests were conducted to measure this relationship.

An underlying study was undertaken as the research set out to determine how changes in one variable, the independent variable; affect changes in another variable, the dependent variable. According to Blumberg et al. (2008:218), the basis of causality is grounded on the logic of hypothesis testing, which is probabilistic in nature and, therefore, cannot be demonstrated with certainty. As such, an experimental design was undertaken in such a manner to reduce the influence of unnecessary variables on the results. To analyse the relationship between financial development and economic growth, either time series or panel data can be used.

To analyse the relationship between the economic growth and financial development, this study the used time series data obtained from World Bank and International monetary Funds (IMF). The sample period consists of annual observations from the 5 BRICS countries and 7 G-7 countries over the period 1996-2013. The total number of observation is therefore 90 for BRICS and 126 for G-7 (18 years multiplier by 5 countries of BRICS
and 18 years multiplied by 7 countries of G-7). The sample period was selected based on the availability of data in all BRICS countries in order to maintain a balanced panel data.

### 3.3.1 Time-series studies

Various analyses can be used to test the relationship between the financial development and economic growth and time series analysis is one of them. According to Levine (2005:905), a variety of time-series techniques have been used to determine the financial development and economic growth relationship. These include Granger-type causality tests and vector autoregressive (VAR) procedures. Likewise, Levine (2005:906) indicated that individual country studies allow researchers to propose country-specific measures of financial development and to develop the time-series dimension of the study. This ensures that research will target country-specific objectives.

Thangavelu and James (2004) investigated the dynamic relationship between financial development and economic growth in Australia. A time-series approach using the VAR model was used and it was found that although financial development caused economic growth, there was no indication of any causality from economic growth to financial development. Kilimani (2009) conducted a similar study using a similar causality technique with data from Uganda and it was also found that financial development caused economic growth.

In a time-series study within the developed and developing countries, Sunde (2012) undertook a study to determine the relationship between financial development and economic growth in South Africa using the growth model that was used by King and Levine (1993). The results of this study presented that there is a bi-directional relationship between financial development and economic growth. However, Sunde (2012) recommended that a more detailed study, including many economic growth and financial sector indicators, would provide a clearer picture on this relationship for South Africa or any other country-specific study. In the case of time series, there are some limitations to the time period of data; another disadvantage includes over-correcting for trends, which skews the correlation in a negative direction. Therefore, the use of panel data might seem as a better model selection for the data used.
The availability of complete datasets for each of the countries can be a limitation. For example, total investment as a percentage of GDP being omitted from the regression as well the proxy of unemployment rate and exchange due to lack of available data or an overlap of similar variables.

3.3.2 Panel data studies

Panel data analysis offers a better alternative to cross-country and time-series analysis to the empirical literature (Dawson, 2008; Hassan et al., 2011; Jaunky, 2012). Most recent studies of the relationship between financial development and economic growth have employed panel data techniques due to the inadequacies of cross-country studies. Levine (2005:900) listed the benefits of panel data techniques as:

- Need to avoid biases associated with country regressions;
- The ability to achieve the time-series and cross-country deviation in the data; and
- To permit the use of influential variables and providing estimates of the financial development and economic growth relationship that are more accurate.

This has led to widespread use of panel data techniques in studying the relationship between finance and growth. According to Dawson (2008:327), a panel data set consists of n individuals (countries) over T time periods (years). The use of panel data enables the study to address a broader range of variables and tackle more complex data than would be possible with pure time series or pure cross-sectional data alone. In addition, by using time series data it would frequently have need of a long-run of data merely to get the necessary number of observations to be able to conduct a meaningful hypothesis testing. But by combining cross-sectional and time series data, it can increase the number of degrees of freedom, and thus the power of the test, through employing information on the dynamic behaviour of a large number of entities at the same time. Structuring the panel data model in a suitable way; removes the encouragement of assured forms of absent variables being bias in regression results.

3.3.3 Functional model specification

The functional form of the growth regression equation is based on the type of study that will be undertaken, that is, cross-country, time series or panel data analysis. This research
will focus on panel data from the BRICS and G-7 countries over the period 1997 to 2013 and hence, the panel data growth regression model is discussed.

In this study, panel data models are considered. Panel data, which is also known as longitudinal or cross-sectional time series data, is a dataset in which the behaviour of entities can be observed over time (Torres-Ryna, 2003:2). Generally, the link between financial development and economic growth is analysed by the following regression equation:

\[ R_{GDP_{it}} = \alpha_0 + \gamma F_{D_{it}} + \beta X_{it} + e_{it} \]  

(3.1)

Where: \( R_{GDP_{it}} \) is growth in the real GDP per capita for county \( i \) at period \( t \), 

\( F_{D_{it}} \) are financial development variables for county \( i \) at period \( t \) 

\( X_{it} \) is a vector of control variables for country \( i \) at period \( t \), and 

\( \alpha_0 \) and \( e_{it} \) represent the intercept and error term respectively.

The description of all the variables used in Equation 3.1 is summarised in Table 3.5. Based on the variable most widely used in the empirical literature and subsequently based on the availability of data for these variables in the BRICS and G-7 countries, the variables are as follows:

Equation 3.1 is the pooled regression model that could be generated for the ordinary least squares (OLS) regressions, but it assumes that intercepts are the same for all countries (Kim, 2012) and this may limit the variation in estimation (Brooks, 2014). To allow for some variation in estimation technique, the fixed effects model (FEM) and random effects model (REM) are normally used to analyse panel data (Torres-Ryna, 2003). However, the use of FEM should be confirmed by the redundant fixed rate effect. The Hausman test for correlated random effects should confirm the use of REM (Brooks, 2014). Thus, this study used these two tests to select the best empirical model suitable for panel data.

### 3.4 DATA AND DESCRIPTION OF THE VARIABLES

The measures of both financial development and economic growth are extracted from the data set of the World Bank (2014) and International Monetary Fund (IMF). The data set includes all twelve countries, which consist of BRICS (Brazil, Russia, India, China and South Africa) and G-7 (Canada, France, Germany, Italy, Japan, United Kingdom and
The nature of this study includes twelve countries, which form part of both developed and developing country groupings, with special focus on BRICS and G-7 countries. This study uses panel data to outline the research methodology for the data range from 1996 to 2013. This sample period consists of annual observations from BRICS and G-7 countries. The sample period was selected based on the availability of data in all BRICS and G-7 countries in order to maintain a balanced panel data. According to Blumberg et al., (2008:228), a population is the total collection of fundamentals about which there is a wish to make inferences, while Saunders and Lewis (2012:132) define a sample as a sub-group of the whole population. Likewise, Saunders and Lewis (2012:133) state that samples are used, as it may not be practical to collect data from the whole population. In this research study, the total population included all 12 countries in BRICS and G-7.

The data sets include 12 countries within the BRICS and G-7 countries. This type of sample is also known as a non-probabilistic purposive sample. A purposive sample is defined as a non-probability sample, where the researcher’s judgement is used to select the sample members based on a range of possible reasons (Saunders & Lewis, 2012:134). In this research study, the sample can be qualified by the exclusion of certain countries. The reason for the exclusion could be due to the lack of available data for these countries.

The research study uses secondary data. Secondary data are defined as data used for a research study that were originally collected for some other purpose and made available to the public (Saunders & Lewis, 2012:84). All data used in this research study were extracted from the World Bank and IMF. According to Saunders and Lewis (2012:90), the benefits of using secondary data are that data are often already in the public domain, data are often available in software compatible formats, it is an unobtrusive method of data collection, datasets can be readily combined, data are more open to public analysis, and data can provide relative background. However, Saunders and Lewis (2012:94) list the pitfalls of secondary data as it only meets the research needs partially; data are not always value-neutral and the researcher is unlikely to know precisely how the data were collected. The motivation for using secondary data in this research study was that the data were easily available and other authors who have previously investigated this research problem under different contexts commonly used this type of secondary data.
In this study, five variables will be used to measure if there is a relationship between financial development and economic growth. Upon the analysis the variables was scaled down from eight variables to five, due to some on the variables like unemployment which is already included as a percentage of population growth and exchange rate of certain countries remaining at a constant it was decided to only use the five that would best suit the data and providing the relevant results.

3.4.1 Description of the empirical analysis

The empirical analysis is concerned with the determination of the effect of financial development on economic growth. Economic growth is measured by growth in real GDP per capita (Alfaro et al., 2004), which is the same method adopted in this study. There are many variables used to measure financial development. Due to the availability of data, this study used stock market capitalisation, real exchange rate and real interest rate as a measure of financial development. In addition to these variables, investment growth and population growth were used as control variables (Levine, 1997:696).

Table 3.3: Variable description

<table>
<thead>
<tr>
<th>Variable</th>
<th>Indicator or proxy</th>
<th>Description</th>
<th>Relationship with EG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent Variable:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economic growth (EG)</td>
<td></td>
<td>This variable is the annual increase in the per capita GDP for each country</td>
<td>--</td>
</tr>
<tr>
<td>Explanatory Variables for Financial Development</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stock market (SM)</td>
<td></td>
<td>This a growth in stock market capitalisation for each country</td>
<td>(+)</td>
</tr>
<tr>
<td>Interest rate (IR)</td>
<td></td>
<td>Country’s real interest rate</td>
<td>(+) or (-)</td>
</tr>
<tr>
<td>Control Variables</td>
<td>Total Investment growth (TI)</td>
<td>Investment equals the amount of private investment as a share of GDP</td>
<td>(+)</td>
</tr>
<tr>
<td>Population growth (POP)</td>
<td></td>
<td>This measure equals the annual rate of population growth</td>
<td>(+) or (-)</td>
</tr>
</tbody>
</table>

Source: Čihák, et al. (2013)
3.4.2 Variable definition

The capital market also provides important avenues for economic growth. Its liquidity role stands out clearly as the most significant among the numerous functions it provides. Stock markets can encourage economic growth by providing an avenue for growing companies to raise capital at lower cost. In addition, companies in countries with developed stock markets are less dependent on bank financing, which can reduce the risk of a credit crunch. According to Levine (1997), without a liquid stock market, many profitable long-term investments would not be undertaken because savers may be reluctant to tie up their investments for a long period of time. The stock market mainly provides liquidity by enabling firms to raise funds through the sale of securities with relative ease and speed.

Therefore, economic growth is an increase in the capacity of an economy to produce goods and services, compared from one period of time to another. Economic growth can be measured in nominal terms, which include inflation, or in real terms, which are adjusted for inflation (Solow, 1956). Population growth rate measures how populations change in size over time. Population size can only be changed by four factors. Births add new individuals to a population, whereas deaths remove individuals from a population (Fogel, 1994). Similarly, immigration into a population adds new individuals, whereas emigration out of a population removes individuals (Chong & Calderon, 2000).

Population growth rates are positive when more individuals are added to a population than are removed, negative when more individuals are removed than are added, and are equal to zero when an equal number of individuals are added and removed. This population size is known as the carrying capacity and is the size beyond which no significant increase can occur due to limitations of some type, such as food, water, sunlight and space. Unemployment growth rate measures the percentages of employable people in a country’s workforce who are over the age of 16 and who have either lost their jobs or have unsuccessfully sought jobs in the last month and are still actively seeking work.

The formula for unemployment rate is:

\[ Unemployment\ Rate = \frac{Number\ of\ unemployed}{Total\ labour\ force} \]  \hspace{1cm} (3.2)

Interest growth is the cost of borrowing money, or conversely, the income earned from lending money. Interest rates are expressed as a percentage of the principal per period.
Exchange growth is the exchange rate between two currencies and is the rate at which one currency will be exchanged for another. It is also regarded as the value of one country’s currency in terms of another currency. Another variable is investment growth rate, which is the ratio of money gained or lost, whether it is realised or unrealised, on an investment relative to the amount of money invested. The amount of money gained or lost may be referred to as interest, profit/loss or net income/loss. The money invested may be referred to as the asset, capital, principal, or the cost basis of the investment. Return on investment usually is expressed as a percentage rather than a fraction.

