The relationship between the financial sector and economic growth in South Africa

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DECLARATION

I, the undersigned, hereby acknowledge that this dissertation, except where otherwise specified in the text, is my own work and has not been submitted, in part or full, to any other university for the purpose of obtaining a degree.

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ABSTRACT

This study investigates the dynamic causal relationship that exists between financial development, economic growth and investment in South Africa. In order to achieve this objective, the study employs various financial sector indicators to proxy financial development. For the banking sector, the following indicators are used, namely the ratio of broad money stock to GDP, the ratio of broad money stock minus currency to GDP, the ratio of private sector credit to GDP, the ratio of non-financial private credit to total credit, and the ratio of liquid liabilities to GDP. In order to proxy financial development through stock market development, the following indicators are used, namely the ratio of market capitalisation to GDP, the ratio of total value of shares traded to GDP, the turnover ratio, and the stock market volatility calculated over a four quarter moving standard deviation, as well as an equally weighted stock market development index which combines the four former indicators.

In both cases, the recently developed ARDL-Bounds testing procedure is applied to test for the presence of long-run cointegration. In addition, the VECM-Granger approach and Innovative Accounting Approach are applied to generate both in-sample and forecast causality results. In contrast to the majority of previous studies, this study also incorporates investment to develop a simple tri-variate causality model to limit the risk of misspecification bias. Employing time–series data covering the period 1969 to 2013, the in-sample empirical findings, when using banking sector indicators, provide evidence of a short-run bi-directional relationship between financial development and economic growth and a demand-following relationship in the long run. The forecast results provide support for a possible changing long-run relationship, with evidence of bi-directionality being found between financial development and economic growth. The results are less conclusive when using stock market development indicators, with the causal relationship being very sensitive to the proxy used. Nevertheless, these results identified that the causal relationship in question does change when using stock market development indicators, rather than banking sector proxies.

Key words: economic growth; economic development banking sector; South Africa; causality; ARDL; Innovative Accounting Approach; Granger VECM; demand-following; bi-directional

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List of Acronyms and Symbols

ADF	Augmented Dickey-Fuller Test
AIC	Akaike Information Criterion
ARCH	Autoregressive Conditional Heteroskedasticity
ARDL	Autoregressive Distributed Lag
DF-GLS	Dickey-Fuller Generalised Least Squares Test
GMM	Generalised Method of Moments
IAA	Innovative Accounting Approach
I(d)	Integrated of order d
LM	Lagrange Multiplier
M2	M1 plus short-term deposits and medium-term deposits
M3	M2 plus long-term deposits whose duration exceeds six months
PP	Phillips-Perron Test
SARB	South African Reserve Bank
SBC	Schwarz Bayesian Information Criterion
SSA	Sub-Saharan Africa
VAR	Vector Autoregressive Model
VECM	Vector Error-Correction Model

Chapter One: Introduction

1.1 Introduction and Background

South Africa has a highly sophisticated and developed financial sector. The Global Competitiveness Report for 2013/14 ranks South Africa third out of 148 countries in terms of financial market development (World Economic Forum, 2013). Odhiambo (2010b) observed that in 1990, South Africa hosted a total of 36 banks, of which 9 were foreign controlled. He further observed that South Africa hosted a total of 47 banks in 2010, 15 of which were branches of foreign banks. In the fourth quarter of 2014, 73 banks and bank representatives were registered in South Africa, which signified a 55 per cent increase in the number of registered banks over the last four years, and a 102 per cent increase over the last 24 years (South African Reserve Bank, 2015). In addition to the growth in the number of banks in South Africa, Figure 1, below, indicates the growth of three traditional financial development indicators over the period 1969 to 2013.[1]

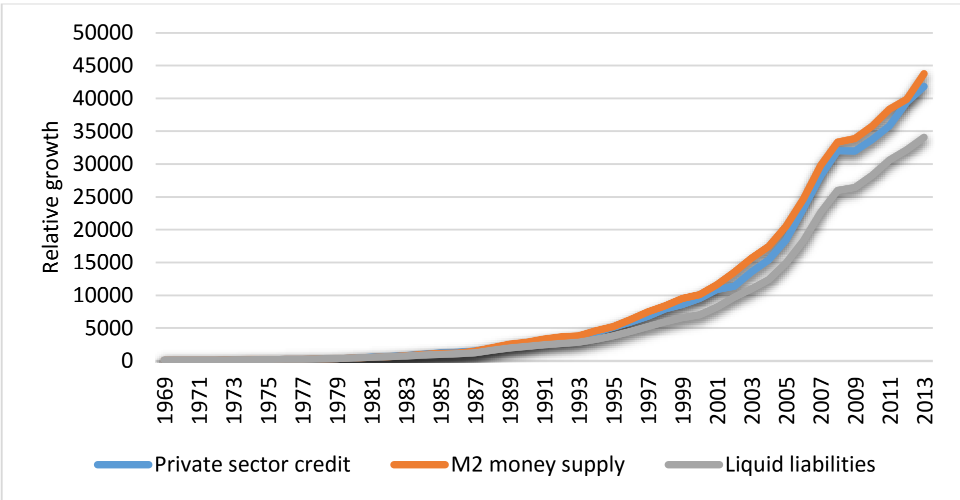

Figure 1. Relative growth of financial development indicators in South Africa during the period 1969 to 2013.

Source: Author's own calculations using data collected from the SARB.

Figure 1 indicates that South Africa's financial development indicators started their growth path in the early 1980s. However, they started growing exponentially from 1990s onward. A slight decline

1 These three indicators are traditionally used by the SARB as proxies for financial development.

can be observed during 2007 to 2009 resulting from the global financial crisis. Nevertheless, the indicators continue to show significant growth thereafter.

South Africa is also home to the Johannesburg Stock Exchange (JSE) which was established in 1887, and according to Odhiambo (2009a), the JSE is regarded as one of the world's largest securities exchanges on the basis of market capitalisation. The South African Futures Exchange (SAFEX) and Bond Exchange of South Africa (BESA) were both established in 1996. By 1999 SAFEX grew from being the 22nd to the 18th largest futures exchange in the world. In the same year it was registered, BESA traded more than 430 000 bonds with a value of $704 billion (Odhiambo, 2010a). The SAFEX and BESA were acquired by the JSE in 2001 and 2009, respectively, which made it possible for the JSE to offer five different markets, namely financial, interest rate derivatives, equities, bonds and commodities.

Currently, the JSE is ranked as the 16th largest stock exchange in the world in terms of market capitalisation. Furthermore, it ranks 1st in the world with regard to regulation and auditing, according to the World Economic Forum (2013). South Africa's strong and well-developed stock market thus offers additional support for arguing that South Africa enjoys a significant level of financial development. The growth in the number of banks registered in South Africa, coupled with the growth in South Africa's financial development indicators and the development of its stock market, give an indication that South Africa has enjoyed significant financial deepening, especially since the 1980s, as indicated by Figure 1. At the same time, however, South Africa's economic growth has consistently shown mixed trends – see Figure 2, below.

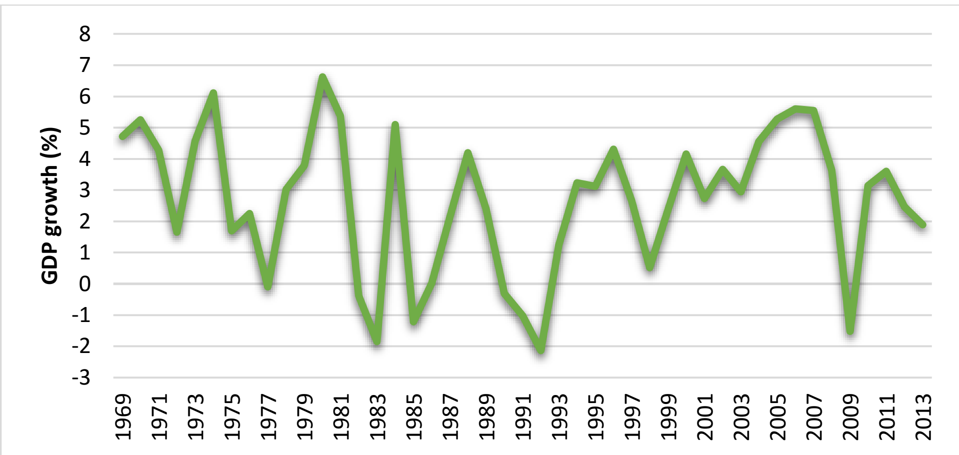

Figure 2. South Africa's GDP growth for the period 1969 to 2013.

Source: Author's own calculations using data from the SARB Bulletin.

During the period 1969–1975, South Africa's average annual GDP growth, in real terms, was 4.0 per cent, while during 1975–1984 South Africa registered an average growth of 2.4 per cent, with 1980 recording the highest growth at 9.2 per cent. The period 1985–1989 experienced a significant decline in growth to an average of 1.4 per cent, the prominent reason being the international sanctions and political instability that occurred during the period (Levy, 1999). Thereafter, for the period 1990–1992, South Africa experienced a negative average annual growth rate of −1.6 per cent. It was only in 1993 that the negative trend was reversed and South Africa was able to grow at an average annual growth rate of 3.0 per cent during the period 1993–1996. Following this relatively high growth period were two consecutive years of declining growth, with 1997 and 1998 registering growths of 2.5 per cent and 0.7 per cent, respectively. The last fifteen years were also highly volatile in terms of economic growth, for example, growth rates for 2000, 2003, 2004, 2005, 2009 and 2013 were 4.2 per cent, 2.8 per cent, 4.5 per cent, 5.0 per cent, −1.5 per cent and 1.9 per cent, respectively.

From the details examined above, an apparent disparity or inconsistency exists between South Africa's economic growth and financial development. Furthermore, only two researchers, namely Agbetsiafa (2004) and Odhiambo (2009b, 2010), have carried out empirical studies for South Africa on the topic in question. The results offered by Agbetsiafa (2004) were indicative of a supply-leading relationship, which means that financial development Granger causes economic growth. In contradiction to these results, Odhiambo (2009a; 2010) identified a demand-following relationship which argues that economic growth Granger causes financial development. The possibility also exists that the relationship may have changed over time. In addition, a general lack of consensus exists regarding this causal relationship. As a result, the question that arises is whether a reliable or consistent causal relationship exists between South Africa's economic growth and financial development.

The current study, therefore, endeavours to answer this question, as well as add to the consensus regarding the finance-growth relationship. In order to achieve these objectives, the study attempts to re-evaluate the relationship between financial development and economic growth with the use of new data, proxies and techniques. The contribution made by the study could help to ensure that current growth policies are properly geared towards the correct relationships influencing South Africa's economic growth enabling the generation of sustainable, long-run growth in the future. Furthermore, the study will assist in better understanding the dynamics that drive both economic growth and financial development in South Africa to provide support in achieving South Africa's current economic objectives of poverty alleviation, inequality reduction and increased employment through higher sustainable growth.

1.2 Statement of Problem

As mentioned in the introduction, South Africa enjoys a highly sophisticated, developed and sufficiently regulated financial market, as is evidenced by South Africa's continued high rankings in the World Economic Forum's (WEF) Global Competitiveness Report. Since the inclusion of a financial market sophistication pillar in the report in 2008, South Africa has been able to sustain a ranking within the top 10 per cent of countries with regard to financial markets sophistication.[2]

Nevertheless, South Africa has not been able to experience the same levels of increased economic growth that often accompanies financial market sophistication[3] (Calderon & Liu, 2003). Consequently, the problem that exists is a possible disconnect between economic growth and financial development. From the introduction, it can be seen that South Africa has been experiencing this problem for the last four decades. As such, it may be possible that South Africa's growth policies are not sufficiently geared to take advantage of the financial market sophistication and thereby improve economic growth.

In addition, a thorough review of the literature, which is provided in Sections 2.2 and 3.2, identifies the problem that much uncertainty exists regarding the causal relationship between financial development and economic growth. This uncertainty holds, regardless of whether the focus is on banking sector or stock market development.[4] Two researchers have investigated this relationship in South Africa, rendering contradictory results. This poses an additional problem since it implies that no consensus has yet been reached in terms of South Africa's finance-growth relationship. As a result, policymakers are confronted with significant difficulty in developing appropriate policies, given the lack of a consensus and, therefore, much research is still required in this regard.