The dependent variable, GDP per capita, is a measure of the total output of a country that takes the GDP and divides it by the number of people in the country. The per capita GDP is especially useful when comparing one country to another because it shows the relative performance of the countries. A rise in per capita GDP signals growth in the economy and tends to translate as an increase in productivity (Alfaro et al., 2004).

According to Čihák et al., (2012) in order for a variable to be a good proxy, it must have a close correlation, not necessarily linear or positive, with the variable of interest. Throughout the various variables, some can also be useful as a proxy, which is a variable that is not in itself directly relevant, but that serves in place of an unobservable or immeasurable variable.

3.5 DATA ANALYSIS

In data analysis it often arises that financial modelling, which comprises of data from both time series and cross-sectional elements, this type of dataset is known as a panel data or longitudinal data. The data used embodies information which is across both time and space. Therefore, this section of the study will present and discuss the important features of panel analysis, and will describe the methods used within a model embodying this data.

In Equation 1.1 in Chapter 1 is the simple empirical setup for a panel analysis, but certain steps has to be followed in order to know when to use a normal panel regression which means that the data is integrated. But in a case where data is not integrated the analysis would continue with a cointegration analysis.

Firstly, a graphical analysis will be conducted in order to identify which variables’ distribution towards economic growth and financial development. This gives an indication as to how normally distribute the variables are and also highlights those variables that are
outliners for example as in the case of BRICS population growth in countries such as China, India and South Africa are greater than the other BRICS countries. Also needed would be the correlation analysis, to identify which variables are correlated with one another and the coefficient is a stronger indication of the variation between the variables used in the sample data. Yet, more relevant features have to be followed to find the specific model suited for the panel data.

Prior to the graphical analysis, panel stationarity test have to follow. The principle of a unit root testing in the panel context is quite similar to that employed in a single equation framework. Employing a unit root test provides a key motivation for using a panel, with the hope that more powerful versions of the tests can be employed when time series and cross-sectional information is combined, as a result of the increase in the sample size. Besides, this analysis provides the integration and co-integration of the data, whereby the approach in selecting the model that would give the best result when testing the relationship.

When data is found to be non-stationary the study would have to continue with a co-integration analysis whereby it will follow the steps to find the fully modified ordinary least square model in order to show the long run relationship between financial development and economic growth for a given period. Research on the subject has been mostly restricted to limited comparisons of smaller sample sizes. However, much of the research done on the FMOLS up to now indicate that there is a long-run relationship. Although extensive research has been carried out on the co-integration data, no single study exist which can directly provide the relationship between financial development and economic growth. Once the evidence indicates that the data in the study is not co-integrated which would mean that in this case, the null hypothesis is that all of the series is stationary, whereas the panel data is rejected if at least one of them is non-stationary. The experimental data is rather tested with a simple panel regression model which entails both time series and cross-sectional data in the design and would be used to continue with the analysis of the study.

Panel data which are found to be stationary results to running a fixed effects or random effects test. The fixed effect model slightly modifies the Chow test which involves incorporating the restriction that all of the intercept dummy variables have the same parameters this refers to the null-hypothesis \((H_0: \mu_1 = \mu_2 \cdots = \mu_N)\). This, states that if the
null-hypothesis is not rejected, that the data can be simply pooled together and the ordinary least square (OLS) can be adopted for the data. Thus meaning that if the fixed effects model is rejected the pooled regression model would be suited for that type of data. Fixed effects estimator restricts the slope coefficient and error variances to be equal across all countries in the long run. The model further restricts the speed of adjustment coefficient and the short-run coefficient to be equal too. However, the model features country-specific intercepts. Fixed effects has a cluster option to estimate intra-group correlation with the standard error (Blackburne & Frank, 2007). Nevertheless, Baltagi et al., (2000) point out that this model is subject to a simultaneous-equation bias due to the endogeneity between the error term and the lagged dependent variable in case of small sample size.

Whereas that fixed effects model is accepted and pooled rejected the study will have to adopt a random effect model test, unlike the fixed effects model, there are no dummy variables which means that the heterogeneity also known as variation in the cross-sectional dimension are not captured. Therefore, if the random effect model is accepted it would mean that the fixed effects model has to be rejected and that makes random effects model the most suited for the sample data (Baltagi et al., 2000).

It is also often said that the random effects model is more relevant when the countries or entity in the sample can be thought of as having been randomly selected from a population, but as for a fixed effects model it is more plausible when the countries or entities in the sample effectively constitute the entire population indicating that the sample would than comprise all of the interest rates and stock market traded on a specific exchange (Blackburne & Frank, 2007). Therefore, the validity of the long-run homogeneity restriction across countries, and hence the efficiency of the other estimators, is examined by the Hausman test. As expected, the Hausman test accepts the null hypothesis of the homogeneity restriction on the regressors in the long run, which indicates that the random effect model would be a better suited model for the data analysis.

The data analysis in the chapter than provides the steps needed in order to accumulate the relationship between financial development and economic growth, various steps has to be followed before a selection can be made upon the model used for the specific
sample data. Therefore, a comparison between the models is of importance to choose the better off model that will result to stronger outputs.

### 3.6 SUMMARY

Many models were taken into account to find the most suited to measure the relationship between financial development and economic growth. Looking at the different variables gives an overview of the effects of both concepts and how they may influence one another. This also allows interaction and how some variables can be used as proxy measures for both financial development and economic growth.

The dependent variable is economic growth, measured as the growth rate of GDP per capita. As far as the control variables are concerned, we initially considered a broad set of control variables typically used in the growth literature: initial real GDP; gross fixed capital formation; population growth; openness to trade; government expenditure as a share of GDP, life expectancy, and inflation. However, when including all variables in the regression, several turned out to be insignificant. We, therefore, proceeded to omit the insignificant explanatory variables one by one until we were left with a model that contained population growth, interest rate, stock market capitalisation and total investment which are all calculated as a percentage of growth as control variables. The full results are available upon request.

This section provided the methodology used in this research study. The use of panel data required the use of econometric analyses to analyse the relationship between financial development and economic growth. Presenting the methodology and discussing the data used will assist the study to report the findings and results in the next chapter.
CHAPTER 4: RESULTS AND DISCUSSIONS

4.1 INTRODUCTION

The study investigates the dynamic relationship between financial development and economic growth in a panel of a group of five developing and seven developed countries over the period of 1996 to 2013. The study uses various financial development indicators and economic growth measures of financial structures and financial systems, and countries the traditional panel regression analysis which was decided once the data was analysed and results showed that the data is stationary therefore the relationship between financial development and economic growth with means to use this analysis.

This chapter is the empirical analysis and results of the relationship between financial development and economic growth. The study started off with a number of eight variables which than became five, being GDP per capita which is the dependent variable and the other four consists out of independent variables known as; stock market capitalisation, total investment, population and interest rate and they are all formulated as a percentage of growth, this was either based on the lack of data from the other variables or some variables overlapping into another for example interest and exchange rate.

For the BRICS and G-7 countries, heterogeneity arises because of the differences in the economic conditions and the degree of development in each country. Therefore, it was decided to employ two recently developed heterogeneous panel unit root tests to check whether the variables in the regression model are stationary or non-stationary. These tests are the Fisher Augmented Dickey–Fuller (Choi, 2001) and the Im, Pesaran and Shin (IPS, 2003) that take heterogeneity into account using individual effects and individual linear trends.

The regression analysis test will be run starting with the pooled effects, fixed effects and random effects. In order to establish which test best suits the data a unit root test had to be run first to test the stationarity of the data. It was found that the data is stationary, if it was not the analysis would have continued with a panel co-integration analysis but since our data is stationary it continues with the panel regression analyses. To test the relationship for panel co-integration the fully modified mode could be used. But in this regard that was not needed for the study.
A discussion on the finding in relation with the literature and previous studies will be done. What they mean in the context of financial development and economic growth. Is BRICS more integrated than G-7 or vice versa? Are findings on each variable used similar to the ones from previous studies? Also indicating the studies that found different results and why they differ.

Each variable will be discussed in context to BRICS and G-7 in providing the variable that is important in both blocks.

4.2  GRAPHICAL ANALYSIS BETWEEN BRICS AND G-7

The study is based on the comparison between BRICS and G-7 countries, which are developing and developed economies. From the study’s results, a comparison could be drawn. Even though these groupings economies operate on different prospects there results are not far-fetched. Looking at the regression analysis both groupings the most suited model is fixed effect based on the data used. Additionally, there are many differentiations between the country groupings based on the various variables that were included into the analysis.

In this section, a simple comparison will be drawn between the 5 variables used to analyse the data, which are as follows GDPPP, POP, IR, TI and SMC:

4.2.1  GDP per capita (GDPPP)

In Figure 4.1, gross domestic product (GDP) per capita was used as a measure tool for economic growth; this variable is the dependant variable; which is a widely used indicator of economic growth in most studies. In the case of BRICS it is seen that economic growth rate is not normally distributed throughout the bloc, due to all these countries still operating on individual economies and all apply to their own policies for finances and growth.

GDPPP for BRICS countries are all moving in a normal trend, but Brazil and Russia show outlier performance as their growth is better off than those of India, China and South Africa. In 2009, all countries economic growth took a down-turn due to the financial crisis hence post-to the financial crisis growth rates began to grow again in a positive trend not as fast as expected but they are all showing signs of growth in the long run. Moreover, Russia’s growth rate was -7.8 percent and in 2013 had a growth rate of 1.3 percent. Brazil
experienced an economic setback of -0.3 in 2009 and an upturn in 2013 of 2.5 percent. However, GDP growth in India and China remained remarkable even though the two countries also experienced some moderation due to a weakening global demand during the period of the financial crisis. Moreover, BRICS is expected to represent almost 47 percent of global GDP by 2050.

**Figure 4.1:** GDP per capita BRICS and G-7

![Graph showing GDP per capita comparison between BRICS and G-7 countries.](image)

Source: Compiled by the author

GDPPP for G-7 countries have been fluctuating throughout 1996 to 2013. Similarly to the BRICS countries, the G-7 economy also took a down-turn due to the financial crisis and it made their economies more unstable. In figure 4.1, it is also seen that United Kingdom and United States economic growth was the worst off out of all seven economies due to their financial markets being influenced directly by the financial crisis. But surely has made an impressive come-back with now being two of the strongest growth countries in the G-7 block.

The G-7 countries particularly have a responsibility for the global economy. The adjusting purchasing power, these seven countries are responsible for a third of the global economic output in 2013 at 32.7 percent. From 2000 to 2013 it indicates that Italy had the lowest overall growth at an estimate of -0.4 percent and the highest growth was Canada with 2.5 percent. Other average growth is indicated in Japan -0.1 percent, France 0.4 percent and Germany 1.6 percent. Also higher growth patterns are seen for United
Kingdom 2.6 percent and United States 2.4 percent. All these percentages are an indication of their real percentage change in GDP since 2000. Prior to that the block it seemed to be on the same trend between 1996 till 1999. With an overall growth percentage of 9 percent.

Overall, it is clear that the growth for BRICS is greater than that of G-7 for the time period studied. It is not a huge gap between the two blocks but yet BRICS does show more favourable results. This means that developed countries, can be out grown by developing countries especially in the case of BRICS whose emerging economies have proven that it is possible.

4.2.2 Population growth

In Figure 4.2, Russia is the only country showing low population growth as for the other four countries POP it has been relatively high especially in India and South Africa. Brazil and China is showing a down turn in the POP growth rate. In addition, POP is insignificant for BRICS due to it having a negative effect on overall economic growth and is a controlling variable towards growth.

The BRICS population growth is far greater than that of the G-7. For BRICS there is a clear indication that in India, Brazil and China there are high levels of population growth that amounts to an overall maximum of 0.0250 percent and a minimum of -0.0058 percent, followed by Russia and South Africa that has lower population growth. From 1996 till 2013 population growth for BRICS has a mean of 0.009 percent and a median of 0.0120 percent. In addition, in G-7 countries in Figure 4.2, shows that the POP growth rate are kept at a constant and doesn’t merely have such an influential impact in the short-run but that will change over the long-run impacts.

Also seen in the distribution Figure 4.2, shows that POP is statistically significant in G-7 so it might not have a great impact on the overall financial development and economic growth of this specific country grouping and surely its seen how drastically the variance of influence there is in BRICS and G-7 with regards to the population growth rate.

Japan has the highest population growth and Canada the lowest in the country block. Whilst globally approximately 8 percent of the population is aged above 65 and above, of which Italy and Germany constitute of 21 percent of this age group. Whereby, Japan
internationally constitutes of 25 percent of people aged in the 65 age group. The overall population growth tends to be more consistent across the G-7 countries (see annexure).

**Figure 4.2: Population growth (POP) BRICS and G-7**

Source: Compiled by the author

Population growth over the time period of 1996 till 2013 is far greater in BRICS, than in G-7 countries.

### 4.2.3 Interest rate (IR)

The financial sector plays a crucial role in the operation of most economies, as it provides intermediation between borrowers and lenders of funds. To the extent that financial intermediaries are efficient institutions for channelling funds from savers to borrowers, they can affect economic growth.
In Figure 4.3, interest rate growth has been low in the most of BRICS and G-7 countries. China shows high levels of interest rates growing over the period of 1996. Followed by India with a very low interest growth rate in 2013, which was due to their respective economic condition at that time. In addition, as seen in the annexure, IR for both BRICS and G-7 are statistically significant which means it has a positive impact on overall growth patterns.

**Figure 4.3: Interest rate (IR)**

![Graph showing interest rate trends for BRICS and G-7 countries](image)

Source: Compiled by the author

Within G-7 there is not much variation in the interest rates, indicating a maximum of 0.489 percent and a minimum of -0.426 percent. BRICS however indicating a maximum of 2.480 percent and a minimum of -4.000 percent. BRICS has a standard deviation of 0.585 percent and G-7 0.146 meaning that the deviation in BRICS is larger than those of G-7, so there is a bigger gap between the variance.

### 4.2.4 Total investment (TI)

In Figure 4.4, TI has been significant for both BRICS and G-7 even though as seen in the figure BRICS shows very low growth rates with regards to total investment in countries like Brazil, China, India and South Africa. Russia seems to be the only outlier with a high
level of growth in investment over the years. Besides, for G-7 countries low growth in total investment is indicated for Japan, Canada, France and United States but an overall low for the G-7 block. For both country groupings TI is statistically significant and can have a positive effect on financial development and economic growth.

**Figure 4.4: Total investment (TI)**

Source: Compiled by the author

Total investment in BRICS represents a maximum of 1.388 percent and a minimum of -0.186 percent. Followed by G-7, with a maximum of 0.139 percent and a minimum of -0.186 percent over the studied period, implying a small gap. It also indicates a standard deviation of 0.175 percent for BRICS and 0.052 percent for G-7. A greater standard deviation means a greater gap between the variance. It is clear that BRICS has the bigger gap between the two country groupings.

### 4.2.5 Stock market capitalisation (SMC)

In Figure 4.5, the SMC clearly shows that BRICS has been showing greater growth figures in the SMC as to G-7, which can be based on the strain on G-7 economies and financial markets. Therefore, the turn-over for BRICS are better as an impact of emerging
economies. And looking at the probability for both country grouping it shows that BRICS SMC is statistically significant at 0.0000 and G-7 is insignificant at 0.9781 (see annexure).

Figure 4.5: Stock market capitalisation (SMC)

Source: Compiled by the author

Even though BRICS shows higher levels of SMC it is mostly contributed by Russia, India and followed by China. In addition, SMC throughout G-7 country grouping seems to have a mean of 0.049 percent and 0.172 percent in BRICS. BRICS is more likely to have a maximum of 2.8 percent growth in SMC, and G-7 a low of only 0.5 percent in comparison to BRICS which accounts for a 2.3 percent difference between the two country groupings. Therefore, in regards to the significance it’s clear as to why SMC in G-7 is insignificant to their output growth over the short-term.

4.3 DESCRIPTIVE STATISTICS

Table 4.1 and 4.2 provides the summary for all variables used in the study. The average of the annual data for each country was calculated for the period of review from 1996 to 2013. This Table also highlights the maximum and minimum of the different variables of this study, and makes it possible to know whether or not the observed variable are within the expected range or they are outliers. It is a well-known fact that time series data are
subjected to the high rate of skewness (Alfaro et al., 2004; Levine, 2005 & Levine, 1997). This is due to the existence of many outliers along the trend line. From the Table of descriptive statistics, Jarque-Bera test of normality is used to see whether the data is normally distributed. The null hypothesis in the normality test assumes that the series are normally distributed. Likewise, the mean based coefficients of skewness and kurtosis are applied to check the symmetric nature of the variables.

From Table 4.1, the positive skewness for three of the five variables indicates that the observed values of the variables have a long tail to the right and for the negative skewness a tail to the left. According to the probability only total investment (TI), population (POP), and interest rate (IR) are not normally distributed as the p-value for Jarque–Bera test are less than 0.05. The skewness (different from zero) and kurtosis (greater than 3) also shows that these three variables are not normally distributed. The P-values of Jarque–Bera test for economic growth (GDPPP) and stock market capitalisation (SMC) are greater than >0.05; meaning that the null hypothesis formality is accepted.

**Table 4.1: Descriptive statistics for G-7**

<table>
<thead>
<tr>
<th></th>
<th>GDPPP</th>
<th>SMC</th>
<th>TI</th>
<th>IR</th>
<th>POP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0.031289</td>
<td>0.049280</td>
<td>-0.001977</td>
<td>-0.057106</td>
<td>0.069751</td>
</tr>
<tr>
<td>Median</td>
<td>0.034163</td>
<td>0.056737</td>
<td>0.005416</td>
<td>-0.075048</td>
<td>0.004808</td>
</tr>
<tr>
<td>Maximum</td>
<td>0.233869</td>
<td>0.531458</td>
<td>0.139637</td>
<td>0.488534</td>
<td>9.107691</td>
</tr>
<tr>
<td>Minimum</td>
<td>-0.179134</td>
<td>-0.472107</td>
<td>-0.186291</td>
<td>-0.426764</td>
<td>-0.899086</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>0.079892</td>
<td>0.188705</td>
<td>0.052306</td>
<td>0.146237</td>
<td>0.815608</td>
</tr>
<tr>
<td>Skewness</td>
<td>-0.155783</td>
<td>0.032544</td>
<td>-1.031167</td>
<td>0.557537</td>
<td>10.91510</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>3.067874</td>
<td>2.935451</td>
<td>4.846713</td>
<td>4.330796</td>
<td>121.6072</td>
</tr>
<tr>
<td>Jarque-Bera</td>
<td>0.533818</td>
<td>0.044116</td>
<td>40.23374</td>
<td>15.82563</td>
<td>76357.20</td>
</tr>
<tr>
<td>Probability</td>
<td>0.765743</td>
<td>0.978183</td>
<td>0.000000</td>
<td>0.000366</td>
<td>0.000000</td>
</tr>
</tbody>
</table>

Source: Compiled by the author

The mean equates for average of all the number of variables in the data group. In Table 4.1, for G-7 countries, the highest mean value is 6.9 percent for population growth, followed by stock market capitalisation of 4.9 percent and 3 percent GDP per capita.
growth. Than a mean low of -0.19 percent for total investment and -5.7 percent for interest rate. This is also confirmed by the skewness that is close to zero and the kurtosis that is close to 3. The mean model (Pesaran and Smith, 1995), as indicated in Table 4.1 the mean accounts for the short-run coefficients, that which includes the speed of adjustments to the long-run equilibrium values, as well as to the error modification to country-by-country, while some long-run coefficient slopes are restricted to be similar across countries.

The standard deviation for G-7 countries shows a high volatile level in POP with a high of 81 percent followed by SMC 18 percent and IR 14 percent, as to GDPPP and TI is below 10 percent which make these variables less volatile including SMC and IR. In BRICS there is a high level of volatility for interest rate and stock market capitalisation, which is the opposite of what is seen in Table 4.1 of G-7 countries.

From Table 4.2, the positive skewness for three of the five variables indicates that the observed values of the variables have a long tail to the right and for the negative skewness a tail to the left.

### Table 4.2: Descriptive statistics for BRICS

<table>
<thead>
<tr>
<th></th>
<th>GDPPP</th>
<th>SMC</th>
<th>TI</th>
<th>IR</th>
<th>POP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>0.164348</td>
<td>0.172362</td>
<td>0.073680</td>
<td>-0.030159</td>
<td>0.009804</td>
</tr>
<tr>
<td>Median</td>
<td>0.118107</td>
<td>0.093039</td>
<td>0.049980</td>
<td>0.000000</td>
<td>0.012003</td>
</tr>
<tr>
<td>Maximum</td>
<td>1.342272</td>
<td>2.888621</td>
<td>1.388535</td>
<td>2.480000</td>
<td>0.025080</td>
</tr>
<tr>
<td>Minimum</td>
<td>-0.059794</td>
<td>-0.675240</td>
<td>-0.186005</td>
<td>-4.000000</td>
<td>-0.005850</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>0.187580</td>
<td>0.498171</td>
<td>0.175142</td>
<td>0.585539</td>
<td>0.007460</td>
</tr>
<tr>
<td>Skewness</td>
<td>4.344654</td>
<td>3.026089</td>
<td>5.342840</td>
<td>-2.387914</td>
<td>-0.373315</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>24.08748</td>
<td>15.10185</td>
<td>38.32699</td>
<td>28.47155</td>
<td>2.558675</td>
</tr>
<tr>
<td>Jarque-Bera</td>
<td>1950.696</td>
<td>686.5631</td>
<td>5108.175</td>
<td>2518.531</td>
<td>2.820839</td>
</tr>
<tr>
<td>Probability</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.000000</td>
<td>0.244041</td>
</tr>
</tbody>
</table>

Source: Compiled by the author

The highest mean is represented by stock market capitalisation with 17 percent and GDP per capita growth of 16 percent (Table 4.2). Than an average of only 7 percent for total
investment followed by a low 0.9 percent for population growth, whereby the outliner is interest rate with an overall low average of -3 percent for the data set. So for BRICS SMC has the highest mean and IR the lowest mean.

In both country blocks it is seen that there is a low average growth for interest rate and respectively total investment. The smallest overall value for G-7 is a minimum of -0.899086 population growth and maximum value of 9.107691 also found in the population growth. There is a big standard deviation between the values with a difference of 8.208605. For BRICS the overall smallest value across the variables is -4.000000 for interest rate and a maximum value of 2.888621 for stock market capitalisation. In both country groupings it is seen that there is a low percentage growth for interest rate and respectively total investment. The smallest overall value for G-7 is a minimum of -0.899086 population growth and maximum value of 9.107691 also found in the population growth. There is a big standard deviation between the values with a difference of 8.208605. For BRICS the overall smallest value across the variables is -4.000000 for interest rate and a maximum value of 2.888621 for stock market capitalisation.

The standard deviation for BRICS shows that IR is 59 percent and SMC is 50 percent volatile. This is an average of 50 percent and moving up to almost 60 percent for the interest rate. The other three variables accounts for 38 percent meaning that they are not that volatile to growth. BRICS in comparison to G-7 shows a higher level of volatility with regards to GDPPP, amounting to 18 percent whereas G-7 is only 7 percent a gap of 11 percent between the blocks.

4.4 CORRELATION ANALYSIS

Correlation analysis had to be run, in order to test whether or not the variables and indicators are correlated with one another.