Consequently, the objective of this study is to identify the relationship between South Africa's financial development and economic growth and to compare the results with previous research. The aim is to contribute towards more certainty surrounding the South African finance-growth relationship. Also, the study will attempt to determine whether banking sector or stock market development is a more important driver of economic growth in South Africa.

The following main research questions are formulated based on the above-mentioned description of the research problem:

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2 See WEF's Global Competitiveness Reports since 2008.

3 Examples of countries who have experienced significant growth following financial market sophistication include China, Chile and Brazil (De Rato, 2007).

4 It should be noted that the financial sector as mentioned in the title of this paper refers to both the South African banking and stock market sector.

- 1 – Does a consistent relationship exist between South Africa's financial development and economic growth?
- 2 – Does South Africa's finance-growth relationship differ when using stock market development as a proxy for financial development rather than banking sector development?

In order to answer the above research questions, the following research objectives are set.

1.3 Research Objectives

The research objectives are divided into general and specific objectives. This dissertation follows an article approach, thus consisting of two articles in order to address the two main research questions. The research objectives will thus reflect the general and specific objectives undertaken by each article. These objectives are described in the sections to follow.

1.3.1 General objective

The general objective of the research undertaken by the first article is to determine whether a consistent finance-growth relationship is present in South Africa or whether a different relationship has emerged compared to previous research. The general objective of article two is to investigate whether stock market development offers different results, with regard to the relationship in question, when compared with banking sector development, or whether policy focus should be afforded to the development of both sectors in South Africa.

1.3.2 Specific objectives

On the basis of the general objectives of the dissertation, specific objectives are set for both articles within the dissertation. The specific objectives for article one are to:

- Provide an overview of South Africa's financial sector development and economic growth.
- Give an in-depth review of the literature on the causal relationship between financial development and growth, concentrating on banking sector development as a proxy for financial development.
- Empirically test South Africa's finance-growth relationship using five distinct banking sector development proxies in order to:
    - 1 – Identify which of the two previous researchers' results match the results of the current study.

   - 2 – Examine the time-effect on empirical results by including seven years of additional data, compared with previous studies.
   - 3 – Determine whether a tri-variate model offers better results, compared with a bi-variate model.

The specific objectives for the second article are to:

- Provide an overview of South Africa's financial market reforms and development.
- Provide an in-depth review of the channels through which stock market development influences economic growth, as well as to provide a review of the relevant literature pertaining to the stock market-growth causal relationship.
- Empirically test the causal relationship between South Africa's stock market development and economic growth so as to:
   - 1 – Identify whether the direction of causality changes when employing stock market development proxies.
   - 2 – Provide additional results for a topic that has not yet been extensively researched in South Africa.
   - 3 – To test the response of causality between stock market development and growth by using a proxy not yet applied in the South African context.

In order to achieve these general and specific objectives, an appropriate research methodology will be applied, which will be discussed in the following section.

1.4 Research Methodology

The research methodology followed in this study consists of two phases, namely a literature review and an empirical study.

1.4.1 Phase 1: Literature review

Given that the dissertation follows an article approach, two literature reviews are required for the first phase of the research methodology. Both reviews will provide a thorough evaluation of the finance-growth relationship, although each will concentrate on a different form of financial development. The literature review in the first article will consider banking sector development as a form of financial development. It will attempt to identify the four prevalent views on the finance-growth relationship and offer a better understanding of the variables, proxies and techniques to be used in the empirical study. The second literature review will consider stock market development as a form of financial development. It will attempt to identify the four channels by which stock market development influences economic growth, as well as the arguments by the non-conformers of the stock market-growth relationship.

1.4.2 Phase 2: Empirical study

The empirical study of the research methodology consists of the research method, data and econometric analysis that will be followed throughout the study.

1.4.2.1 Research Method

The aim of the research design is to offer a workable structure in order to enable the empirical approach to achieve the various general and specific objectives of the study. The research method can be classified as being purely quantitative, which will allow econometric analysis of South Africa's finance-growth relationship. A quantitative research method is the most appropriate for the given study since the objectives are quantitative in nature. Furthermore, quantifiable results generated from this method can be used to identify more accurate and verifiable development policies.

The specific design that will be used is a time series analysis. Time series analysis offers an appropriate design as it will enable the study to test whether relationships change over time. Furthermore, previous studies for South Africa, which are being re-evaluated by the current study, have used time series analysis and therefore this requires the current study to employ time series analysis, if the results are to be compared. Considering that the current study is a country-specific study, the design is appropriate as it is able to take into account the country-specific characteristics of South Africa (Quah, 1993; Caselli, Esquivel, & Lefort 1996; Ghirmay 2004; Odhiambo 2008, 2009a).

1.4.2.2 Data

As mentioned, the dissertation consists of two articles which employ different proxies to represent banking sector and stock market development. The data that will be used in article one consists of annual time series data for South Africa, covering the period 1969 to 2013. The data consists of five banking sector proxies, real GDP per capita, and gross fixed capital formation. The four banking sector proxies include the ratio of broad money stock to GDP, the ratio of broad money stock minus currency to GDP, the ratio of private sector credit to GDP, the ratio of non-financial private credit to total credit and the ratio of liquid liabilities to GDP.

The data for the second article consists of quarterly time series data for South Africa over the period 1989 to 2013. The reason for the shorter time period in the second article is warranted by a limitation on data availability. The data also consists of five stock market development proxies, real GDP per capita and gross fixed capital formation. The five proxies include the ratio of market capitalisation to GDP, the ratio of total value of shares traded to GDP, the turnover ratio, and stock market volatility calculated as a four quarter moving standard deviation, together with an equally weighted stock market development index which combines the four former indicators. The data for both articles will be garnered from different sources including the SARB's historical time series data, World Bank's Data Bank, and data from the JSE. Both articles will include gross fixed capital formation as the third additional variable to develop a tri-variate model. Real GDP per capita will be used in both articles to proxy economic growth as is the norm in previous studies. The rationale for including five proxies in each article is to contribute to the development of a consensus regarding the relationship in question.

1.4.2.3 Econometric Analysis

Even though the dissertation is article based, the econometric techniques for both articles will be the same in order to allow comparison of results between the two articles. Both articles will use descriptive statistics to provide an overview of the data used in the econometric analysis. Three main econometric techniques will be applied in both articles namely, an autoregressive distributed lag (ARDL)-Bounds testing procedure designed by Pesaran and Shin (1999), a Granger causality test as employed by Narayan and Smyth (2008), and an Innovative Accounting Approach (IAA) developed by Shan (2005). The ARDL-bounds procedure will be used to examine the long-run cointegration relationship between financial development, economic growth and investment. However, before the ARDL-bounds procedure can be applied, it is important to test for stationarity using unit root tests. The unit root tests are needed to identify any possible data series that are integrated of order two. Those that are integrated of order two will not be used as they undermine the validity of the results (Pesaran, Shin & Smith, 2001). Only after the long-run relationships have been identified by the ARDL-bounds procedure will the Granger causality test be applied. The Granger causality test will test the short, long and joint causal relationships between financial development, economic growth and investment. Lastly, the Innovative Accounting Approach (IAA) will be applied in order to provide out-of-sample results for the causal relationships.

1.5 Chapter Division

The remainder of the dissertation will be organised as follows. Chapter 2 presents the first article which will focus on banking sector proxies as a form of financial development. In Chapter 3, the second article is presented which makes use of stock market development as a proxy for financial development in South Africa. Both articles, within their respective chapters, are divided into sections containing an introduction, literature review, empirical study, results and conclusion. Lastly, chapter 4 will provide an overarching conclusion to the dissertation and also offer recommendations and limitations depending on results. Furthermore, an evaluation of the study's strengths and weaknesses will also be included, as well as scope for further research.

Chapter Two: Banking Sector Development

2.1 Introduction

Since the seminal work of Schumpeter (1911), theoretical and empirical literature sources have given considerable attention to the causal relationship between financial development and economic growth due to the important implications that such research holds for development policy. Still, there has been significant debate regarding the direction of causality between financial development and economic growth since the early twentieth century (Odhiambo, 2010). The main drive behind this debate revolves around whether growth in the real sector is caused by growth in the financial sector through the dynamic process of economic development or, whether it is development in the real sector that drives financial sector development. Traditionally, the majority of studies in this area of research have relied on banking sector development to serve as a proxy for financial development.

Nevertheless, Odhiambo (2010) argues that there are three key limitations that previous empirical studies tend to suffer from, the first of which is the use of bivariate causality tests. The majority of previous studies tend to concentrate on developing a bivariate causality model, therefore, increasing the model's risk of exposure to an omitted-variable or misspecification bias. Stated differently, these previous studies fail to capture the effect that a third variable, affecting both financial development and economic growth, would have on the direction of causality between financial development and economic growth, as well as the magnitude of estimates within the causality system. It may thus be possible for such a variable to significantly alter the causal relationship between financial development and economic growth.

Secondly, the majority of previous studies tend to examine the causal relationship between financial development and economic growth by mainly relying on cross-sectional data. The problem, however, stemming from the use of cross-country analysis, which lumps together different countries at different stages of their financial and economic development, is its tendency to inadequately address country-specific effects and so only provide pooled estimates regarding the causal relationship between financial development and economic growth. Lastly, the cointegration approaches employed by the majority of previous studies included the Engle and Granger residual-based cointegration test developed by Engle and Granger (1987) and the maximum-likelihood-estimation cointegration approach based on the work by Johansen (1988) and Johansen and Juselius (1990). Recently, however, studies such as Narayan and Smyth (2005), among others, have argued that the two above-mentioned cointegration approaches tend to be inappropriate for studies involving small sample sizes. Furthermore, these studies require all input variables to be integrated of the same order, which often limits the scope of an empirical investigation.

This study, therefore, departs from the traditional studies with the aim of overcoming the problems outlined above. In addition, the study attempts to contribute to the available literature surrounding the causal relationship between South Africa's financial development and economic growth, such that appropriate development policy recommendations may be provided. The second objective of this study follows, as mentioned in the introductory chapter, from the fact that no consensus has yet been reached regarding the relationship between financial development and economic growth in South Africa. In order to achieve these objectives, the study:

(i) Develops a simple tri-variate model by incorporating investment as the third variable, which influences both financial development and economic growth. The choice of constructing a tri-variate causality framework by including investment as the third variable largely follows the economic theory behind investment and financial development on the one side, and investment and economic growth, on the other.

(ii) Employs a time series approach in the case of South Africa for the period 1969 to 2013.

(iii) Uses the recently developed ARDL-Bounds testing approach to perform cointegration analysis between financial development, economic growth and investment.

(iv) Employs five distinct financial development proxies, namely the ratio of broad money stock to GDP, the ratio of broad money stock minus currency to GDP, the ratio of private sector credit to GDP, the ratio of non-financial private credit to total credit, and the ratio of liquid liabilities to GDP.

The remainder of the chapter is structured as follows. Section 2 provides a review of the literature pertaining to the relationship between financial development and economic growth. Section 3 provides a description of the data, while Section 4 discusses the econometric methodology employed. The empirical results are presented in Section 5, with Section 6 concluding the chapter.

2.2 Literature Review

Following the inception of research into the relationship between financial depth and economic growth, different views have been held by researchers. A study by Patrick (1966) distinguished between two main views. The first view, known as the supply-leading phenomenon, contends that financial development causes economic growth (Mckinnon, 1973; Shaw, 1973; King & Levine, 1993a). The reason, as argued by Jung (1986), is that development in the financial sector tends to precede economic growth and thereby offers a channel through which scarce resources are redirected to large investors through small savers, which drives growth in the economy. In contrast, the second view is known as the demand-following response which argues that without economic growth, financial development would not occur (Robinson, 1962; Friedman & Schwartz, 1963; Demetrides & Hussein, 1996). This view argues that economic growth is the cause of financial development within an economy. For a significant period of time these two views were considered as the only two responses regarding the relationship between financial development and economic growth, with many a researcher favouring the supply-leading view, as is evident from the review to follow. In recent years, however, new data and modelling techniques have led to the development of four distinct possibilities regarding the relationship that exists between financial depth and growth in the economy.