Table 4.3 and 4.4 summarise the correlation coefficient for G-7 and BRICS, respectively. The overall correlation coefficients for the BRICS variables are positive, but only the population growth tends to be negative correlated with other variables. This means that if GDPPP, SMC and TI increase POP tend to decrease. Population growth would move in the opposite direction from the other variables, except the interest rate (IR) which is positively correlated with POP.
Table 4.3: Correlation results for G-7

<table>
<thead>
<tr>
<th></th>
<th>GDPPP</th>
<th>SMC</th>
<th>TI</th>
<th>IR</th>
<th>POP</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDPPP</td>
<td>1.000000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SMC</td>
<td>0.058473</td>
<td>1.000000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TI</td>
<td>0.309883</td>
<td>0.424653</td>
<td>1.000000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IR</td>
<td>0.212549</td>
<td>0.149971</td>
<td>0.190110</td>
<td>1.000000</td>
<td></td>
</tr>
<tr>
<td>POP</td>
<td>-0.029510</td>
<td>-0.107709</td>
<td>0.007720</td>
<td>0.015133</td>
<td>1.000000</td>
</tr>
</tbody>
</table>

Source: Compiled by the author

In Table 4.3 and 4.4, the correlation size for the most variables has a coefficient with an absolute value below 0.5. Meaning that throughout the test the correlation size is not that big, but there surely has a positive relationship even though it is not very strong. In addition total investment shows an absolute value above 0.5 for both gdp per capita and stock market capitalisation, meaning that investment is strongly correlated with gdp per capita as well as stock market capitalisation in BRICS. The G-7 coefficients are less than 0.5, making the grouping for those variables not as strongly correlated as in BRICS countries and for the period undertaken by the study.

Table 4.4: Correlation results for BRICS

<table>
<thead>
<tr>
<th></th>
<th>GDPPP</th>
<th>SMC</th>
<th>TI</th>
<th>IR</th>
<th>POP</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDPPP</td>
<td>1.000000</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SMC</td>
<td>0.440331</td>
<td>1.000000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TI</td>
<td>0.752941</td>
<td>0.506102</td>
<td>1.000000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IR</td>
<td>0.082890</td>
<td>0.091921</td>
<td>0.080882</td>
<td>1.000000</td>
<td></td>
</tr>
<tr>
<td>POP</td>
<td>-0.380466</td>
<td>-0.258307</td>
<td>-0.401962</td>
<td>0.054050</td>
<td>1.000000</td>
</tr>
</tbody>
</table>

Source: Compiled by the author

In the case of G-7 only GDPPP and SMC are negatively correlated with POP and all other variables are positively correlated meaning that if one variable increases, the other also increases, or vice versa. The correlation above explains the strength of the association between the variables, meaning that, when the variables are closer to +1 the stronger.
correlated it is. A lower correlation meaning closer to +0 means that the variables are less related or in the case of it being perfect to 0 it refers that the variables are not correlated at all. Summarising these empirical results, it can be stated that there is no clear consensus on the relation between financial and economic development in different developed and developing countries clusters. The empirical results of this study show that the relationship between financial and economic development in countries does exists, however, the analysis results of the relation between financial and economic development in the two different country blocks are mixed.

4.5  PANEL UNIT ROOT TEST

Recent literature suggests that panel-based unit root tests have higher power than unit root tests based on individual time series (Hadri, 2000). There a number of panel unit root test, following five types of panel unit root tests namely: Levin, Lin and Chu (2002), Breitung (2000), Im, Pesaran and Shin (2003), Fisher-type tests using ADF and PP tests (Maddala and Wu (1999) and Choi (2001), and Hadri (2000).

Table 4.5: Panel unit root test for BRICS

<table>
<thead>
<tr>
<th>Variables</th>
<th>Levin, Lin &amp; Chu t*</th>
<th>Im, and stat</th>
<th>Pesaran Shin W-</th>
<th>ADF - Fisher Chi-square</th>
<th>PP - Fisher Chi-square</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDPPP</td>
<td>-24.1509***</td>
<td>-11.9361***</td>
<td>281.355***</td>
<td>299.647***</td>
<td></td>
</tr>
<tr>
<td>SMC</td>
<td>-6.67875***</td>
<td>-6.00317***</td>
<td>49.6104***</td>
<td>51.5849***</td>
<td></td>
</tr>
<tr>
<td>TI</td>
<td>-2.4485***</td>
<td>-3.92463***</td>
<td>34.7435***</td>
<td>55.2888***</td>
<td></td>
</tr>
<tr>
<td>IR</td>
<td>-6.67875***</td>
<td>-7.37767***</td>
<td>63.3513***</td>
<td>319.275***</td>
<td></td>
</tr>
<tr>
<td>POP</td>
<td>-1.6169*</td>
<td>-2.00397**</td>
<td>21.1645**</td>
<td>13.9083</td>
<td></td>
</tr>
</tbody>
</table>

* *** and ** and * indicate 1percent , 5percent and 10percent significance levels respectively

<table>
<thead>
<tr>
<th></th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADF</td>
<td>-6.838393</td>
<td>0.0000</td>
</tr>
<tr>
<td>Residual variance</td>
<td>0.004785</td>
<td></td>
</tr>
<tr>
<td>HAC variance</td>
<td>0.002407</td>
<td></td>
</tr>
</tbody>
</table>

Source: Compiled by the author
The ADF test was also used to supplement these tests. The results of these unit root tests are in Table 4.5 and 4.6. Probabilities for the unit root test are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality. The Tables 4.5 and 4.6 for BRICS and G-7 presents the results of the tests at the levels for LLC, IPS, ADF and PP panel root test at level indicating that all variables are I(0) in the constant of the panel root regression.

**Table 4.6: Panel unit root test for G-7**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Levin, Lin &amp; Chu t*</th>
<th>Im, Pesaran and Shin W-stat</th>
<th>ADF - Fisher Chi-square</th>
<th>PP - Fisher Chi-square</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDPPP</td>
<td>-5.89925***</td>
<td>-4.24739***</td>
<td>42.2200***</td>
<td>34.7550***</td>
</tr>
<tr>
<td>SMC</td>
<td>-6.31691***</td>
<td>-4.92060***</td>
<td>48.7834***</td>
<td>27.9940**</td>
</tr>
<tr>
<td>TI</td>
<td>-8.56980***</td>
<td>-7.05564***</td>
<td>69.9176***</td>
<td>72.7847***</td>
</tr>
<tr>
<td>IR</td>
<td>-7.47393***</td>
<td>-7.31547***</td>
<td>72.0342***</td>
<td>72.3131***</td>
</tr>
<tr>
<td>POP</td>
<td>-1.02523</td>
<td>-2.34066***</td>
<td>29.7653***</td>
<td>23.9440**</td>
</tr>
</tbody>
</table>

* *** and ** indicate 1 percent and 5 percent significance levels respectively

<table>
<thead>
<tr>
<th>ADF</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-9.311596</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Residual variance: 0.000115
HAC variance: 3.55E-05

Source: Compiled by the author

All variables are stationary or I(0), hence there is no need for conducting a panel co-integration tests, which will only be done if the variables have a unit root or are I(1). Thus, this study will proceed with simple panel regressions.

### 4.6 PANEL REGRESSION ANALYSIS

Panel regression data allows you to control those variables you cannot observe or measure like cultural factors or difference in business practices across companies; or variables that change over time but not across entities. This is, it accounts for individual heterogeneity. With panel data you can include variables at different levels of the analysis that are for multilevel or hierarchical modelling. The test begins with a simple pooled...
reduction, followed by the redundant fixed effect at which it will be decided which model is more suited the fixed effect model (FEM) or random effect model (REM).

4.6.1 Pooled regression

First a pooled regression, fixed effect model (FEM) and random effect model (REM) were estimated and redundant fixed effects tests and correlated random effects - Hausman Test were used to identify the model supported by the data. The results of the selected are then presented and discussed. Results of pooled regression and FEM were different, suggesting that the redundant fixed Effects tests, which test for Test cross-section fixed effects, had to be conducted to identify the relevant model between these models.

Table 4.7:  Pooled regression for BRICS

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.128865</td>
<td>0.026173</td>
<td>4.923649</td>
<td>0.0000</td>
</tr>
<tr>
<td>SMC</td>
<td>0.026794</td>
<td>0.030875</td>
<td>0.867825</td>
<td>0.3879</td>
</tr>
<tr>
<td>TI</td>
<td>0.726431</td>
<td>0.092682</td>
<td>7.837917</td>
<td>0.0000</td>
</tr>
<tr>
<td>IR</td>
<td>0.008458</td>
<td>0.022778</td>
<td>0.371320</td>
<td>0.7113</td>
</tr>
<tr>
<td>POP</td>
<td>-2.284952</td>
<td>1.947335</td>
<td>-1.173374</td>
<td>0.2439</td>
</tr>
</tbody>
</table>

Source: Compiled by the author

The pooled regression analysis or ordinary least square (OLS) results of the model, is presented in Table 4.7 and 4.8 for BRICS and G-7, respectively. The results show that the (POP) is negatively or inversely related to (GDPPP) in BRICS, and (SMC) and (POP) are also negatively related to GDPPP in G-7. The coefficients are not statically significant as the P-values are greater than 5 percent.

Then for all other variables that are positively related to the constant parameter, it means that if a variable increases by a unit, that the constant will increase by that amount of that specific variable. Hence, total investment (TI), with a value coefficient of 0.726431 and 0.496234 units. This implies that if the coefficient increases by a unit, GDPPP increases by 0.726431 and 0.496234 for BRICS and G-7.
Table 4.8: Pooled regression for G-7

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.040115</td>
<td>0.007652</td>
<td>5.242209</td>
<td>0.0000</td>
</tr>
<tr>
<td>SMC</td>
<td>-0.046431</td>
<td>0.040052</td>
<td>-1.159282</td>
<td>0.2486</td>
</tr>
<tr>
<td>TI</td>
<td>0.496234</td>
<td>0.144615</td>
<td>3.431405</td>
<td>0.0008</td>
</tr>
<tr>
<td>IR</td>
<td>0.091745</td>
<td>0.047306</td>
<td>1.939392</td>
<td>0.0548</td>
</tr>
<tr>
<td>POP</td>
<td>-0.004542</td>
<td>0.008365</td>
<td>-0.542996</td>
<td>0.5881</td>
</tr>
</tbody>
</table>

Source: Compiled by the author

Followed by, interest rate (IR) with a coefficient of 0.091745 in G-7 and 0.008458 in BRICS, indicating that if the coefficients increases by a unit, GDPPP will increase by 0.091745 and 0.008458. For population growth the opposite is expected, the value of the coefficients is -2.284952 in BRICS and -0.004542 in G-7. Which indicates that when the coefficient population declines by a unit, there will be an inverse growth for GDPPP. When population growth declines, it creates better results for economic growth.

The multiple determination coefficients $R^2$ have an average value of 0.578789 for BRICS implying that 58 percent in economic growth (GDPPP) changes is traceable to SMC, TI, IR and POP. Followed by, G-7 with a multiple determination coefficient $R^2$ that has a low value of 0.131327 implying that 13 percent in GDPPP changes is traceable to SMC, TI, IR and POP. This accounts for 45 percent in the two country grouping.

Table 4.9: Fixed effect (cross-sectional specific estimates) for BRICS

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.095315</td>
<td>0.047414</td>
<td>2.010269</td>
<td>0.0477*</td>
</tr>
<tr>
<td>SMC</td>
<td>0.018525</td>
<td>0.031471</td>
<td>0.588622</td>
<td>0.5578</td>
</tr>
<tr>
<td>TI</td>
<td>0.778007</td>
<td>0.100665</td>
<td>7.728646</td>
<td>0.0000*</td>
</tr>
<tr>
<td>IR</td>
<td>0.008853</td>
<td>0.022745</td>
<td>0.389235</td>
<td>0.6981</td>
</tr>
<tr>
<td>POP</td>
<td>0.895888</td>
<td>4.544480</td>
<td>0.197138</td>
<td>0.8442</td>
</tr>
</tbody>
</table>

Notes: $R^2 = 0.601472$, $N = 90$, Prob (F) = 0.000000. (*) denotes significance at 5 percent significance level.

Source: Compiled by the author
Meaning that in this pooled regression analysis BRICS tends to have a stronger output than G-7. However, these results have to be compared to those of FE model.

Table 4.9 and 4.10, show that for BRICS countries all coefficients are positively related to economic growth, however for G-7 there are only two variables positively related namely total investment (TI) and interest rate (IR), while population (POP) and stock market capitalisation (SMC) of G-7 shows an insignificant negative relationship with GDPPP.

Table 4.10: Fixed effect (cross-sectional specific estimates) for G-7

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.040245</td>
<td>0.007724</td>
<td>5.210241</td>
<td>0.0000*</td>
</tr>
<tr>
<td>SMC</td>
<td>-0.046910</td>
<td>0.040663</td>
<td>-1.153605</td>
<td>0.2511</td>
</tr>
<tr>
<td>TI</td>
<td>0.466491</td>
<td>0.148508</td>
<td>3.141189</td>
<td>0.0021*</td>
</tr>
<tr>
<td>IR</td>
<td>0.092177</td>
<td>0.047827</td>
<td>1.927300</td>
<td>0.0564**</td>
</tr>
<tr>
<td>POP</td>
<td>-0.006567</td>
<td>0.008597</td>
<td>-0.763883</td>
<td>0.4465</td>
</tr>
</tbody>
</table>

Notes: R² = 0.160757, N = 126, Prob (F) = 0.000000. (*) denotes significance at 5% and (**) 10% significance level.

Source: Compiled by the author

Therefore, in BRICS, a unit increase in SMC, TI, IR and POP leads to 0.018525, 0.778007, 0.008853 and 0.895888 units increase in GDPPP. Or in the case of G-7, a unit increase in TI and IR leads to 0.466491 and 0.092177 units increase in GDPPP respectively, while a unit increase in SMC and POP will cause a decline in GDPPP by -0.046910 and -0.006567. The R², has a high value of 0.601472 approximately 0.60 and shows that 60 percent of changes in economic growth (GDPPP) is brought about by SMC, TI, IR and POP for BRICS and a low value of 0.160757 approximately 0.16 and shows that 16 percent of changes in economic growth (GDPPP) is brought about SMC, TI, IR and POP for G-7. The 40 percent and 84 percent balance is accounted for by the error term. The remaining results evaluate the joint significance of the period effects, and of all of the effects, respectively (see Annexure: A).

4.6.2 Redundant fixed effect

The likelihood ratio hence is between 0 and 1. Low values of the likelihood ratio mean that the observed result was less likely to occur under the null hypothesis that the fixed
effects are equal to zero as compared to the alternative that effects are different from zero. High values of the statistic mean that the observed outcome was nearly as likely to occur under the null hypothesis as the alternative, and the null hypothesis cannot be rejected.

Table 4.11: Redundant fixed effect for BRICS

<table>
<thead>
<tr>
<th>Effects Test</th>
<th>Statistic</th>
<th>d.f.</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross-section F</td>
<td>1.152545</td>
<td>(4,81)</td>
<td>0.3380</td>
</tr>
<tr>
<td>Cross-section Chi-square</td>
<td>4.981955</td>
<td>4</td>
<td>0.2892</td>
</tr>
</tbody>
</table>

Source: Compiled by the author

Table 4.12: Redundant fixed effect for G-7

<table>
<thead>
<tr>
<th>Effects Test</th>
<th>Statistic</th>
<th>d.f.</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross-section F</td>
<td>0.672121</td>
<td>(6,115)</td>
<td>0.6723</td>
</tr>
<tr>
<td>Cross-section Chi-square</td>
<td>4.342759</td>
<td>6</td>
<td>0.6304</td>
</tr>
</tbody>
</table>

Source: Compiled by the author

For the G-7 countries data, the fixed effect model is better than the pooled regression. It presented more positive results and with a lower cross-section F as in comparison to BRICS.

In Table 4.11 and 4.12, it seems like the change in variable total investment (TI) and interest rate (IR) are the only statistically significant values for G-7, and SMC, TI and IR are statistically significant values for BRICS. The $R^2$ value for BRICS is a high of 0.578789 and a low of 0.131327 for G-7 and the p-value is also less than $\alpha=0.05$ for G-7. Hence, it indicates that the model is a good predictor of economic growth for G-7 and not that strongly for BRICS (see Annexure: A)

Hence, the next step is to estimate the REM results and use the correlated random effects using Hausman Test to select between FEM and REM. Results of correlated random effects - Hausman Test, in Table 4.11, show that the p-value of 0.0041, the Chi-squared test is less than 1percent, implying that the REM is not appropriate (see annexure). Hence, the fixed effects specification is preferred by our data. Thus the results of the FEM presented and discussed.
4.6.3 Testing for random effect

The random effects model which is also known as the error components model, which assumes that the random effects are uncorrelated with the explanatory variables – otherwise there would be an endogeneity problem, which in turn would make the estimators inconsistent. The Hausman Test for Correlated Random Effects tests this hypothesis.

Table 4.13: Hausman test for BRICS

<table>
<thead>
<tr>
<th>Correlated Random Effects - Hausman Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test cross-section random effects</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test Summary</th>
<th>Chi-Sq. Statistic</th>
<th>Chi-Sq. d.f.</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross-section random</td>
<td>4.610181</td>
<td>4</td>
<td>0.3297</td>
</tr>
</tbody>
</table>

Source: Compiled by the author

Table 4.13 is the portion which describes the test statistic and provides a summary of the results. However, the statistic provide little evidence against the null hypothesis that there is no misspecification.

The next portion of the output provides additional test detail, showing the coefficient estimates from both the random and fixed effects estimators, along with the variance of the difference and associated p-values for the hypothesis that there is no difference. Note that in some cases, the estimated variances can be negative so that the probabilities cannot be computed.

Table 4.14: Cross-section random effects test

<table>
<thead>
<tr>
<th>Cross-section random effects test comparisons:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Fixed</th>
<th>Random</th>
<th>Var(Diff.)</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMC</td>
<td>0.018525</td>
<td>0.026794</td>
<td>0.000044</td>
<td>0.2122</td>
</tr>
<tr>
<td>TI</td>
<td>0.778007</td>
<td>0.726431</td>
<td>0.001605</td>
<td>0.1979</td>
</tr>
<tr>
<td>IR</td>
<td>0.008853</td>
<td>0.008458</td>
<td>0.000002</td>
<td>0.7890</td>
</tr>
<tr>
<td>POP</td>
<td>0.895888</td>
<td>-2.284952</td>
<td>16.887210</td>
<td>0.4389</td>
</tr>
</tbody>
</table>

Source: Compiled by the author
For Table 4.13 and 4.14, this specific data random effect modelling is valid due the composite errors term \( \omega_{it} \) which is correlated with the explanatory variables. The random effect results shows that for BRICS it is more preferably better to use the random effect model as in terms of the fixed effect model.

The variation difference between variables are much smaller, meaning that they are now stronger correlated to one another and that the sample is a good fit for this specific model and data. So we accept the null hypothesis of the random effect and reject the alternative fixed effects for BRICS.

**Table 4.15: Hausman test for G-7**

<table>
<thead>
<tr>
<th>Cross-section random effects test comparisons:</th>
<th>Fixed</th>
<th>Random</th>
<th>Var(Diff.)</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMC</td>
<td>0.018525</td>
<td>0.026794</td>
<td>0.000044</td>
<td>0.2122</td>
</tr>
<tr>
<td>T1</td>
<td>0.778007</td>
<td>0.726431</td>
<td>0.001605</td>
<td>0.1979</td>
</tr>
<tr>
<td>IR</td>
<td>0.008853</td>
<td>0.008458</td>
<td>0.000002</td>
<td>0.7890</td>
</tr>
<tr>
<td>POP</td>
<td>0.895888</td>
<td>-2.284952</td>
<td>16.887210</td>
<td>0.4389</td>
</tr>
</tbody>
</table>

Source: Compiled the author

This portion Table 4.15, results shows that there is little evidence against the null hypothesis and that there is no misspecification. Therefore, it's assumed that the null hypothesis \( H_0 \) which is equal to random effect = 0 and the null hypothesis is accepted and the alternative will be rejected which is fixed effects for G-7.

**Table 4.16: Cross-section random effects**

| Source: Compiled by the author |
For BRICS the sample, random effect is preferred over the fixed effect. The p-value for the test is greater than 1 percent, indicating that the random effects model is appropriate and that the fixed effects specifications is to be preferred. Therefore, for G-7 countries we will continue with the random effects, but also looking at the fixed effect results for BRICS on its own without the Hausman test. Therefore, Table 4.16 indicates a small variance between the results for fixed effects and random effects. The cross section test shows better results for G-7 data whereby the null hypothesis will accept the random effects and reject the alternative fixed effects as it best suits the G-7 sample with stronger results (see Annexure A).

Table 4.17: Random effects model BRICS

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.128865</td>
<td>0.026079</td>
<td>4.941289</td>
<td>0.0000</td>
</tr>
<tr>
<td>SMC</td>
<td>0.026794</td>
<td>0.030765</td>
<td>0.870934</td>
<td>0.3862</td>
</tr>
<tr>
<td>TI</td>
<td>0.726431</td>
<td>0.092351</td>
<td>7.866000</td>
<td>0.0000</td>
</tr>
<tr>
<td>IR</td>
<td>0.008458</td>
<td>0.022697</td>
<td>0.372651</td>
<td>0.7103</td>
</tr>
<tr>
<td>POP</td>
<td>-2.284952</td>
<td>1.940383</td>
<td>-1.177578</td>
<td>0.2423</td>
</tr>
</tbody>
</table>

Source: Compiled by the author

There is a variance in the coefficients sample regression due to the different countries having different economies to which it caters, whereby the data for BRICS is either very close to 1 or very far from zero.

Table 4.18: Random effects model G7

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.120121</td>
<td>0.034573</td>
<td>3.474388</td>
<td>0.0008</td>
</tr>
<tr>
<td>SMC</td>
<td>0.023182</td>
<td>0.030739</td>
<td>0.754160</td>
<td>0.4528</td>
</tr>
<tr>
<td>TI</td>
<td>0.755773</td>
<td>0.095929</td>
<td>7.878441</td>
<td>0.0000</td>
</tr>
<tr>
<td>IR</td>
<td>0.008485</td>
<td>0.022471</td>
<td>0.377589</td>
<td>0.7067</td>
</tr>
<tr>
<td>POP</td>
<td>-1.550088</td>
<td>2.585755</td>
<td>-0.599472</td>
<td>0.5505</td>
</tr>
</tbody>
</table>

Source: Compiled by the author
Table 4.17 and Table 4.18 is the hypothesis of the random effects model results, which is sometimes also called the error components model. The parameter estimate is significant for both BRICS and G-7 countries, whereby, total investment is statistically significant. However, since the BRICS and G-7 results are not tightly correlated, a random effects approach had to be used; otherwise the fixed effects model would have been preferable.

4.7 DISCUSSION OF THE RESULTS

Based on the random effect results of which in this case were the particular type of panel data model specification that was most preferred for this sample size. Even though the intercepts vary cross-sectionally the results still showed each cross-section entity and it having different error terms for each sample size and period used in the study.

Within the findings of the analysis it highlighted the importance of financial institutes in funding productive total investments and promoting stock market capitalisation. Throughout the analysis there was a strong indication towards total investment being a contributor to economic growth and financial development. Even though in past literature with regards to finance the correct financial systems has to be in place for financial development to increase economic growth.

When looking specifically at the variables used, for this data it showed a strong indication that financial development, primarily through total investment as an indicator affects economic growth positively and even interest rates have a positive effect.