The first of these possibilities, as identified by Graff (1999), is that there is no causal relationship between financial development and economic growth. This view implies that even though financial development and economic growth appear to follow a similar pattern, the observed correlation between them is the result of nothing more than a historical particularity and that both follow their own distinct paths. The second view, as mentioned above, is the supply-leading response which argues that financial development is a determining factor of economic growth, in other words, the causal relationship flows from financial development to economic growth. Researchers supportive of the supply-leading view include Mckinnon (1973), Shaw (1973), King and Levine (1993a) and Levine and Zervos (1998a; 1998b). The third possibility or view is the demand-following phenomenon which assumes that economic growth is the driver of financial development. The view pertains that growth of the real sector produces increased demand for financial services and thus brings about an increased demand for financial development. This hypothesis is supported by numerous researchers, including Robinson (1962), Friedman and Schwartz (1963), Demetrides and Hussein (1996), Singh and Weisse (1998), and Ireland (1994). The last hypothesis argues that a bi-directional relationship exists between financial development and economic growth which empirically means that financial development and economic growth are able to Granger-cause each other (Demetrides & Hussein, 1996). Consequently, the literature review will follow a thematic structure based on the four hypotheses mentioned above.

The seminal work of Mckinnon (1973) and Shaw (1973) found that financial development is able to contribute to economic growth through its ability to raise a country’s savings rate and thereby increase its investment rate and economic growth. Consequently, these studies offered the initial support for the supply-leading hypothesis. Studies undertaken by De Gregorio and Guidotti (1995), Ahmed and Ansari (1998), Rajan and Zingales (1998), Calderon and Liu (2003), Christopoulos and Tsionas (2004), and Habibullah and Eng (2006) used panel data in order to determine the causal relationship between finance and growth. The results of these studies pointed towards a supply-leading causal relationship. De Gregorio and Guidotti (1995) made use of the ratio of bank credit to nominal GDP as a proxy for financial development and further concluded that the effects of the supply-leading relationship tend to diverge over time and across countries. Drawing on a Geweke decomposition test, Calderon and Liu (2003) identified that financial deepening offered a larger contribution to the growth of a developing economy, compared with an industrial economy. Moreover, their results proved that the longer the sampling period is, the larger is the positive effect flowing from finance to growth.

This result provides a contrasting view to that observed by De Gregorio and Guidotti (1995). The supply-leading effect discovered by Habibullah and Eng (2006) was performed by using a generalised method of moments (GMM) technique and causality testing analysis for 13 developing Asian countries. Using a different method, Christopoulos and Tsionas (2004) applied a panel-based vector error-correction model in conjunction with unit root tests and co-integration analysis, with results pointing to a supply-leading effect. Developing regression equations on the basis of a Cobb-Douglas production function and using a standard Granger causality test, Ahmed and Ansari (1998) investigated the supply-leading hypothesis and, as mentioned, found support for the hypothesis.

Two studies for Sub-Saharan African (SSA) countries found a supply-leading relationship between the depth of the financial sector and economic growth (Spears 1992; Agbetsiafa 2004). Using a sample of cross-country data, Spears (1992) concluded that in the early stages of a country's development, a definitive link exists between financial development and economic growth, but the results vary depending on the financial development proxy used. Combining the Johansen and Juselius co-integration test with a Granger causality test, Agbetsiafa (2004) reported results indicating both supply-leading and demand-following causality. For South Africa, the results pointed to a supply-leading effect.

Bhattacharya and Sivasubramanian (2003) made use of a ratio of liquid liabilities to nominal GDP to identify that, for the period 1970 to 1999, India's financial development led to growth in GDP. In comparison, Suleiman and Aamer (2008) used four financial development proxies – the ratio of M2 to nominal GDP, the ratio of M2 minus currency to nominal GDP, the ratio of bank credit to private sector on nominal GDP and the ratio of private credit to total domestic credit. The results confirmed that financial sector deepening is an important instrument for long-term economic growth. A study by Choe and Moosa (1999) maintained that banking sector development offers more significant influence to growth than capital market development does. Numerous studies opted for a cross-sectional methodology on national data in order to determine the relationship that exists between financial development and economic growth (Gelb 1989; Fry 1995, 1997; King & Levine 1993a, 1993b; Levine 1997, 1998; Levine & Zervos 1998a, 1998b). These studies provided significant support for the supply-leading hypothesis. Additional empirical studies that offer support for the supply-leading hypothesis include Jung (1986), Greenwood and Jovanovic (1990), Bencivenga and Smith (1991), Odedokun (1996), Thakor (1996), Rajan and Zingales (1998), Ghali (1999), and Jalilian and Kirkpatrick (2002).

Empirical studies that have questioned the apparent importance that a well-developed financial sector holds for promoting economic growth include Robinson (1952), Stiglitz (1994) and Singh and Weisse (1998). The main argument of these studies follows the notion that through enhanced economic growth, a country's financial sector will develop as a result of increased demand for financial services. Other studies that argue in favour of the demand-following hypothesis include Friedman and Schwartz (1963), Crichton and de Silva (1989), Ireland (1994), Demetrides and Hussein (1996), Shan, Morris and Sun (2001), Agbetsiafa (2004), Waqabaca (2004), Odhiambo (2007; 2008; 2010), and Zang and Kim (2007). Demetrides and Hussein (1996), Shan, Morris and Sun (2001) and Waqabaca (2004) examined the demand-following relationship using time-series data. These studies argued in favour of a time-series approach due to its superiority over a cross-sectional approach and the inability of cross-sectional data to capture country-specific characteristics and avoid treating countries as homogeneous entities. Demetrides and Hussein (1996) made use of two financial development proxies, the ratio of bank deposit liabilities to nominal GDP and the ratio of bank claims on the private sector to nominal GDP, and concluded that the directional causality of the countries studied were largely bi-directional, although evidence of demand following causality was also found.

Shan, Morris and Sun (2001) and Waqabaca (2004) performed regression analysis using a bi-variate vector autoregressive (VAR) framework, arguing that it offers the opportunity to avoid technical problems usually encountered by other time-series frameworks. Studies on SSA countries were undertaken by Agbetsiafa (2004) and Odhiambo (2007; 2010). Agbetsiafa (2004) used a Johansen and Juselius co-integration test and a causality test based on an error-correction model. The results were largely indicative of a supply-leading effect, including the results for South Africa, but two of the eight countries showed a demand-following phenomenon. Odhiambo (2007) made use of data from three SSA countries and three distinct financial development proxies. The results concluded that the finance-growth relationship varies across countries and over time, with Kenya and South Africa showing a demand-following relationship, and Tanzania, a supply-leading relationship. Transforming the original bi-variate model of finance and growth into a simple tri-variate model by including investment, Odhiambo (2010) was able to use the ARDL-bounds framework developed by Pesaran and Shin (1999) to study South Africa's finance-growth relationship. In addition, three specific proxies for financial development were also used, namely the ratios of broad money to GDP, liquid liabilities to GDP and private sector credit to GDP. The results indicated, by and large, the presence of a demand-following relationship. The studies by Odhiambo (2008; 2010) argued in favour of employing a tri-variate model, since a bi-variate model is prone to the problem of variable omission bias.

Notwithstanding the studies that argue in favour of the supply-leading hypothesis and the demand-following hypothesis, numerous alternative empirical studies have found results that offer support for a bi-directional causality between financial development and economic growth. For example, Arestis and Demetriades (1997), Akinboade (1998), and Odhiambo (2005) all opted for the Johansen co-integration methodology in order to study the finance-growth nexus. Arestis and Demetriades (1997) provided evidence of bi-directionality and further maintained that the use of cross-sectional data poses a risk to the validity of a study's results due to its inability to consider individual country circumstances. Including two financial development proxies – the ratio of broad money to GDP and the ratio of liquid liabilities to GDP – Akinboade (1998) observed that financial development causes, and is also caused by, economic growth. Odhiambo (2005) upheld the fact that results depended significantly on the financial development proxy used, with a supply-leading effect being predominant for the proxy of broad money to GDP. The two remaining proxies – the ratio of currency to narrow money demand and the ratio of bank claims on the private sector to GDP – generated results in support of a bi-directional relationship.

Studies that employed autoregressive modelling techniques include Wood (1993), Luintel and Khan (1999), Hondroyiannis, Lolos and Papapetrou (2005), and Suleiman and Aamer (2008). Wood (1993) employed Hsiao's (1979) autoregressive modelling technique in order to identify the relationship that existed between the development of finance and economic growth in Barbados over the period 1946–1990. The results of this study showed evidence of a bidirectional causal relationship. Assessing the causal relationship between finance and growth in Greece over the period 1986 to 1999, Hondroyiannis, Lolos and Papapetrou (2005) were able to verify bi-directional causality by using a VAR technique modelling framework. Furthermore, the authors stated that banking sector development contributes significantly to economic growth by means of improved financial development. Similar to Odhiambo (2008; 2010), the study by Suleiman and Aamer (2008) developed a tri-variate VAR model by including investment as the third variable. The study found significant evidence of bi-directionality for Egypt's financial sector development and growth in GDP. Additional empirical studies that conform to the consensus of a bi-directional phenomenon include Demetrides and Hussein (1996), Greenwood and Smith (1997), Shan, Morris and Sun (2001), Al-Yousif (2002), Calderon and Liu (2003), and Chuah and Thai (2004).

The hypothesis that no causal relationship exists between financial development and economic growth was pioneered by Lucas (1988). The study argued that even though an observed correlation between finance and growth exists, the two factors may not be causally related. It states that the correlation may merely be caused by the embedded nature of their trending paths, in other words, both factors may be regarded as trending in the same direction, when in fact they are both independent of each other. Lucas (1988:42) stated that "economists badly overstress the role of financial factors in economic growth." Considering panel data covering 93 countries over the period 1970 to 1990, Graff (1999) implemented cross-country regression analysis to identify the relationship between finance and growth. The results confirmed that finance plays an important role for economic growth, especially in less-developed countries. Nevertheless, the results were unable to support the notion of a stable finance-growth nexus which, in turn, offered support for the no causality hypothesis.

The preceding section provided an examination of available literature regarding the relationship between financial development and growth, relying largely on banking sector development. The section to follow will provide a description regarding the data to be used in the current study, as well as the sources from which the data were garnered.

2.3 Data Description, Sources and Definitions

2.3.1 Data Description

Abu-Bader and Abu-Qarn (2008) argue that financial development, in whichever form, encompasses the interaction of numerous activities and institutions. As a result, fully capturing financial development in a single proxy is simply impossible. This paper, therefore, employs five distinct financial development proxies for the purpose of ensuring robust results regarding the relationship between financial development, economic growth and investment.

The first measure used has been commonly employed in the literature by researchers such as Mckinnon (1973), Shaw (1973), Gelb (1989) and King and Levine (1993a), amongst others. This measure represents the ratio of broad money stock, M2, to real GDP. The use of this measure conforms well to the outside money model developed by McKinnon which states that before self-financed investment is possible, accumulation of money balances is required. The debt-intermediation approach developed by Gurley and Shaw (1955) and Shaw (1973) does, however, not support the use of this measure as a financial development proxy. They argue that, especially in developing economies, broad money stock comprises a large portion of currency held outside the banking system. Consequently, an increase in this proxy could lead to a very limited indication as regards the degree of financial intermediation by a country's banking institutions and simply reflects a more extensive use of currency. Nonetheless, the measure, henceforth referred to as $M2GDP$, is employed to offer robustness of results and comparison with other studies.

To serve as an alternative to the first measure, Demetrides and Hussein (1996) proposed using the ratio of broad money stock minus currency to real GDP as a measure of financial development. As such, this second measure considers only the currency within the banking system, which serves to eliminate the criticism found in the first measure and offers a more representative measure of financial development and specifically, the degree of financial intermediation within the market. This measure offers the second proxy of financial development for the current study and is referred to as $M2CGDP$.

The third measure to be employed is the ratio of private sector credit to real GDP. This proxy has been used by numerous researchers, including King and Levine (1993a; 1993b), Demetrides and Hussein (1996), and Beck, Levine and Loayza (2000). The advantage that this measure holds, compared with $M2GDP$ and $M2CGDP$, is its ability to offer an assessment regarding the allocation of financial assets within the market. An increase in private financial savings will result in an increase of both $M2GDP$ and $M2CGDP$, although this does not mean that private sector credit, which is essentially responsible for the quality and quantity of investment within the market, will increase, assuming higher reserve requirements. Therefore, it is important to employ private sector credit individually in order to provide more evident information regarding the quantity and efficiency of investment within the market and thus its influence on economic growth. This proxy will be referred to as $PRIVS$.