The findings for BRICS corresponds to the literature of (Calderon & Liu, 2003; Christopoulos & Tsionas, 2004; Dawson, 2010) with regards to the data adopting the random effect model, which can be based on the different country groupings operating their financial structure on various exchange rate regimes and in countries like China they make us of fixed exchange and South Africa operates on a floating exchange it has a big impact on the financial systems. For the BRICS sample there is a strong positive impact from total investment and that’s mostly the capital that sustains most economies having a positive investment structure that is driven by economic growth over time.

Population growth tends to bring down economic growth in this regards due to most of the countries in the BRICS bloc consisting of larger populations groups than that of the developed country groupings and this places a strain on the economies. The interest rate
also indicated a strong correlation with economic growth and financial development and was also seen in other studies (Rousseau & Wachtel, 2002); (Baltagi et al., 2000) which reflect similar results. The role of the variables are of utter importance as it gives indication of the direction of the relationship which is based on the findings.

Another reason why there is that existence of a relationship between BRICS countries can be due to the new BRICS bank that is significant in order for economic growth and financial development too take place within the block. Their future outlooks can continue to grow if the right indicators and measures are in place and the implementation of growth and development systems are well organised and monitored.

However, G-7 results also provided a strong correlation between economic growth and financial development through total invest and interest rates as indicators and measures of the study. The random effects model was chosen for the G-7 sample even though there was little variation between the variables outputs, when looking at the cross-sectional results fixed effect did results into positive outputs for the G-7 bloc and due to the sample size and period it was found that random effects was the most appropriate for that sample. Other studies also tend to move more towards fixed effects for developed countries and giving stronger integration between variables because their economies are much more closely related than those of BRICS countries. This indication is also strongly driven due to the fluctuations within the developed countries.

Hence, the empirical results for both BRICS and G-7 were quite similar which may indicate that there is an integration between developed and developing countries financial development and economic growth relationship. As there might be structure that developed and developing finance and economic systems that can be shared between the groups that may drive economic growth and result to better financial development.

Based on the theory the development of endogenous growth theory (Lucas, 1988 & Romer, 1986) spurred interest in the role and importance of financial development in driving economic growth. The literature highlighted the importance of the financial sector in encouraging growth, specifically by mobilising savings, resource allocation to the most productive investment, information reduction, transaction and monitoring costs, diversifying risks, and facilitating the exchange of goods and services.
A study done by Arcand et al., (2012), who utilized different datasets at the country and industry levels found that the negative financial development and economic growth relationship occurs once the ratio of private credit to GDP surpasses a threshold of about 110 percent for high-income countries. In addition, for this study, ratio of private credit was not used as a variable but it surely creates space for a new study to see if in actual fact the same outcome will occur.

This occurred with the BRICS and G-7 analysis, with the groupings being developed and developing countries, the effect was positive even though they were drawn more to other studies, which was best suited for the countries data yet it was a positive result. Also with the developing countries economic growth is enhanced through capital accumulation and for developed countries it is more driven by enhancing productivity. Rousseau and Wachtel (2002) identified the inflation channel as the providing the relation between financial development and economic growth, and find that growth is not much affected when annual inflation exceeds 13 percent.

In order to reduce the shortcomings of both cross-sectional and time series analysis, researchers have increasingly turned to panel data that enable them to combine time series and cross-sectional features and offer a variety of estimation approaches for example (Calderon & Liu, 2003; Christopoulos & Tsionas, 2004; Dawson, 2010). However, these studies apply either the traditional fixed or random effect methods, or the panel cointegration technique. The former averages the data per country to isolate the trend effects which hides the dynamic relationship between the variables of interests.

To summarize, these results challenge the notion that financial development has a positive and significant long-run impact on economic growth as a whole.

4.8 SUMMARY

Descriptive statistics did in fact indicate that the GDP growth and the financial development indicators were growing in the same direction in an aggregate basis, that is by average all country data, however when statistically significant tests were run, it could not be concluded that differences between countries’ economic growth rates could be explained by difference in their financial development indicators.
In the tests it was found that the data for G-7 is not suited for random effects this due to fact that the approach is only valid when the composite error term \( \omega_{it} \) is uncorrelated with all of the explanatory variables.

On the empirical side, the World Bank and IMF data and various financial indicators can conclude that there is a positive relationship between financial indicators and growth, and that financial development is strongly correlated with subsequent rates of growth, capita, and investment. They correctly emphasize that policies that alter the efficiency of financial intermediation employ a first-order influence on growth. This is a standard implication of models of endogenous growth with financial intermediation.

However, the study tried to establish a significant relationship between financial development and economic growth. Also uses the measure of stock market capitalisation, and conclude that there is a significant relationship. The emphasise of the results are indicative of partial correlation only, and more research would be needed in the area.

Likewise, some of the variables could be used for both financial development and economic growth econometric tests due to the majority variables being controlling and having either a positive or negative impact on growth.
CHAPTER 5: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 SUMMARY

The aim of the study was to analyse the relationship between financial development and economic growth. In this chapter, the conclusions will be drawn about the research problem. The main objective of this study is to analyse the relationship between financial development and economic growth and to determine whether the financial sector can be viewed as an alternative pillar for future economic growth through using various measurements and indicators of financial development and economic growth to see how it contributes to countries overall growth and development.

To test the financial development and economic growth relationship in the two country groupings (BRICS and G-7), two alternatives of financial development have been used, each measuring one particular service delivered by the financial intermediaries. These two indicators are fairly small compared to what most other studies have used in their literature. Real GDP per capita has been preferred to serve as the indicator of economic growth dependent with what is attained in the literature. Some indicators were also supplementary to take into account the subsidising influence of other imperative sectors of the economy.

Chapter 1 provided an introduction and background to the study, which mainly consisted of an introduction of the research problem followed by the background on financial development and economic growth. The various measures of financial systems were discussed and, additionally, the measurements of economic growth were examined ultimately to bring the two concepts together and gain a better understanding of how a relationship can exist in terms of financial development and economic growth.

Chapter 2 is the theoretical literature of financial development and economic growth was discussed. This involved a review on the stages of economic growth and was followed by the different types of theories revolving on economic growth. It was then found that when economic policies are set in place it is possible to find indirect economic growth impacts that may influence financial development in the long term. Initially, that was the effect the study aimed towards, because economic policies play such a fundamental role in the output of economic growth.
Through means of the economic growth literature, it was found that the endogenous growth theory with regards to financial intermediation has a positive effect on steady-state growth. In addition, the intervention of government has a negative effect on financial systems, which puts a strain on growth figures. To conclude economic growth theory, it can be mentioned that the endogenous growth may not be the best theory to elevate economic growth. Because there is not one specific policy that can fully sustain the theory, studies tend to include mixed policies in order to accommodate economic gaps that only policies are able to aid in terms of future economic conditions. Moreover, the theory of financial development was discussed.

This had to be done in order to have a better understanding of financial systems and how a financial system may influence the growth of the economy. According to the previous authors, financial development is not only good for economic growth, but it is one of the causes of economic growth. Through the various indicators and key role players of financial development was explained in a financial framework. It resulted in a positive influence on economic growth when the financial systems are in place and can provide a drive within long-term economic growth. Failing to do so, financial systems that are not well established places a strain on economic growth and development.

Chapter 3 involved a literature analysis on the various test and models that can be used to measure the relationship between financial development and economic growth. Also, which model is most relevant for the data presented in the study? The methodology section was also introduced through the relevant literature. Followed by description of research parameters conducted or that can be used in this specific research design which will conclude the financial development and economic growth relationship model for the study.

Chapter 4 involved an empirical analysis that was based on previous studies. In this study, it was found that there is a correlation between financial development and economic growth, but it is under certain conditions. Upon literature analysis in chapter 3, it was found that the relationship between financial development and economic growth does vary depending on the time period under investigation. It can also vary in terms of the countries used within a specific data set and the different test that was taken in order to get the most significant results. Lastly, the analytical framework, which is used in order to measure financial development and the economic growth conditions.
5.2 OVERVIEW OF FINDINGS

The possible contribution of financial development to economic growth is substantial, but cannot be taken for granted and depends on the construction of the appropriate institutional structure. Predictable measures of financial depth, in the case of private assets and financial development, is defined as moving from banks towards capital markets and are not always connected with higher rates of economic growth.

Financial liberalisation leads to more resourceful and liquid financial intermediation, but does not appear to raise the rates of domestic savings or investment in the aggregate. The efficiency gained from the customary model of financial liberalisation in terms of investment provision and corporate governance can be overshadowed by uncertainty from short-term foreign capital flows. Output, according to the classical economist Adam Smith, transmits to labour, capital and land inputs. Output growth was also driven by population growth, investment growth, and land growth, as well as increases in overall productivity. Investment was endogenous because it was determined by the rate of savings.

Overall, it was found that in terms of financial market development, the size of the banking sector and the level of financial development of the banking sector have the greatest influence on economic growth for the time period under investigation.

Through the assessment of different indicators of financial development it was found that individually all these determinants was used to assess the financial strength of an economy and can be related to future growth and development. In addition, to conclude the study, in an observation concerning the financial framework it was found that, when the degree of financial development is higher in a country, then the availability of financial services will be wider.

To conclude, there is a positive relationship between financial indicators and growth, and that financial development is correlated strongly with subsequent rates of growth, stock market capitalisation, and total investment. In addition, it was found that this is a standard implication of models of endogenous growth with financial intermediation.
5.3 LIMITATIONS OF THE STUDY

- It is of importance to review the role of commercial banks in developing countries, which have been the modern intermediaries between saving households and investing firms, but have more recently moved into asset management and fee-based services.
- The development of a long-term bond market should be a priority, as this would not only provide long-term capital for growth at reasonable real cost but also stabilise exchange rate expectations and enable the monetary authorities to intervene effectively to damp macroeconomic cycles caused by external shocks.
- Not always being able to find full and adequate reports on financial markets.
- While there are improvements upon the measure of financial development, there is still only focus placed on one segment of the financial systems, namely; banks.
- Data are all linked to the World Bank Development Indicators Series and IMF, therefore, the data cannot always be verified or validated by another party not linked to the World Bank or IMF.
- There are many other models that can still be used in order to find the most significant results, but due to time constraints, not all can be experimented. Other variables could be included in the study but there are strict time constraints and lack of data, which made it difficult to extract.
- Some results are sensitive to the sample of countries chosen: it may be inappropriate to draw policy implications from cross-country studies that treat different economies as homogeneous entities.

5.4 RECOMMENDATIONS

- When the relationship between economic growth and financial sector development in a country is positive, the government of the country should gear their policy strategies toward firming up and developing the financial sector. Such measures can be achieved through the judicial system, building reliable regulation and supervision for the financial system, could contribute towards growing the financial sector in a number of countries and could encourage faster economic growth.
- Subsequently financial development is an imperative element for economic growth, additional support/research should be dedicated towards the precise instrument by
which it impacts economic growth and countries should be able to share that among one another for global economic growth to adhere.

- Advance studies should consist of other indicators of financial development not used in the literature study for instance the number of ATMs, number of bank branches and usage of credit and debit cards as alternatives of financial development. This influence can provide more efficient results about the relationship between financial development and economic growth.

- The comparison between financial sectors of BRICS and G-7 countries is not too common, thus there is a need to conduct more comparative studies between the countries with different levels of development in order to arrive, at a more general conclusion on the relationship between financial development and economic growth across BRICS and G-7 countries.

- Data should be regularly updated by countries and need to ensure that the values published are accurate, so that future studies can be able to produce relevant results.

- When a country’s financial development and economic growth frameworks are in a positive relationship it results in positive growth and development. Their focus points should be whichever one they lack and also meeting a stronger output for the future and generations still to come.

5.5 CONCLUSION

By means of the theoretical overview, the empirical analysis in this study also revealed some precision regarding the significance of financial development. The empirical debate about the relationship between financial development and economic growth is centred on three points. First, the mechanism through which the past affects the present, secondly, the real direction of the relationship between them, and the third point is around the type of financial institution, which affects economic growth the most.