The ratio of non-financial private credit to total domestic credit is the fourth financial development proxy employed by this study and is referred to as $CREDR$. According to Abu-Bader and Abu-Qarn (2008), this ratio offers to capture the credit distribution role between the private and public sector. The reasoning behind this proxy is that an increase in the ratio should indicate that the flow of credit within the private and public sectors has increased. As such, more funds are available for investment, which should positively influence economic growth. The final measure used is the ratio of liquid liabilities to real GDP, referred to as LLB. The use of this measure, as well as $M2GDP$ and $PRIVS$, is supported by the fact that they constitute the basic financial development indicators used by the South African Reserve Bank (SARB). This ratio has also been employed by Odhiambo (2010), which is one of the comparison studies, therefore including LLB in the current study should offer important comparative results.

Following the work of Gelb (1989), Sala-i-Martin (1994), King and Levine (1993a; 1993b), Demetrides and Hussein (1996), Arestis and Demetriades (1997), Shan, Morris and Sun (2001), Al-Yousif (2002), Abu-Bader and Abu-Qarn (2008), and Odhiambo (2010), the current study employs real GDP per capita, $RGDPPC$, as an indicator for economic growth. In addition, a third variable is introduced into the regression system, namely the ratio of real private investment to real GDP, referred to as $RINV$. The reason for incorporating the investment rate is to develop a simple tri-variate model so as to limit the risk of omitted variable or model specification bias. Furthermore, Abu-Bader and Abu-Qarn (2008) and Odhiambo (2010) argue that this investment variable is one of a few economic variables that offer a robust correlation to both economic growth and the financial development indicators following the theoretical links between the variables.

2.3.2 Data Sources and Variable Definitions

This study employs annual time series data covering the period 1969 to 2013 for all variables, with the exception of the ratio of broad money stock, minus currency to real GDP which is only available for the period 1979 to 2013. The three sources from which raw data were obtained include the SARB, the World Bank and the International Monetary Fund. The variables used in the regression analysis are defined as follows:

1. $M2GDP$ = the ratio of broad money stock to real GDP. Nominal value of M2 was deflated using the consumer price index (2010 = 100).

2. $M2CGDP$ = the ratio of broad money stock minus currency to real GDP. Nominal value of M2 was deflated using the consumer price index (2010 = 100).

3. $PRIVS$ = the ratio of private sector credit to real GDP. Nominal value of private sector credit was deflated using the consumer price index (2010 = 100).

4. $CREDR$ = the ratio of real non-financial private credit to real total credit (2010 = 100).

5. LLB = the ratio of liquid liabilities (M3) to real GDP. Nominal value of M3 was deflated using the consumer price index (2010 = 100).

6. $RGDPPC$ = real per capita GDP (2010 = 100).

7. $RINV$ = the investment rate calculated as the ratio of real private investment to real GDP (2010 = 100).

All ratio variables were calculated using real terms (constant 2010 prices) for both the numerator and denominator. The growth variable, $RGDPPC$, is also expressed in real terms. The use of real terms, especially for the growth variable, is justified to eliminate the effects that price level changes may have on regression results. Lastly, all variables employed are transformed into their natural logarithmic forms for the purpose of ensuring an approximately normal distribution for each variable. Also, logarithmic transformation assists in providing a non-linear relationship between the dependent and independent variables, while simultaneously preserving the linearity of the regression model (Benoit, 2011). The section to follow will examine the estimation techniques that will be employed to study the relationship between financial development, economic growth and investment.

2.4 Empirical Methodology

2.4.1 ARDL-Bounds Testing Procedure

The Autoregressive Distributed Lag (ARDL) approach developed by Pesaran and Shin (1999) was later extended into the ARDL-bounds testing procedure by Pesaran, Shin and Smith (2001). This ARDL-bounds procedure is employed in order to test whether a long-run cointegration relationship exists between financial development, economic growth and investment. Five distinct models are estimated, one for each financial development proxy used. The five models can be expressed as the following unrestricted error-correction models.

Model 1a: M2GDP, Economic Growth and Investment

$$\Delta lnM2GDP_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta lnM2GDP_{t-i} + \sum_{i=0}^{n} \alpha_{2i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \alpha_{3i} \Delta lnRGDPPC_{t-i} + \alpha_4 lnM2GDP_{t-1} + \alpha_5 lnRINV_{t-1} + \alpha_6 lnRGDPPC_{t-1} + e_{1t} \quad (1)$$

$$\Delta lnRGDPPC_t = \gamma_0 + \sum_{i=1}^{n} \gamma_{1i} \Delta lnRGDPPC_{t-i} + \sum_{i=0}^{n} \gamma_{2i} \Delta lnM2GDP_{t-i} + \sum_{i=0}^{n} \gamma_{3i} \Delta lnRINV_{t-i} + \gamma_4 lnRGDPPC_{t-1} + \gamma_5 lnM2GDP_{t-1} + \gamma_6 lnRINV_{t-1} + e_{2t} \quad (2)$$

$$\Delta lnRINV_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \beta_{2i} \Delta lnM2GDP_{t-i} + \sum_{i=0}^{n} \beta_{3i} \Delta lnRGDPPC_{t-i} + \beta_4 lnRINV_{t-1} + \beta_5 lnM2GDP_{t-1} + \beta_6 lnRGDPPC_{t-1} + e_{3t} \quad (3)$$

Model 2a: M2CGDP, Economic Growth and Investment

$$\Delta lnM2CGDP_t = \delta_0 + \sum_{i=1}^{n} \delta_{1i} \Delta lnM2CGDP_{t-i} + \sum_{i=0}^{n} \delta_{2i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \delta_{3i} \Delta lnRGDPPC_{t-i} + \delta_4 lnM2CGDP_{t-1} + \delta_5 lnRINV_{t-1} + \delta_6 lnRGDPPC_{t-1} + \varepsilon_{1t} \quad (4)$$

$$\Delta lnRGDPPC_t = \vartheta_0 + \sum_{i=1}^{n} \vartheta_{1i} \Delta lnRGDPPC_{t-i} + \sum_{i=0}^{n} \vartheta_{2i} \Delta lnM2CGDP_{t-i} + \sum_{i=0}^{n} \vartheta_{3i} \Delta lnRINV_{t-i} + \vartheta_4 lnRGDPPC_{t-1} + \vartheta_5 lnM2CGDP_{t-1} + \vartheta_6 lnRINV_{t-1} + \varepsilon_{2t} \quad (5)$$

$$\Delta lnRINV_t = \theta_0 + \sum_{i=1}^{n} \theta_{1i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \theta_{2i} \Delta lnM2CGDP_{t-i} + \sum_{i=0}^{n} \theta_{3i} \Delta lnRGDPPC_{t-i} + \theta_4 lnRINV_{t-1} + \theta_5 lnM2CGDP_{t-1} + \theta_6 lnRGDPPC_{t-1} + \varepsilon_{3t} \quad (6)$$

Model 3a: PRIVS, Economic Growth and Investment

$$\Delta lnPRIVS = \lambda_0 + \sum_{i=1}^{n} \lambda_{1i} \Delta lnPRIVS_{t-i} + \sum_{i=0}^{n} \lambda_{2i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \lambda_{3i} \Delta lnRGDPPC_{t-i} + \lambda_4 lnPRIVS_{t-1} + \lambda_5 lnRINV_{t-1} + \lambda_6 lnRGDPPC_{t-1} + \epsilon_{1t} \quad (7)$$

$$\Delta lnRGDPPC_t = \pi_0 + \sum_{i=1}^{n} \pi_{1i} \Delta lnRGDPPC_{t-i} + \sum_{i=0}^{n} \pi_{2i} \Delta lnPRIVS_{t-i} + \sum_{i=0}^{n} \pi_{3i} \Delta lnRINV_{t-i} + \pi_4 lnRGDPPC_{t-1} + \pi_5 lnPRIVS_{t-1} + \pi_6 lnRINV_{t-1} + \epsilon_{2t} \quad (8)$$

$$\Delta lnRINV_t = \xi_0 + \sum_{i=1}^{n} \xi_{1i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \xi_{2i} \Delta lnPRIVS_{t-i} + \sum_{i=0}^{n} \xi \, \Delta lnRGDPPC_{t-i} + \xi_4 lnRINV_{t-1} + \xi_5 lnPRIVS_{t-1} + \xi_6 lnRGDPPC_{t-1} + \epsilon_{3t} \quad (9)$$

Model 4a: CREDR, Economic Growth and Investment

$$\Delta lnCREDR_t = \phi_0 + \sum_{i=1}^{n} \phi_{1i} \Delta lnCREDR_{t-i} + \sum_{i=0}^{n} \phi_{2i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \phi_{3i} \Delta lnRGDPPC_{t-i} + \phi_4 lnCREDR_{t-1} + \phi_5 lnRINV_{t-1} + \phi_6 lnRGDPPC_{t-1} + \varphi_{1t} \quad (10)$$

$$\Delta lnRGDPPC_t = \varrho_0 + \sum_{i=1}^{n} \varrho_{1i} \Delta lnRGDPPC_{t-i} + \sum_{i=0}^{n} \varrho_{2i} \Delta lnCREDR_{t-i} + \sum_{i=0}^{n} \varrho_{3i} \Delta lnRINV_{t-i} + \varrho_4 lnRGDPPC_{t-1} + \varrho_5 lnCREDR_{t-1} + \varrho_6 lnRINV_{t-1} + \varphi_{2t} \quad (11)$$

$$\Delta lnRINV_t = \psi_0 + \sum_{i=1}^{n} \psi_{1i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \psi_{2i} \Delta lnCREDR_{t-i} + \sum_{i=0}^{n} \psi_{3i} \Delta lnRGDPPC_{t-i} + \psi_4 lnRINV_{t-1} + \psi_5 lnCREDR_{t-1} + \psi_6 lnRGDPPC_{t-1} + \varphi_{3t} \quad (12)$$

Model 5a: LLB, Economic Growth and Investment

$$\Delta lnLLB_t = \tau_0 + \sum_{i=1}^{n} \tau_{1i} \Delta lnLLB_{t-i} + \sum_{i=0}^{n} \tau_{2i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \tau_{3i} \Delta lnRGDPPC_{t-i} + \tau_4 lnLLB_{t-1} + \tau_5 lnRINV_{t-1} + \tau_6 lnRGDPPC_{t-1} + \omega_{1t} \quad (13)$$

$$\Delta lnRGDPPC_t = \upsilon_0 + \sum_{i=1}^{n} \upsilon_{1i} \Delta lnRGDPPC_{t-i} + \sum_{i=0}^{n} \upsilon_{2i} \Delta lnLLB_{t-i} + \sum_{i=0}^{n} \upsilon_{3i} \Delta lnRINV_{t-i} + \upsilon_4 lnRGDPPC_{t-1} + \upsilon_5 lnLLB_{t-1} + \upsilon_6 lnRINV_{t-1} + \omega_{2t} \quad (14)$$

$$\Delta lnRINV_t = \varphi_0 + \sum_{i=1}^{n} \varphi_{1i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \varphi_{2i} \Delta lnLLB_{t-i} + \sum_{i=0}^{n} \varphi_{3i} \Delta lnRGDPPC_{t-i} + \varphi_4 lnRINV_{t-1} + \varphi_5 lnLLB_{t-1} + \varphi_6 lnRGDPPC_{t-1} + \omega_{3t} \quad (15)$$

where: $lnM2GDP$ = logarithmic transformation of the ratio of broad money stock to real GDP; $lnM2CGDP$ = logarithmic transformation of the ratio of broad money stock minus currency to real GDP; $lnPRIVS$ = logarithmic transformation of the ratio of private sector credit to real GDP; $lnCREDR$ = logarithmic transformation of the ratio of real non-financial private credit to real total credit; $lnLLB$ = logarithmic transformation of the ratio of liquid liabilities (M3) to real GDP; $lnRINV$ = logarithmic transformation of the rate of investment; $lnRGDPPC$ = logarithmic transformation of real GDP per capita; e_t, ε_t, ϵ_t, φ_t and ω_t = white noise error terms; Δ = first difference operator.