Different studies that have focused on both developing and developed countries, however, have recommended opposing results, which states that causality is running from economic growth to financial development for developed countries, finding no relationship between the two variables for developing countries. On the contrary, other studies report that the relationship between financial development and economic growth also indicates that it functions in two directions, which demonstrates that in the early
phases about advancements for one country’s particular fund principal reasons causes growth and later on, it will be the reverse.

However, a portion of studies reason that the course of the association of budgetary improvement conclude that the direction of the relationship between financial development and economic growth will be delicate of the decision of the estimation instrument to fiscal improvement. Additionally, other studies, demonstrate that the result obtained could rely upon the sort of budgetary organisation prevailing in a country. As stated by them, the financial segment of countries where both banks and stock markets are well aided and produced, this will not affect economic growth in the same manner as in countries where only banks are well developed.

However, in the recent examination of conducting comparative studies on many countries, it may be paramount to recognise those separate levels of the improvements from their fiscal divisions. This will be significant because it can have an impact on the association and in addition bearing the relationship between finance and economic growth. It can assist in accomplishing a deepening overview of the circumstance when analysing or interpreting those outcomes of the econometric tests.

Chapter 3 of this study provided an overview of the empirical literature, before highlighting some differences in terms of measures, indicators and models that can be used to gain results. In this chapter, the study discovered that in spite the fact that the countries confronted numerous barriers, which ruin the advancement about their particular economies growth and financial development, there may be proof that certain indicators for financial development have positively affected economic growth. The econometric analysis in Chapter 4 has tried to verify this finding.

The results obtained from the econometric regressions recommend that financial development and economic growth in both countries groupings are positively related. Even though a relationship was found between financial development and economic growth, many more studies should be analysed and statistics have to be tested in order to conduct stronger opinions and to provide adequate recommendations for future outlooks.


*Journal of Economic Literature*, 35:688-726.


ANNEXURE A

BRICS – POOLED EFFECTS

Dependent Variable: GDPPP
Method: Panel Least Squares
Date: 10/17/15  Time: 13:28
Sample: 1996 2013
Periods included: 18
Cross-sections included: 5
Total panel (balanced) observations: 90

<table>
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<tr>
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<th>Coefficient</th>
<th>Std. Error</th>
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R-squared 0.578789  Mean dependent var 0.164348
Adjusted R-squared 0.558967  S.D. dependent var 0.187580
S.E. of regression 0.124572  Akaike info criterion -1.273907
Sum squared resid 1.319053  Schwarz criterion -1.135029
Log likelihood 62.32583  Hannan-Quinn criter. -1.217903
F-statistic 29.19977  Durbin-Watson stat 0.988324
Prob(F-statistic) 0.000000

FIXED-EFFECT

Dependent Variable: GDPPP
Method: Panel Least Squares
Date: 10/17/15  Time: 13:13
Sample: 1996 2013
Periods included: 18
Cross-sections included: 5
Total panel (balanced) observations: 90

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Effects Specification

Cross-section fixed (dummy variables)

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| Adjusted R-squared 0.562111  S.D. dependent var 0.187580
| S.E. of regression 0.124128  Akaike info criterion -1.240373
| Sum squared resid 1.248021  Schwarz criterion -0.990393
| Log likelihood 64.81681  Hannan-Quinn criter. -1.39566
| F-statistic 15.28096  Durbin-Watson stat 1.017260
| Prob(F-statistic) 0.000000
### Method: Panel Least Squares

**Date:** 10/17/15  **Time:** 13:15

**Sample:** 1996 2013  
**Periods included:** 18  
**Cross-sections included:** 5  
**Total panel (balanced) observations:** 90  
**White cross-section standard errors & covariance (d.f. corrected)**

**WARNING:** estimated coefficient covariance matrix is of reduced rank

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**Effects Specification**

- Cross-section fixed (dummy variables)
- Period fixed (dummy variables)

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| Adjusted R-squared | 0.644895 |
| S.E. of regression | 0.111780 |
| Sum squared resid | 0.799668 |
| Log likelihood | 84.84710 |
| F-statistic | 7.465194 |
| Prob(F-statistic) | 0.000000 |

---

### Method: Panel EGLS (Period random effects)

**Date:** 10/17/15  **Time:** 13:16

**Sample:** 1996 2013  
**Periods included:** 18  
**Cross-sections included:** 5  
**Total panel (balanced) observations:** 90  
**Swamy and Arora estimator of component variances**

**White cross-section standard errors & covariance (d.f. corrected)**

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**Effects Specification**

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**Cross-section fixed (dummy variables)**

| Period random | 0.000000 | 0.0000 |
| Idiosyncratic random | 0.111780 | 1.0000 |

**Weighted Statistics**

---

Financial development and economic growth in BRICS and G-7 countries: a comparative analysis
### Unweighted Statistics

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**Dependent Variable:** GDPPP  
**Method:** Panel EGLS (Period random effects)  
**Date:** 10/17/15  
**Time:** 13:16  
**Sample:** 1996-2013  
**Periods included:** 18  
**Cross-sections included:** 5  
**Total panel (balanced) observations:** 90  
**Swamy and Arora estimator of component variances**

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**Effects Specification**

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Financial development and economic growth in BRICS and G-7 countries: a comparative analysis
### Financial development and economic growth in BRICS and G-7 countries: a comparative analysis

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**Effects Specification**

- Cross-section random: 5.99E-09, 0.0000
- Idiosyncratic random: 0.124128, 1.0000

**Weighted Statistics**

- R-squared: 0.578789
- Adjusted R-squared: 0.558967
- S.E. of regression: 0.124572
- Sum squared resid: 1.319053
- Durbin-Watson stat: 0.988324

**Unweighted Statistics**

- R-squared: 0.578789
- Sum squared resid: 1.319053
- Durbin-Watson stat: 0.988324
Cross-section random  0.031909  0.0753
Period random  0.000000  0.0000
Idiosyncratic random  0.111780  0.9247

Weighted Statistics

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Dependent Variable: GDPPP
Method: Panel EGLS (Cross-section random effects)
Date: 10/17/15  Time: 13:18
Sample: 1996 2013
Periods included: 18
Cross-sections included: 5
Total panel (balanced) observations: 90
Swamy and Arora estimator of component variances

Swamy and Arora estimator of component variances

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Effects Specification

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Period fixed (dummy variables)
Idiosyncratic random  0.111780  1.0000

Weighted Statistics

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Unweighted Statistics

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</table>

Financial development and economic growth in BRICS and G-7 countries: a comparative analysis
## G-7 (POOLED, FIXED AND RANDOM EFFECTS)

### Pooled-effect

Dependent Variable: GDPPP  
Method: Panel Least Squares  
Date: 10/17/15   Time: 13:29  
Sample: 1996 2013  
Periods included: 18  
Cross-sections included: 7  
Total panel (balanced) observations: 126

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R-squared | 0.131327   | Mean dependent var | 0.031289 |
Adjusted R-squared | 0.102610   | S.D. dependent var | 0.079892 |
S.E. of regression | 0.075682   | Akaike info criterion | -2.285684 |
Sum squared resid | 0.693056   | Schwarz criterion | -2.173133 |
Log likelihood | 148.9981   | Hannan-Quinn criter | -2.239958 |
F-statistic | 4.573228   | Durbin-Watson stat | 1.439760 |
Prob(F-statistic) | 0.001788   |                   |        |

### Fixed-effect

Dependent Variable: GDPPP  
Method: Panel Least Squares  
Date: 10/17/15   Time: 13:30  
Sample: 1996 2013  
Periods included: 18  
Cross-sections included: 7  
Total panel (balanced) observations: 126

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<th>Prob.</th>
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<td>0.008597</td>
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</table>

R-squared | 0.160757   | Mean dependent var | 0.031289 |
Adjusted R-squared | 0.1087779   | S.D. dependent var | 0.079892 |
S.E. of regression | 0.076305   | Akaike info criterion | -2.224912 |
Sum squared resid | 0.669576   | Schwarz criterion | -1.977300 |
Log likelihood | 151.1695   | Hannan-Quinn criter | -2.124315 |

Effects Specification

Cross-section fixed (dummy variables)

R-squared | 0.160757   | Mean dependent var | 0.031289 |
Adjusted R-squared | 0.1087779   | S.D. dependent var | 0.079892 |
S.E. of regression | 0.076305   | Akaike info criterion | -2.224912 |
Sum squared resid | 0.669576   | Schwarz criterion | -1.977300 |
Log likelihood | 151.1695   | Hannan-Quinn criter | -2.124315 |
### Financial development and economic growth in BRICS and G-7 countries: a comparative analysis

<table>
<thead>
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<th>t-Statistic</th>
<th>Prob.</th>
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<tr>
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<td>-1.018420</td>
<td>0.3110</td>
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### Effects Specification

- Cross-section fixed (dummy variables)
- Period fixed (dummy variables)

### Additional Statistics

- Durbin-Watson stat: 1.462497
- Prob(F-statistic): 0.022243

---

### Financial development and economic growth in BRICS and G-7 countries: a comparative analysis

Dependent Variable: GDPPP
Method: Panel Least Squares
Date: 10/17/15  Time: 13:31
Sample: 1996 2013
Periods included: 18
Cross-sections included: 7
Total panel (balanced) observations: 126

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<th>Prob.</th>
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</table>

### Effects Specification

- Cross-section fixed (dummy variables)
- Period fixed (dummy variables)

---

Financial development and economic growth in BRICS and G-7 countries: a comparative analysis

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### Financial Development and Economic Growth in BRICS and G-7 Countries: A Comparative Analysis

#### Regression Results

**Dependent Variable:** GDPPP  
**Method:** Panel EGLS (Period random effects)  
**Date:** 10/17/15  
**Time:** 13:33  
**Sample:** 1996-2013  
**Periods included:** 18  
**Cross-sections included:** 7  
**Total panel (balanced) observations:** 126  
**Swamy and Arora estimator of component variances**

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<th>Prob.</th>
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<td>TI</td>
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#### Effects Specification

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<th>S.D.</th>
<th>Rho</th>
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#### Weighted Statistics

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<th>Value</th>
<th>Description</th>
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</thead>
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<td>Mean dependent var</td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.041493</td>
<td>S.D. dependent var</td>
</tr>
<tr>
<td>S.E. of regression</td>
<td>0.060252</td>
<td>Sum squared resid</td>
</tr>
<tr>
<td>F-statistic</td>
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<td>Durbin-Watson stat</td>
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<tr>
<td>Prob(F-statistic)</td>
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#### Unweighted Statistics

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<tr>
<td>Sum squared resid</td>
<td>0.682220</td>
<td>Durbin-Watson stat</td>
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<tr>
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</table>
Redundant fixed effects tests

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section fixed effects

<table>
<thead>
<tr>
<th>Effects Test</th>
<th>Statistic</th>
<th>d.f.</th>
<th>Prob.</th>
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<tbody>
<tr>
<td>Cross-section F</td>
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<tr>
<td>Cross-section Chi-square</td>
<td>4.342759</td>
<td>6</td>
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Cross-section fixed effects test equation:
Dependent Variable: GDPPP
Method: Panel Least Squares
Date: 10/17/15   Time: 13:34
Sample: 1996 2013
Periods included: 18
Cross-sections included: 7
Total panel (balanced) observations: 126

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<th>t-Statistic</th>
<th>Prob.</th>
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</thead>
<tbody>
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<td>0.144615</td>
<td>3.431405</td>
<td>0.0008</td>
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<tr>
<td>IR</td>
<td>0.091745</td>
<td>0.047306</td>
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<td>POP</td>
<td>-0.004542</td>
<td>0.008365</td>
<td>-0.542996</td>
<td>0.5881</td>
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R-squared         0.131327 Mean dependent var 0.031289
Adjusted R-squared 0.102610 S.D. dependent var 0.079892
S.E. of regression 0.075682 Akaike info criterion -2.285684
Sum squared resid  0.693056 Schwarz criterion -2.173133
Log likelihood     148.9981 Hannan-Quinn criter. -2.239958
F-statistic        4.573228 Durbin-Watson stat 1.439760
Prob(F-statistic)  0.001788