The ARDL-bounds procedure has numerous advantages when compared with other cointegration testing techniques. The first advantage is its ability to make provision for finite samples which eliminates the potential for small sample bias. Pattichis (1999) argues that because of its ability to avoid short-run dynamics from being pushed into the residual term, the bounds testing procedure also offers more statistically sound properties, compared with the Engle-Granger technique. The third advantage is related to the procedure's assumption regarding the order of integration of regression variables. The ARDL approach does not require the restrictive assumption imposed by other cointegration techniques where the order of integration of all variables under study is required to be the same. Owing to this, Mah (2000) argues that the bounds testing procedure remains valid regardless of whether a variable is integrated of order one or zero [I(1) or I(0)]. It should, however, be mentioned that no variables integrated of order two [I(2)] should be permitted when applying this approach as they have the potential to invalidate the regression results (Pesaran *et al*, 2001). The fourth advantage of the bounds testing procedure, identified by Tang (2004; 2005), is its ability to correct for residual serial correlation regardless of the endogeneity of explanatory variables. Furthermore, the bounds procedure provides unbiased long-run model estimates and valid t-statistics irrespective of the fact that certain regressors may be endogenous within the model (Harris & Sollis, 2003). Lastly, the procedure is able to simultaneously estimate short-run and long-run coefficients.

The ARDL-bounds testing procedure operates on the basis of a joint F-statistic or Wald test with a null hypothesis of no cointegration. Under this null hypothesis, the asymptotic distribution of the F-statistic is non-standard amongst the variables under examination. In order to test for cointegration under this null hypothesis, Pesaran and Pesaran (1997) and Pesaran *et al.* (2001) provide two bounds of critical values for a given level of significance, namely an upper and lower bound. The lower critical bound is based on the assumption that all variables are I(0) which indicates that, amongst the examined variables, no cointegration relationship exists. Consequently, the upper bound is developed by assuming that all variables under examination are cointegrated, hence they are all I(1) variables. Provided, therefore, that the F-statistic is calculated to be below the lower bound, then the null hypothesis cannot be rejected and no cointegration relationship exists amongst the variables. If the F-statistic is found to exceed the upper bound, then the variables are considered to be cointegrated, since the null hypothesis is rejected. Finally, if the F-statistic is calculated as being between the upper and lower bound, then the cointegration test becomes inconclusive with no definitive inference to be made (Pesaran & Pesaran, 1997; Pesaran & Shin, 1998; Pesaran *et al.*, 2001).

It has been mentioned above that the bounds procedure can be applied, regardless of whether a variable is I(0) or I(1), although an I(2) variable should not be permitted in order to preserve the validity of results (Shahbaz & Dube, 2012; Rahman & Shahbaz, 2013). The current study, therefore, takes this consideration into account by testing the order of integration of each variable before it enters the model by means of the Dickey-Fuller Generalised Least Squares (DF-GLS) and Phillips-Perron (PP) unit root tests. Any variable found to be I(2) will thus be discarded from the study. The "general to specific" approach developed by Hendry and Ericsson (1991) is used to identify the optimal lag length for each regression model with the aim of addressing concerns of over-parameterisation which could have a negative effect on results. In order to perform the "general to specific" approach, an initial lag length, determined by the Akaike Information Criterion (AIC) and Schwarz Bayesian Information Criterion (SBC), is introduced into each regression model. Thereafter, parsimonious models are generated by gradually dropping variables that are considered to be statistically insignificant. Lastly, specification and diagnostic tests are performed on each ARDL-bounds model to ensure its statistical significance and soundness.

2.4.2 Granger Causality based of a VECM

The next step, after identifying cointegration relationships in section 2.4.1, is to apply the Granger causality test. The aim thereof is to examine the short-run, long-run and joint Granger causality that exists between economic growth, financial development and investment. The Granger causality tests are performed by employing similar Vector Error Correction models (VECMs) to those found in Odhiambo (2009a) and Narayan and Smyth (2008) which, for the current study, are as follows.

Model 1b: M2GDP, Economic Growth and Investment

$$\Delta lnM2GDP_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i}\, \Delta lnM2GDP_{t-i} + \sum_{i=0}^{n} \alpha_{2i}\, \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \alpha_{3i}\, \Delta lnRGDPPC_{t-i} + \eta_1 ECM_{t-1} + e_{1t} \quad (16)$$

$$\Delta lnRGDPPC_t = \gamma_0 + \sum_{i=1}^{n} \gamma_{1i}\, \Delta lnRGDPPC_{t-i} + \sum_{i=0}^{n} \gamma_{2i}\, \Delta lnM2GDP_{t-i} + \sum_{i=0}^{n} \gamma_{3i}\, \Delta lnRINV_{t-i} + \eta_3 ECM_{t-1} + e_{2t} \quad (17)$$

$$\Delta lnRINV_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i}\, \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \beta_{2i}\, \Delta lnM2GDP_{t-i} + \sum_{i=0}^{n} \beta_{3i}\, \Delta lnRGDPPC_{t-i} + \eta_2 ECM_{t-1} + e_{3t} \quad (18)$$

Model 2b: M2CGDP, Economic Growth and Investment

$$\Delta lnM2CGDP_t = \delta_0 + \sum_{i=1}^{n} \delta_{1i}\, \Delta lnM2CGDP_{t-i} + \sum_{i=0}^{n} \delta_{2i}\, \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \delta_{3i}\, \Delta lnRGDPPC_{t-i} + \mu_1 ECM_{t-1} + \varepsilon_{1t} \quad (19)$$

$$\Delta lnRGDPPC_t = \vartheta_0 + \sum_{i=1}^{n} \vartheta_{1i} \Delta lnRGDPPC_{t-i} + \sum_{i=0}^{n} \vartheta_{2i} \Delta lnM2CGDP_{t-i} + \sum_{i=0}^{n} \vartheta_{3i} \Delta lnRINV_{t-i} + \mu_3 ECM_{t-1} + \varepsilon_{2t} \quad (20)$$

$$\Delta lnRINV_t = \theta_0 + \sum_{i=1}^{n} \theta_{1i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \theta_{2i} \Delta lnM2CGDP_{t-i} + \sum_{i=0}^{n} \theta_{3i} \Delta lnRGDPPC_{t-i} + \mu_2 ECM_{t-1} + \varepsilon_{3t} \quad (21)$$

Model 3b: PRIVS, Economic Growth and Investment

$$\Delta lnPRIVS = \lambda_0 + \sum_{i=1}^{n} \lambda_{1i} \Delta lnPRIVS_{t-i} + \sum_{i=0}^{n} \lambda_{2i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \lambda_{3i} \Delta lnRGDPPC_{t-i} + \varpi_1 ECM_{t-1} + \epsilon_{1t} \quad (22)$$

$$\Delta lnRGDPPC_t = \pi_0 + \sum_{i=1}^{n} \pi_{1i} \Delta lnRGDPPC_{t-i} + \sum_{i=0}^{n} \pi_{2i} \Delta lnPRIVS_{t-i} + \sum_{i=0}^{n} \pi_{3i} \Delta lnRINV_{t-i} + \varpi_3 ECM_{t-1} + \epsilon_{2t} \quad (23)$$

$$\Delta \ln RINV_t = \xi_0 + \sum_{i=1}^{n} \xi_{1i} \Delta \ln RINV_{t-i} + \sum_{i=0}^{n} \xi_{2i} \Delta lnPRIVS_{t-i} + \sum_{i=0}^{n} \xi \Delta lnRGDPPC_{t-i} + \varpi_2 ECM_{t-1} + \epsilon_{3t} \quad (24)$$

Model 4b: CREDR, Economic Growth and Investment

$$\Delta lnCREDR_t = \phi_0 + \sum_{i=1}^{n} \phi_{1i} \Delta lnCREDR_{t-i} + \sum_{i=0}^{n} \phi_{2i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \phi_{3i} \Delta lnRGDPPC_{t-i} + \zeta_1 ECM_{t-1} + \varphi_{1t} \quad (25)$$

$$\Delta lnRGDPPC_t = \varrho_0 + \sum_{i=1}^{n} \varrho_{1i} \Delta lnRGDPPC_{t-i} + \sum_{i=0}^{n} \varrho_{2i} \Delta lnCREDR_{t-i} + \sum_{i=0}^{n} \varrho_{3i} \Delta lnRINV_{t-i} + \zeta_3 ECM_{t-1} + \varphi_{2t} \quad (26)$$

$$\Delta lnRINV_t = \psi_0 + \sum_{i=1}^{n} \psi_{1i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \psi_{2i} \Delta lnCREDR_{t-i} + \sum_{i=0}^{n} \psi_{3i} \Delta lnRGDPPC_{t-i} + \zeta_2 ECM_{t-1} + \varphi_{3t} \quad (27)$$

Model 5b: LLB, Economic Growth and Investment

$$\Delta lnLLB_t = \tau_0 + \sum_{i=1}^{n} \tau_{1i} \Delta lnLLB_{t-i} + \sum_{i=0}^{n} \tau_{2i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \tau_{3i} \Delta lnRGDPPC_{t-i} + \sigma_1 ECM_{t-1} + \omega_{1t} \quad (28)$$

$$lnRGDPPC_t = \upsilon_0 + \sum_{i=1}^{n} \upsilon_{1i} \Delta lnRGDPPC_{t-i} + \sum_{i=0}^{n} \upsilon_{2i} \Delta lnLLB_{t-i} + \sum_{i=0}^{n} \upsilon_{3i} \Delta lnRINV_{t-i} + \sigma_3 ECM_{t-1} + \omega_{2t} \quad (29)$$

$$\Delta lnRINV_t = \varphi_0 + \sum_{i=1}^{n} \varphi_{1i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \varphi_{2i} \Delta lnLLB_{t-i} + \sum_{i=0}^{n} \varphi_{3i} \Delta lnRGDPPC_{t-i} + \sigma_2 ECM_{t-1} + \omega_{3t} \quad (30)$$

where ECM_{t-1} represents the lagged error correction term resulting from the long-run cointegrating equations, Equations (1) to (15), of the ARDL models; α_0, γ_0, β_0, δ_0, ϑ_0, θ_0, λ_0, π_0, ξ_0, ϕ_0, ϱ_0, ψ_0, τ_0, υ_0 and φ_0 represent constant terms of the VECM equations; e_{1t}, ε_{1t}, ϵ_{3t}, φ_{3t} and ω_{3t} are residual terms that are assumed to be normally distributed with a mean of zero and a constant variance (Rahman & Shahbaz, 2013).

The VECM equations, Equations (16) to (30), are most appropriate to use, given the existence of long-run relationships amongst the variables in Equations (1) to (15), since the long-run relationships, further confirmed by the statistical significance of the lagged error-correction term, suggest Granger causality from at least one direction. Nonetheless, the ARDL models fail to offer guidance regarding the direction of causality between the variables under examination. In this case, determining the direction of causality can only be determined by applying the VECM Granger causality approach which uses the F-statistic of the explanatory variables and the t-statistic of the lagged error-correction term in order to distinguish between short-run, long-run and joint causality.

The F-statistic, generated by a Wald test on the statistically significant explanatory variables, is used to identify the short-run causality within a model, while the t-statistic of the statistically significant coefficient of the lagged error-correction term is used to examine the long-run causal relationship between the variables under consideration. Joint causality, which is considered as the presence of short- and long-run causality, is examined by also generating an F-statistic with the use of a Wald test. The difference, however, is the fact that the F-statistic is generated by employing both statistically significant explanatory variables and the error correction term into the Wald test. According to Shahbaz, Tang and Shabbir (2011), joint causality is regarded as a strong measure of Granger causality, therefore the presence of joint causality within a model offers significant support for the existence of Granger causality in the model under investigation.

The estimation of parsimonious VECMs follows the same procedure as with the ARDL models. Similarly, the VECMs also undergo specification and diagnostic tests to ensure the statistical correctness of each model, and also the conclusion drawn regarding causality. Furthermore, following the work of Narayan and Smyth (2006), Morley (2006), and Odhiambo (2009a), an error-correction term will only be estimated for equations where the null hypothesis of no cointegration is rejected, even though Equations (16) to (30) incorporate an error-correction term.

2.4.3 Innovative Accounting Approach

Numerous studies, such as Narayan and Smyth (2006), Shahbaz (2012a), Rahman and Shahbaz (2013), and Shahbaz, Sbia, Hamdi and Rehman (2014), argue that the robustness of Granger causality testing is limited to in-sample testing, which means that the relative strength of causal relationships cannot be fully captured beyond the selected sample period. As a result, the reliability and validity of results produced by the VECM Granger approach is weakened and restricted to in-sample testing. Furthermore, beyond the selected sample, the VECM Granger approach is unable to determine the amount of feedback that exists between the variables under consideration.