BRICS

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section fixed effects

<table>
<thead>
<tr>
<th>Effects Test</th>
<th>Statistic</th>
<th>d.f.</th>
<th>Prob.</th>
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<td>Cross-section Chi-square</td>
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Cross-section fixed effects test equation:
Dependent Variable: GDPPP
Method: Panel Least Squares
Date: 10/17/15   Time: 13:36
Sample: 1996 2013
Periods included: 18
Cross-sections included: 5
Total panel (balanced) observations: 90
<table>
<thead>
<tr>
<th>Variable</th>
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<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
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<tbody>
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R-squared 0.578789  Mean dependent var 0.164348
Adjusted R-squared 0.558967  S.D. dependent var 0.187580
S.E. of regression 0.124572  Akaike info criterion -1.273907
Sum squared resid 1.319053  Schwarz criterion -1.135029
Log likelihood 62.32583  Hannan-Quinn criter. -1.217903
F-statistic 29.19977  Durbin-Watson stat 0.988324
Prob(F-statistic) 0.000000

G-7

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

<table>
<thead>
<tr>
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<th>Chi-Sq. Statistic</th>
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Cross-section random effects test comparisons:

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<th>Var(Diff.)</th>
<th>Prob.</th>
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### CORRELATED RANDOM EFFECTS – HAUSMAN TEST

**BRICS**

Cross-section random effects test equation:
Dependent Variable: GDPPP
Method: Panel Least Squares
Date: 10/17/15    Time: 13:37
Sample: 1996 2013
Periods included: 18
Cross-sections included: 5
Total panel (balanced) observations: 90

<table>
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<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
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**Effects Specification**

Cross-section fixed (dummy variables)

| R-squared | 0.601472 | Mean dependent var | 0.164348 |
| Adjusted R-squared | 0.562111 | S.D. dependent var | 0.187580 |
| S.E. of regression  | 0.124128 | Akaike info criterion | -1.240373 |
| Sum squared resid    | 1.248021 | Schwarz criterion   | -0.990393 |
| Log likelihood      | 64.81681 | Hannan-Quinn criter. | -1.139566 |
| F-statistic         | 15.28096 | Durbin-Watson stat  | 1.017260 |
| Prob(F-statistic)   | 0.000000 |                    |          |
ANNEXURE B

BRICS

Panel unit root test: Summary
Series: GDPPP
Date: 10/16/15    Time: 18:53
Sample: 1996 2013
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 3
Newey-West automatic bandwidth selection and Bartlett kernel

<table>
<thead>
<tr>
<th>Method</th>
<th>Statistic</th>
<th>Prob.**</th>
<th>Cross-sections</th>
<th>Obs</th>
</tr>
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<tr>
<td>Null: Unit root (assumes common unit root process)</td>
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<tr>
<td>Levin, Lin &amp; Chu t*</td>
<td>-24.1509</td>
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<tr>
<td>Null: Unit root (assumes individual unit root process)</td>
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<tr>
<td>Im, Pesaran and Shin W-stat</td>
<td>-11.9361</td>
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<tr>
<td>ADF - Fisher Chi-square</td>
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** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: SMC
Date: 10/17/15    Time: 12:57
Sample: 1996 2013
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 3
Newey-West automatic bandwidth selection and Bartlett kernel

<table>
<thead>
<tr>
<th>Method</th>
<th>Statistic</th>
<th>Prob.**</th>
<th>Cross-sections</th>
<th>Obs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Null: Unit root (assumes common unit root process)</td>
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<tr>
<td>Levin, Lin &amp; Chu t*</td>
<td>-6.67875</td>
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<tr>
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<td>Im, Pesaran and Shin W-stat</td>
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** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: TI
Date: 10/17/15    Time: 12:58
Sample: 1996 2013
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 3
Newey-West automatic bandwidth selection and Bartlett kernel

Financial development and economic growth in BRICS and G-7 countries: a comparative analysis
<table>
<thead>
<tr>
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<th>Prob.**</th>
<th>Cross-sections</th>
<th>Obs</th>
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</thead>
<tbody>
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</table>

Null: Unit root (assumes individual unit root process)

<table>
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<th>Method</th>
<th>Statistic</th>
<th>Prob.**</th>
<th>Cross-sections</th>
<th>Obs</th>
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</thead>
<tbody>
<tr>
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<tr>
<td>PP - Fisher Chi-square</td>
<td>55.2888</td>
<td>0.0000</td>
<td>5</td>
<td>85</td>
</tr>
</tbody>
</table>

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
---
** Date: 10/17/15  Time: 12:58 **
Sample: 1996 2013
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 2
Newey-West automatic bandwidth selection and Bartlett kernel

<table>
<thead>
<tr>
<th>Method</th>
<th>Statistic</th>
<th>Prob.**</th>
<th>Cross-sections</th>
<th>Obs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levin, Lin &amp; Chu t*</td>
<td>-2.61113</td>
<td>0.0045</td>
<td>5</td>
<td>79</td>
</tr>
</tbody>
</table>

Null: Unit root (assumes individual unit root process)

<table>
<thead>
<tr>
<th>Method</th>
<th>Statistic</th>
<th>Prob.**</th>
<th>Cross-sections</th>
<th>Obs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Im, Pesaran and Shin W-stat</td>
<td>-7.37767</td>
<td>0.0000</td>
<td>5</td>
<td>76</td>
</tr>
<tr>
<td>ADF - Fisher Chi-square</td>
<td>63.3513</td>
<td>0.0000</td>
<td>5</td>
<td>79</td>
</tr>
<tr>
<td>PP - Fisher Chi-square</td>
<td>319.275</td>
<td>0.0000</td>
<td>5</td>
<td>85</td>
</tr>
</tbody>
</table>

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
---
** Date: 10/17/15  Time: 12:59 **
Sample: 1996 2013
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 3
Newey-West automatic bandwidth selection and Bartlett kernel

<table>
<thead>
<tr>
<th>Method</th>
<th>Statistic</th>
<th>Prob.**</th>
<th>Cross-sections</th>
<th>Obs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levin, Lin &amp; Chu t*</td>
<td>-1.61690</td>
<td>0.0529</td>
<td>5</td>
<td>76</td>
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</table>

Null: Unit root (assumes individual unit root process)

<table>
<thead>
<tr>
<th>Method</th>
<th>Statistic</th>
<th>Prob.**</th>
<th>Cross-sections</th>
<th>Obs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Im, Pesaran and Shin W-stat</td>
<td>-2.00397</td>
<td>0.0225</td>
<td>5</td>
<td>76</td>
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<tr>
<td>ADF - Fisher Chi-square</td>
<td>21.1645</td>
<td>0.0200</td>
<td>5</td>
<td>76</td>
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<tr>
<td>PP - Fisher Chi-square</td>
<td>13.9083</td>
<td>0.1772</td>
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<td>85</td>
</tr>
</tbody>
</table>

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Financial development and economic growth in BRICS and G-7 countries: a comparative analysis

110
Panel unit root test: Summary
Series: GDPPP
Date: 10/16/15   Time: 18:57
Sample: 1996 2013
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel

<table>
<thead>
<tr>
<th>Method</th>
<th>Statistic</th>
<th>Prob.**</th>
<th>Cross-sections</th>
<th>Obs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Null: Unit root (assumes common unit root process)</td>
<td></td>
<td></td>
<td>7</td>
<td>117</td>
</tr>
<tr>
<td>Levin, Lin &amp; Chu t*</td>
<td>-5.89925</td>
<td>0.0000</td>
<td>7</td>
<td>117</td>
</tr>
</tbody>
</table>

Null: Unit root (assumes individual unit root process)

Im, Pesaran and Shin W-stat                      | -4.24739  | 0.0000  | 7              | 117 |
ADF - Fisher Chi-square                          | 42.2200   | 0.0001  | 7              | 117 |
PP - Fisher Chi-square                           | 34.7550   | 0.0016  | 7              | 119 |

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: SMC
Date: 10/17/15   Time: 12:59
Sample: 1996 2013
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 3
Newey-West automatic bandwidth selection and Bartlett kernel

<table>
<thead>
<tr>
<th>Method</th>
<th>Statistic</th>
<th>Prob.**</th>
<th>Cross-sections</th>
<th>Obs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Null: Unit root (assumes common unit root process)</td>
<td></td>
<td></td>
<td>7</td>
<td>117</td>
</tr>
<tr>
<td>Levin, Lin &amp; Chu t*</td>
<td>-6.31691</td>
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<td>114</td>
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</tbody>
</table>

Null: Unit root (assumes individual unit root process)

Im, Pesaran and Shin W-stat                      | -4.92060  | 0.0000  | 7              | 114 |
ADF - Fisher Chi-square                          | 48.7834   | 0.0000  | 7              | 114 |
PP - Fisher Chi-square                           | 27.9940   | 0.0143  | 7              | 119 |

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: TI
Date: 10/17/15   Time: 13:01
Sample: 1996 2013
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 3
Newey-West automatic bandwidth selection and Bartlett kernel

<table>
<thead>
<tr>
<th>Method</th>
<th>Statistic</th>
<th>Prob.**</th>
<th>Cross-sections</th>
<th>Obs</th>
</tr>
</thead>
</table>

Financial development and economic growth in BRICS and G-7 countries: a comparative analysis

111
Null: Unit root (assumes common unit root process)
Levin, Lin & Chu t* -8.56980 0.0000 7 116

Null: Unit root (assumes individual unit root process)
Im, Pesaran and Shin W-stat -7.05564 0.0000 7 116
ADF - Fisher Chi-square 69.9176 0.0000 7 116
PP - Fisher Chi-square 72.7847 0.0000 7 119

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: IR
Date: 10/17/15 Time: 13:03
Sample: 1996 2013
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel

<table>
<thead>
<tr>
<th>Method</th>
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<th>Prob.**</th>
<th>Cross-sections</th>
<th>Obs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Null: Unit root (assumes common unit root process)</td>
<td>Levin, Lin &amp; Chu t*</td>
<td>-7.47393</td>
<td>0.0000</td>
<td>7</td>
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<tr>
<td>Null: Unit root (assumes individual unit root process)</td>
<td>Im, Pesaran and Shin W-stat</td>
<td>-7.31547</td>
<td>0.0000</td>
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<tr>
<td></td>
<td>ADF - Fisher Chi-square</td>
<td>72.0342</td>
<td>0.0000</td>
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</tr>
<tr>
<td></td>
<td>PP - Fisher Chi-square</td>
<td>72.3131</td>
<td>0.0000</td>
<td>7</td>
</tr>
</tbody>
</table>

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Panel unit root test: Summary
Series: POP
Date: 10/17/15 Time: 13:03
Sample: 1996 2013
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 3
Newey-West automatic bandwidth selection and Bartlett kernel

<table>
<thead>
<tr>
<th>Method</th>
<th>Statistic</th>
<th>Prob.**</th>
<th>Cross-sections</th>
<th>Obs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Null: Unit root (assumes common unit root process)</td>
<td>Levin, Lin &amp; Chu t*</td>
<td>-1.02523</td>
<td>0.1526</td>
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<tr>
<td>Null: Unit root (assumes individual unit root process)</td>
<td>Im, Pesaran and Shin W-stat</td>
<td>-2.34066</td>
<td>0.0096</td>
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<tr>
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<td>ADF - Fisher Chi-square</td>
<td>29.7653</td>
<td>0.0082</td>
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</tr>
<tr>
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<td>PP - Fisher Chi-square</td>
<td>23.9440</td>
<td>0.0465</td>
<td>7</td>
</tr>
</tbody>
</table>

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.