In order to overcome this limitation, the study examined the robustness of causality effects beyond the selected sample period by applying the innovative accounting approach (IAA) developed by Shan (2005).[5] The IAA consists of a variance decomposition approach and an impulse response function. The variance decomposition approach measures the percentage of a series' predicted error variance, ahead of the selected sample period over different time horizons, resulting from innovative shocks to the explanatory variables within the system (Narayan & Smyth, 2006; Shahbaz, 2012b; Shahbaz, Shahbaz Shabbir, & Sabihuddin Butt, 2013).

Sims (1980) noted an important aspect regarding variance decomposition. A variable's predicted error variance can be fully explained by its own innovations, provided the variable is exogenous as regards the other variables in the system. Furthermore, two important advantages are offered by the variance decomposition approach, the first of which was pointed out by Pesaran and Shin (1999). The method is able to illustrate the proportional contribution of the dependent variable, given innovative shocks in the explanatory variables within the system. The second advantage is that a Vector Autoregressive (VAR) system uniquely determines the ordering of variables, which means that the variance decomposition approach becomes insensitive to the ordering of variables under a VAR system (Zivot & Wang, 2006). The predicted error variance decomposition approach also provides simultaneous estimation of shock effects on each variable. In addition, Engle and Granger (1987) and Ibrahim (2005) claimed that better variance decomposition results are produced under a VAR framework, than under other approaches.

The impulse response function, which constitutes the second part of the IAA, is regarded as an alternative to the predicted error variance decomposition approach. The impulse response function

5 The IAA has also been applied extensively by Narayan and Smyth (2006), Khan and Shahbaz (2010), Lorde, Waithe and Francis (2010), Paul and Uddin (2011), Shahbaz, Islam and Aamir (2012) Shahbaz (2012), Rahman and Shahbaz (2013) and Shahbaz, Sbia, Hamdi and Rehman (2014).

serves to provide a graphical illustration of the time length and extent to which the dependent variable reacts to innovative shocks stemming from the explanatory variables. Shan (2005:1356) stated that, "impulse response function analysis attempts to trace out the time path that effects of shocks on other variables contained in the VAR have on a particular variable". In other words, the approach is designed for the purpose of determining the response, over time, of each variable in the VAR system to shocks in itself and the other explanatory variables. What distinguishes this analysis from other approaches is its ability to offer simultaneous estimation of shock effects where each variable in the VAR system can serve as a dependent and explanatory variable for other dependent variables, for example, economic growth can serve as a dependent variable, but also as an explanatory variable to investment or financial development (Arouri, Uddin, Nawaz, Shahbaz, & Teulon, 2014). The subsequent section illustrates and examines the results generated by employing the methodologies described in the preceding sections.

2.5 Empirical Test Results

2.5.1 Descriptive Statistics and Stationarity Tests

The descriptive statistics for each variable employed is shown in Table 1, below. The descriptive analysis indicates that all variables are normally distributed according to the Jarque-Bera statistic, with the exception of $PRIVS$ and LLB, which may be caused by significant outliers in the data. In order to improve the stability of each model, provision was made for structural breaks by employing dummy variables for three potential breakpoint dates in a stepwise fashion and testing for their significance.[6]

Table 1. Descriptive Statistics for Each Series over Its Sample Period

	$M2GDP$	$M2CGDP$	$PRIVS$	$CREDR$	LLB	$RGDPPC$	$RINV$
Mean	0.46	0.35	0.59	0.84	0.60	47510.40	0.25
Median	0.44	0.35	0.56	0.87	0.58	46710.00	0.26
Maximum	0.66	0.48	0.84	0.96	0.81	56044.00	0.33
Minimum	0.34	0.24	0.46	0.69	0.48	42386.00	0.19
Standard Dev	0.10	0.06	0.10	0.08	0.08	3635.181	0.04
Skewness	0.60	0.31	1.03	-0.64	1.08	0.87	-0.11
Kurtosis	2.09	2.49	2.97	2.01	3.25	2.87	1.71
Jacque-Bera	4.27	0.94	8.03	4.90	8.88	5.69	3.21
Probability	0.12	0.63	0.02	0.09	0.01	0.06	0.20

6 The three potential breakpoint dates identified and dummy variables employed are 1986, 1994 and 2008 which represent the disinvestment from South Africa, South Africa's political transition and the global financial crisis, respectively.

Table 1. Descriptive Statistics for Each Variable over Its Sample Period (Cont.)

	$\Delta M2GDP$	$\Delta M2CGDP$	$\Delta PRIVS$	$\Delta CREDR$	ΔLLB	$\Delta RGDPPC$	$\Delta RINV$
Mean	0.00	0.00	0.00	0.00	0.00	278.45	0.00
Median	0.00	0.01	0.00	0.00	0.00	476.00	0.00
Maximum	0.05	0.04	0.08	0.05	0.06	2004.00	0.03
Minimum	-0.05	-0.05	-0.07	-0.04	-0.04	-2009.00	-0.05
Standard Dev	0.02	0.02	0.03	0.02	0.03	1094.99	0.02
Skewness	-0.17	-0.44	0.22	0.18	0.40	-0.44	-0.61
Kurtosis	2.38	2.65	3.40	2.23	2.61	2.32	3.32
Jacque-Bera	0.91	1.28	0.63	1.35	1.43	2.28	2.90
Probability	0.63	0.53	0.73	0.51	0.49	0.32	0.23

Although not a prerequisite of the ARDL-bounds approach, stationarity tests are employed to ensure that no variable used is I(2) or higher. Testing for order two or higher integrated variables is important, following the ARDL approach's assumption that all variables are either I(0) or I(1). As noted by Pesaran *et al.* (2001) and Narayan (2005), the inclusion of an I(2) or higher variable would render the computed F-statistics, necessary for cointegration testing, invalid. The most commonly used unit root test was developed by Dickey and Fuller (1979; 1981). This test, known as the Augmented Dickey-Fuller (ADF) test, uses a parametric approach to test for stationarity in a series. Using Monte Carlo simulations, the power of the ADF test to test for stationarity was, however, proven to be very low (Schwert, 2002). Consequently, the current study uses the PP test developed by Phillips and Perron (1988) and the unit root test proposed by Elliot *et al.* (1996), the Dickey-Fuller-GLS test. Both these tests offer stronger approaches to testing for stationarity which assists in overcoming the low power problem experienced by the ADF test.

The results of stationarity tests in level and first difference form are presented in Table 2, below. In order to ensure robustness of stationarity results, the Dickey-Fuller-GLS test was performed with an intercept and both a trend and intercept, while the PP test was performed with an intercept, both a trend and intercept, and also neither a trend nor intercept. The results indicate that all variables, with the exception of $lnM2CGDP$ and $lnRINV$, are non-stationary in level form. For this reason, the next step was to difference all the variables in order for stationarity tests to be performed on the variables in their first difference form. The results in Table 2 provide confirmation of stationarity for each variable after differencing. Despite the two variables that were found to be stationary in level form, the null hypothesis of non-stationarity was rejected by both unit roots tests for all variables under study in their first difference form. It should, therefore, be noted that none of the variables were found to be integrated of order two. Owing to this, all the variables defined in Section 2.3.2 are included in the current empirical study.

Table 2. Stationarity Tests of Variables in Level and First Difference Form

Dickey-Fuller GLS Test in Level				Phillips-Perron (PP) Test in Level			
Variable	Intercept	Trend and Intercept	No Trend or Intercept	Variable	Intercept	Trend and Intercept	No Trend or Intercept
$lnM2GDP$	-0.28(0)	-2.13(0)	N/A	$lnM2GDP$	-0.52[4]	-2.60[4]	-1.33[4]
$lnM2CGDP$	-1.54(1)	-3.91(1)***	N/A	$lnM2CGDP$	-1.61[5]	-2.24[4]	-1.75[7]*
$lnPRIVS$	-0.40(0)	-2.06(0)	N/A	$lnPRIVS$	-0.75[1]	-2.34[1]	-1.24[1]
$lnCREDR$	-0.54(0)	-1.67(0)	N/A	$lnCREDR$	-1.05[1]	-1.81[2]	-1.52[0]
$lnLLB$	-1.24(1)	-1.61(1)	N/A	$lnLLB$	-0.88[2]	-1.58[1]	-0.64[2]
$lnRGDPPC$	-0.45(1)	-1.38(1)	N/A	$lnRGDPPC$	-0.32[1]	-0.73[1]	-1.40[1]
$lnRINV$	-1.98(1)**	-2.10(1)	N/A	$lnRINV$	-1.00[0]	-0.95[0]	-0.72[1]

Dickey-Fuller GLS Test in First Difference				Phillips-Perron (PP) Test in First Difference			
Variable	Intercept	Trend and Intercept	No Trend or Intercept	Variable	Intercept	Trend and Intercept	No Trend or Intercept
$\Delta lnM2GDP$	-5.58(0)***	-5.60(0)***	N/A	$\Delta lnM2GDP$	-5.48[6]***	-5.44[6]***	-5.36[4]***
$\Delta lnM2CGDP$	-3.89(0)***	-4.46(0)***	N/A	$\Delta lnM2CGDP$	-4.67[5]***	-4.83[5]***	-4.57[3]***
$\Delta lnPRIVS$	-5.71(0)***	-5.73(0)***	N/A	$\Delta lnPRIVS$	-5.76[0]***	-5.74[0]***	-5.70[1]***
$\Delta lnCREDR$	-6.54(0)***	-6.53(0)***	N/A	$\Delta lnCREDR$	-6.46[0]***	-6.39[0]***	-6.34[1]***
$\Delta lnLLB$	-4.43(0)***	-4.80(0)***	N/A	$\Delta lnLLB$	-4.65[0]***	-4.72[1]***	-4.67[0]***
$\Delta lnRGDPPC$	-4.11(0)***	-4.41(0)***	N/A	$\Delta lnRGDPPC$	-4.39[3]***	-4.39[5]***	-4.30[3]***
$\Delta lnRINV$	-3.25(0)***	-3.68(0)**	N/A	$\Delta lnRINV$	-3.52[9]**	-3.48[12]*	-3.58[10]***

Note:

1. ***, ** and * illustrates statistical significance at the 1%, 5% and 10% levels, respectively.

2. The Newey and West (1987) bandwidth, represented by the value in brackets, was used to select the truncation lag for the PP tests. The critical values, represented by the value in parentheses, identified by Elliot, Rothenberg and Stock (1996) were used for the Dickey-Fuller GLS test.

2.5.2 ARDL-Bounds Test

As mentioned in the methodology, the cointegration relationship between financial development, economic growth and investment is examined by means of the ARDL-bounds testing approach, a two-step approach. The first of which is to identify the initial lag order of each variable in Equations (1) to (15) from the unrestricted Models, 1a to 5a. The initial lag length is obtained by using the AIC and SBC according to the methodology. Having identified the initial lag length, a parsimonious model is generated by applying Hendry's "general to specific" approach (Campos, Ericsson, & Hendry, 2008). This approach provides the optimal lag for each individual variable of the five ARDL models used in this study. The second step of the approach is to apply the bounds F-test to Equations

(1) to (15) for the purpose of determining whether the null hypothesis of no cointegration can be rejected for the variables under study. The results of the ARDL-bounds test are provided in Table 3, below. The results are reported for each equation under its specific unrestricted model. For Model 1a, the reported results provide evidence of cointegration for all three equations where $M2GDP$, $RGDPPC$ and $RINV$ are employed as dependent variables. When the financial development proxy, $M2CGDP$, is used, the results are similar to Model 1a, with evidence of cointegration found for each equation under Model 2a.

Table 3. Bounds F-test Results for ARDL Cointegration Models

	Dependent Variable	Optimal lag length	F-statistics
Model 1a: M2GDP, Economic Growth and Investment			
$F_{M2GDP}(M2GDP \mid RGDPPC,\ RINV)$	$\Delta lnM2GDP_t$	7, 8, 7	15.38^{***}
$F_{RGDPPC}(RGDPPC \mid M2GDP,\ RINV)$	$\Delta lnRGDPPC_t$	8, 6, 6	12.57^{***}
$F_{RINV}(RINV \mid RGDPPC,\ M2GDP)$	$\Delta lnRINV_t$	5, 8, 6	25.96^{***}
Model 2a: M2CGDP, Economic Growth and Investment			
$F_{M2CGDP}(M2CGDP \mid RGDPPC,\ RINV)$	$\Delta lnM2CGDP_t$	5, 7, 3	40.21^{***}
$F_{RGDPPC}(RGDPPC \mid M2CGDP,\ RINV)$	$\Delta lnRGDPPC_t$	7, 7, 5	17.54^{***}
$F_{RINV}(RINV \mid RGDPPC,\ M2CGDP)$	$\Delta lnRINV_t$	4, 1, 1	6.65^{***}
Model 3a: PRIVS, Economic Growth and Investment			
$F_{PRIVS}(PRIVS \mid RGDPPC,\ RINV)$	$\Delta lnPRIVS_t$	1, 0, 3	6.59^{***}
$F_{RGDPPC}(RGDPPC \mid PRIVS,\ RINV)$	$\Delta lnRGDPPC_t$	6, 0, 2	4.17^{*}
$F_{RINV}(RINV \mid RGDPPC,\ PRIVS)$	$\Delta lnRINV_t$	8, 1, 1	11.77^{***}
Model 4a: CREDR, Economic Growth and Investment			
$F_{CREDR}(CREDR \mid RGDPPC,\ RINV)$	$\Delta lnCREDR_t$	8, 7, 8	13.90^{***}
$F_{RGDPPC}(RGDPPC \mid CREDR,\ RINV)$	$\Delta lnRGDPPC_t$	6, 3, 0	3.73
$F_{RINV}(RINV \mid RGDPPC,\ CREDR)$	$\Delta lnRINV_t$	8, 2, 3	16.60^{***}
Model 5a: LLB, Economic Growth and Investment			
$F_{LLB}(LLB \mid RGDPPC,\ RINV)$	$\Delta lnLLB_t$	4, 0, 7	2.16
$F_{RGDPPC}(RGDPPC \mid LLB,\ RINV)$	$\Delta lnRGDPPC_t$	6, 0, 2	4.09
$F_{RINV}(RINV \mid RGDPPC,\ LLB)$	$\Delta lnRINV_t$	6, 1, 6	4.05

Asymptotic Critical Values

Significance Level	Lower Bound [I(0)]	Upper Bound [I(1)]
1%	5.15	6.36
5%	3.79	4.85
10%	3.17	4.14

Note:

1. ***, ** and * illustrate rejection of bounds test null hypothesis at the 1%, 5% and 10% levels, respectively.
2. Asymptotic critical values taken from Pesaran *et al.* (2001:300), CI(iii).
3. According to Pesaran *et al.* (2001), critical values are given by $k + 1$ for CI(i), CI(iii) and CI(v), therefore $k = 2$ for the current study.

For Model 3a, the results showed evidence of cointegration at a 1% level of significance for the $PRIVS$ and $RINV$ equations, and showed evidence of cointegration at a 10% significance level for the $RGDPPC$ equation. Cointegration is found to prevail in Model 4a for equations $CREDR$ and $RINV$, but not for equation $RGDPPC$. Finally, for Model 5a which employs LLB as a financial development proxy, the results offered no indication of cointegration for either of the equations. These results implied that all equations under Models 1a to 3a and equations $CREDR$ and $RINV$ under Model 4a are estimated with an error-correction term for the Granger causality test. For the remainder of the equations, equation $RGDPPC$ of Model 4a and all equations under Model 5a, only short-run Granger causality will be estimated due to the absence of long-run relationships within these equations.

Table 4. Diagnostic Test Results for ARDL Cointegration Models - Models 1a to 5a

Model 1a: M2GDP, Economic Growth and Investment

Diagnostic Tests	Dependent Variable					
	$\Delta lnM2GDP_t$		$\Delta lnRGDPPC_t$		$\Delta lnRINV_t$	
	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
Jarque-Bera Test	JB: 0.25	0.88	JB: 0.36	0.84	JB: 0.44	0.80
Breusch-Godfrey LM Test	F: 0.92 [8]	0.54	F: 0.90 [8]	0.55	F: 0.88 [8]	0.57
ARCH Test	F: 0.72 [8]	0.68	F: 0.46 [8]	0.87	F: 0.45 [8]	0.88
Ramsey RESET Test	F: 0.03 [1]	0.86	F: 0.29 [1]	0.60	F: 0.60 [1]	0.45
R-Squared	0.82		0.88		0.95	
Adjusted R-Squared	0.67		0.75		0.90	

Model 2a: M2CGDP, Economic Growth and Investment

Diagnostic Tests	Dependent Variable					
	$\Delta lnM2CGDP_t$		$\Delta lnRGDPPC_t$		$\Delta lnRINV_t$	
	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
Jarque-Bera Test	JB: 0.63	0.73	JB: 1.00	0.61	JB: 0.46	0.78
Breusch-Godfrey LM Test	F: 2.35 [7]	0.12	F: 10.85 [7]	0.23	F: 1.77 [4]	0.18
ARCH Test	F: 1.22 [7]	0.36	F: 0.60 [7]	0.75	F: 1.01 [4]	0.42
Ramsey RESET Test	F: 2.15 [1]	0.16	F: 0.01 [1]	0.93	F: 0.91 [1]	0.35
R-Squared	0.90		0.90		0.83	
Adjusted R-Squared	0.84		0.85		0.78	

Table 4. Diagnostic Test Results for ARDL Cointegration Models - Models 1a to 5a (Cont.)

Model 3a: PRIVS, Economic Growth and Investment

Diagnostic Tests	Dependent Variable					
	$\Delta lnPRIVS_t$		$\Delta lnRGDPPC_t$		$\Delta lnRINV_t$	
	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
Jarque-Bera Test	JB: 0.66	0.72	JB: 1.04	0.60	JB: 0.71	0.70
Breusch-Godfrey LM Test	F: 0.69 [3]	0.57	F: 1.20 [6]	0.34	F: 1.88 [8]	0.14
ARCH Test	F: 2.13 [3]	0.11	F: 0.86 [6]	0.54	F: 0.34 [8]	0.94
Ramsey RESET Test	F: 0.57 [1]	0.46	F: 0.00 [1]	0.98	F: 1.48 [1]	0.24
R-Squared	0.49		0.64		0.86	
Adjusted R-Squared	0.37		0.56		0.78	

Model 4a: CREDR, Economic Growth and Investment

Diagnostic Tests	Dependent Variable					
	$\Delta lnCREDR_t$		$\Delta lnRGDPPC_t$		$\Delta lnRINV_t$	
	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
Jarque-Bera Test	JB: 0.03	0.99	JB: 0.74	0.69	JB: 0.33	0.85
Breusch-Godfrey LM Test	F: 1.05 [8]	0.46	F: 1.52 [6]	0.21	F: 1.64 [8]	0.19
ARCH Test	F: 1.26 [8]	0.32	F: 1.07 [6]	0.41	F: 0.64 [8]	0.74
Ramsey RESET Test	F: 0.03 [1]	0.87	F: 0.02 [1]	0.89	F: 2.28 [1]	0.14
R-Squared	0.83		0.61		0.86	
Adjusted R-Squared	0.68		0.52		0.80	

Model 5a: LLB, Economic Growth and Investment

Diagnostic Tests	Dependent Variable					
	$\Delta lnLLB_t$		$\Delta lnRGDPPC_t$		$\Delta lnRINV_t$	
	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
Jarque-Bera Test	JB: 2.33	0.31	JB: 0.55	0.76	JB: 2.11	0.35
Breusch-Godfrey LM Test	F: 1.73 [7]	0.16	F: 1.45 [6]	0.24	F: 0.28 [6]	0.94
ARCH Test	F: 0.68 [7]	0.68	F: 0.71 [6]	0.64	F: 0.21 [8]	0.97
Ramsey RESET Test	F: 0.10 [1]	0.75	F: 0.03 [1]	0.87	F: 2.86 [1]	0.10
R-Squared	0.54		0.68		0.78	
Adjusted R-Squared	0.39		0.60		0.72	

Note: Numbers in brackets indicate the lag length included.

After examination of the cointegration results generated by the ARDL-bounds testing procedure, each model was exposed to a series of diagnostic tests to ensure the validity and robustness of cointegration results. The results of these diagnostic tests are presented in Table 4, above. The Jarque-Bera statistic indicated that the residuals for all regression equations are normally distributed. Pesaran *et al.* (2001) have noted that errors of an ARDL model must be serially independent. As a result, the Breusch-Godfrey Lagrange Multiplier (LM) test was used to examine the serial correlation of each equation to ensure that Equations (1) to (15) do not suffer from serial correlation. The results of the LM test indicated that, indeed, none of the equations suffered from serial correlation. The

Autoregressive Conditional Heteroskedasticity (ARCH) test was used to test for heteroskedasticity. The ARCH test was used in the current study due to the advantage it holds in making provision, and offering more reliable results, for autoregressive models. The ARCH test results indicated that no presence of heteroskedasticity is found in the error terms for any of the ARDL models. Lastly, none of the ARDL models suffered from general misspecification errors, given the results of the Ramsey reset test. The diagnostic results, thus, indicate that all cointegration models are statistically stable and significant and offer sound results regarding cointegration analysis.

Table 5. VECM Granger Causality Analysis

Model 1b: M2GDP, Economic Growth and Investment

Type of Granger Causality

Dependent Variable	Short-Run: $\Delta lnM2GDP_t$	Short-Run: $\Delta lnRGDPPC_t$	Short-Run: $\Delta lnRINV_t$	Long-Run: ECT_{t-1}	Joint (Short-Run and Long-Run): $\Delta lnM2GDP_t, ECT_{t-1}$	Joint: $\Delta lnRGDPPC_t, ECT_{t-1}$	Joint: $\Delta lnRINV_t, ECT_{t-1}$
	F-statistic [p-values]			[t-statistic]	F-statistic [p-values]		
$\Delta lnM2GDP_t$	-	15.51*** [0.00]	4.52** [0.04]	-0.29*** [0.00]	-	11.96*** [0.00]	6.48*** [0.00]
$\Delta lnRGDPPC_t$	4.55** [0.04]	-	16.19*** [0.00]	-0.00*** [0.00]	7.54*** [0.00]	-	12.59*** [0.00]
$\Delta lnRINV_t$	12.80*** [0.00]	24.95*** [0.00]	-	-1.01** [0.01]	8.31*** [0.00]	13.54*** [0.00]	-

Model 2b: M2CGDP, Economic Growth and Investment

Type of Granger Causality

Dependent Variable	Short-Run: $\Delta lnM2CGDP_t$	Short-Run: $\Delta lnRGDPPC_t$	Short-Run: $\Delta lnRINV_t$	Long-Run: ECT_{t-1}	Joint (Short-Run and Long-Run): $\Delta lnM2CGDP_t, ECT_{t-1}$	Joint: $\Delta lnRGDPPC_t, ECT_{t-1}$	Joint: $\Delta lnRINV_t, ECT_{t-1}$
	F-statistic [p-values]			[t-statistic]	F-statistic [p-values]		
$\Delta lnM2CGDP_t$	-	8.91*** [0.00]	6.41** [0.02]	-0.05* [0.06]	-	10.66*** [0.00]	4.94** [0.02]
$\Delta lnRGDPPC_t$	6.51** [0.02]	-	11.43*** [0.00]	-0.04*** [0.00]	10.60*** [0.00]	-	8.94*** [0.00]
$\Delta lnRINV_t$	0.11 [0.75]	36.19*** [0.00]	-	-0.76* [0.07]	1.89 [0.17]	27.92*** [0.00]	-

Model 3b: PRIVS, Economic Growth and Investment

Type of Granger Causality

Dependent Variable	Short-Run: $\Delta lnPRIVS_t$	Short-Run: $\Delta lnRGDPPC_t$	Short-Run: $\Delta lnRINV_t$	Long-Run: ECT_{t-1}	Joint (Short-Run and Long-Run): $\Delta lnPRIVS_t, ECT_{t-1}$	Joint: $\Delta lnRGDPPC_t, ECT_{t-1}$	Joint: $\Delta lnRINV_t, ECT_{t-1}$
	F-statistic [p-values]			[t-statistic]	F-statistic [p-values]		
$\Delta lnPRIVS_t$	-	10.39*** [0.00]	4.47** [0.01]	-0.28** [0.03]	-	7.31*** [0.00]	4.44*** [0.00]
$\Delta lnRGDPPC_t$	3.50* [0.07]	-	16.35*** [0.00]	-0.00*** [0.00]	6.61*** [0.00]	-	11.90*** [0.00]
$\Delta lnRINV_t$	4.04** [0.05]	25.36*** [0.00]	-	-0.96** [0.01]	4.67** [0.02]	19.30*** [0.00]	-

Table 5.VECM Granger Causality Analysis (Cont.)

Model 4b: CREDR, Economic Growth and Investment							
	Type of Granger Causality						
	Short-Run			Long-Run	Joint (Short-Run and Long-Run)		
Dependent Variable	$\Delta lnCREDR_t$	$\Delta lnRGDPPC_t$	$\Delta lnRINV_t$	ECT_{t-1}	$\Delta lnCREDR_t, ECT_{t-1}$	$\Delta lnRGDPPC_t, ECT_{t-1}$	$\Delta lnRINV_t, ECT_{t-1}$
	F-statistic [p-values]			[t-statistic]	F-statistic [p-values]		
$\Delta lnCREDR_t$	-	2.77** [0.01]	5.82*** [0.00]	-0.30** [0.00]	-	10.25*** [0.00]	6.36** [0.00]
$\Delta lnRGDPPC_t$	9.64*** [0.00]	-	20.74*** [0.00]	-	-	-	-
$\Delta lnRINV_t$	2.29 [0.12]	13.11*** [0.00]	-	-0.90 [0.12]	2.09 [0.12]	10.04*** [0.00]	-

Model 5b: LLB, Economic Growth and Investment							
	Type of Granger Causality						
	Short-Run			Long-Run	Joint (Short-Run and Long-Run)		
Dependent Variable	$\Delta lnLLB_t$	$\Delta lnRGDPPC_t$	$\Delta lnRINV_t$	ECT_{t-1}	$\Delta lnLLB_t, ECT_{t-1}$	$\Delta lnRGDPPC_t, ECT_{t-1}$	$\Delta lnRINV_t, ECT_{t-1}$
	F-statistic [p-values]			[t-statistic]	F-statistic [p-values]		
$\Delta lnLLB_t$	-	8.54*** [0.00]	1.68 [0.20]	-	-	-	-
$\Delta lnRGDPPC_t$	7.10*** [0.00]	-	8.27*** [0.00]	-	-	-	-
$\Delta lnRINV_t$	7.30*** [0.00]	28.87** [0.00]	-	-	-	-	-

Note: ***, ** and * illustrates statistical significance at the 1%, 5% and 10% levels, respectively.

2.5.3 Granger Causality Analysis on the Basis of Vector Error Correction Models

Following the methodology, after identifying long-run cointegration between financial development, economic growth and investment, the next step is to apply Granger causality testing to analyse the causality between the variables under study. As mentioned, short, long and joint causality will be examined. The short-run causality is examined using a Wald or F-test to identify the joint statistical significance of the lagged differences of explanatory variables, while the long-run causality is examined by the statistical significance of the lagged error-correction term's coefficient. Similarly, the joint causality is examined by identifying the joint statistical significance of both the lagged differences of explanatory variables and the lagged error-correction term using a Wald or F-test. Table 5 presents the results of these causality tests. These results show that for Model 1b, using $M2GDP$ as a financial development proxy, financial development is Granger caused by economic growth and investment, both in the short- and long-run. Financial development and investment are also found to Granger cause economic growth in the short-run and long-run. However, the small value of the statistically significant error-correction term implies that the disequilibrium between the short- and long-run is corrected instantaneously, possibly caused by the efficiency of the South African financial market. Lastly, for the short-and long-run, investment is found to be Granger caused by financial development and economic growth. Thus, the results from Model 1b are indicative of bi-directional flows between financial development, economic growth and investment for the short-run, although a unidirectional relationship exists between financial development and economic growth in the long-run, with economic growth Granger causing financial development.

When $M2CGDP$ is used as a financial development proxy in Model 2b, economic growth and investment Granger cause financial development, while economic growth is found to be Granger caused by financial development and investment. These results apply regardless of the short- or long-run and imply that bi-directional causality exists between financial development and economic growth, as well as between economic growth and investment. In addition, the results from Model 2b indicate unidirectional causality flowing from investment to financial development for both the short- and long-run. Results for Model 3b indicate similar findings to that of Model 1b, with financial development being Granger caused by economic growth and investment within the short- and long-run. Economic growth is Granger caused by financial development and investment, both in the short- and long-run, while short- and long-run causality flows from financial development and economic growth to investment. The results, therefore, point to similar bi-directionality and unidirectional causal relationships as found in Model 1a. For Model 4b, long-run causality was only tested for the $CREDR$ and $RINV$ equations, and not for the $RGDPPC$ equation since no long-run cointegration was found to exist for the specified equation. Nonetheless, the results of Model 4b show evidence of short-run bi-directional causality flowing between financial development and economic growth, as well as between economic growth and investment. Unidirectional causality is found flowing from economic growth to financial development in the long-run. Furthermore, short- and long-run unidirectional causality is found with investment Granger causing financial development, as was the case in Model 2b. Finally, Model 5b offers only short-run causality results due to the absence of long-run cointegration. Similarly, bi-directionality is found to occur between financial development and economic growth, and between economic growth and investment. Short-run unidirectional causality is found to flow from financial development to investment. The results for both short- and long-run causality for all five models are confirmed by the statistical significance of the F-statistics and the coefficients of the error-correction terms. Furthermore, the statistical significance of the joint causality analysis supports the above-explained findings.

Table 6. Diagnostic Test Results for VECM Models - Models 1b to 5b

Model 1b: M2GDP, Economic Growth and Investment

Diagnostic Tests	Dependent Variable					
	$\Delta lnM2GDP_t$		$\Delta lnRGDPPC_t$		$\Delta lnRINV_t$	
	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
Jarque-Bera Test	JB: 2.14	0.34	JB: 1.12	0.57	JB: 2.86	0.24
Breusch-Godfrey LM Test	F: 1.18 [8]	0.36	F: 0.73 [6]	0.63	F: 0.35 [3]	0.79
ARCH Test	F: 1.51 [8]	0.22	F: 0.38 [6]	0.89	F: 0.21 [3]	0.89
Ramsey RESET Test	F: 0.96 [1]	0.34	F: 0.07 [1]	0.79	F: 0.25 [1]	0.62
R-Squared	0.66		0.64		0.55	
Adjusted R-Squared	0.59		0.58		0.50	

Model 2b: M2CGDP, Economic Growth and Investment

Diagnostic Tests	Dependent Variable					
	$\Delta lnM2CGDP_t$		$\Delta lnRGDPPC_t$		$\Delta lnRINV_t$	
	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
Jarque-Bera Test	JB: 1.16	0.56	JB: 2.05	0.36	JB: 0.73	0.70
Breusch-Godfrey LM Test	F: 0.37 [9]	0.92	F: 0.33 [5]	0.89	F: 0.21 [6]	0.97
ARCH Test	F: 1.32 [9]	0.38	F: 0.88 [5]	0.52	F: 1.15 [6]	0.38
Ramsey RESET Test	F: 0.36 [1]	0.56	F: 0.00 [1]	0.98	F: 0.72 [1]	0.41
R-Squared	0.65		0.48		0.73	
Adjusted R-Squared	0.53		0.37		0.69	

Table 6. Diagnostic Test Results for VECM Models – Models 1b to 5b (Cont.)

Model 3b: PRIVS, Economic Growth and Investment

Diagnostic Tests	Dependent Variable					
	$\Delta lnPRIVS_t$		$\Delta lnRGDPPC_t$		$\Delta lnRINV_t$	
	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
Jarque-Bera Test	JB: 0.16	0.92	JB: 1.46	0.48	JB: 1.52	0.47
Breusch-Godfrey LM Test	F: 0.82 [8]	0.60	F: 0.85 [6]	0.55	F: 0.83 [4]	0.52
ARCH Test	F: 0.51 [8]	0.83	F: 0.32 [6]	0.92	F: 0.37 [4]	0.83
Ramsey RESET Test	F: 0.31 [1]	0.59	F: 0.32 [1]	0.58	F: 1.74 [1]	0.20
R-Squared	0.50		0.62		0.86	
Adjusted R-Squared	0.38		0.56		0.78	

Model 4b: CREDR, Economic Growth and Investment

Diagnostic Tests	Dependent Variable					
	$\Delta lnCREDR_t$		$\Delta lnRGDPPC_t$		$\Delta lnRINV_t$	
	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
Jarque-Bera Test	JB: 0.06	0.97	JB: 2.42	0.30	JB: 5.08	0.08
Breusch-Godfrey LM Test	F: 0.53 [8]	0.82	F: 0.98 [6]	0.46	F: 0.70 [8]	0.69
ARCH Test	F: 0.66 [8]	0.72	F: 0.57 [6]	0.75	F: 1.13 [8]	0.39
Ramsey RESET Test	F: 0.18 [1]	0.68	F: 0.00 [1]	0.99	F: 0.02 [1]	0.90
R-Squared	0.46		0.62		0.55	
Adjusted R-Squared	0.37		0.57		0.46	

Model 5b: LLB, Economic Growth and Investment

Diagnostic Tests	Dependent Variable					
	$\Delta lnLLB_t$		$\Delta lnRGDPPC_t$		$\Delta lnRINV_t$	
	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
Jarque-Bera Test	JB: 0.98	0.61	JB: 0.97	0.62	JB: 2.12	0.35
Breusch-Godfrey LM Test	F: 0.80 [6]	0.58	F: 1.37 [7]	0.28	F: 0.16 [7]	0.99
ARCH Test	F: 0.77 [6]	0.60	F: 0.39 [7]	0.90	F: 0.77 [7]	0.61
Ramsey RESET Test	F: 0.21 [1]	0.65	F: 0.15 [1]	0.70	F: 1.50 [1]	0.23
R-Squared	0.46		0.73		0.84	
Adjusted R-Squared	0.39		0.63		0.79	

Note: Numbers in brackets indicate the lag length included.

Diagnostic tests were also performed on the VECM Granger causality equations to ensure soundness of the Granger causality analysis. The results of these tests are presented in Table 6, above. The Jarque-Bera statistic was once again applied to examine the normality of residual terms. The results provide evidence of normality for all VECM equations. The LM test indicates that none of the equations suffer from serial correlation. The results of the last two diagnostic tests, the ARCH and Ramsey reset, point to the fact that none of the equations are subject to heteroskedasticity and misspecification problems.

2.5.4 Innovative Accounting Approach

Economic literature argues that the VECM Granger causality approach is unable to provide meaningful information regarding a dependent variable's likely Granger endogeneity or exogeneity beyond a specified sample period (Narayan & Smyth, 2004). In order to overcome this limitation, the current study employs the Innovative Accounting Approach which provides a method for examining the out-of-sample effectiveness of causality effects and deducing the degree of feedback transmitted from one variable to another.

As set out in the methodology, the Innovative Accounting Approach consists of a variance decomposition analysis and impulse response functions. Table 7 summarises the results of the variance decomposition over a five-year period. A five-year time horizon was selected for the variance decomposition analysis and impulse response functions following the work of Rahman and Shahbaz (2013) who argue that any time period exceeding five years tends to provide less reliable decomposition and impulse response results due to a significantly large standard error.

Starting with Model 1, where $M2GDP$ serves as the financial development proxy, the results of Table 7 indicate that financial development is explained by 36.23 per cent of its own innovative shock, with economic growth and investment explaining financial development by 60.95 per cent and 2.82 per cent, respectively, through their innovative shocks. When economic growth is used as the dependent variable, then innovative shocks stemming from investment account for 65.83 per cent of economic growth. The remainder of economic growth is explained by 30.36 per cent of its own innovative shock, with a marginal portion of 3.81 per cent being explained by financial development. Lastly, 77.75 per cent of investment is explained by its own innovative shocks, while economic growth and financial development contribute 15.26 per cent and 7.00 per cent, respectively.

The results of Model 2 show that financial development is largely caused by itself at 74.89 per cent, while 15.62 per cent and 9.49 per cent stem from economic growth and investment, respectively. Financial development explains economic growth by 83.80 per cent through its innovative shocks and economic growth explaining itself by 11.83 per cent. A minimal portion is contributed by investment, at 4.37 per cent. Investment is mainly caused by innovative shocks to financial development, at 65.85 per cent. The remainder of investment is proportionally caused by economic growth and investment itself at 14.26 per cent and 19.89 per cent, respectively.

Table 7. Variance Decomposition Results

Model 1: M2GDP, Economic Growth and Investment

Variance Decomposition of $lnM2GDP_t$

Period	Standard Error	$lnM2GDP_t$	$lnRGDPPC_t$	$lnRINV_t$
1	0.05	55.25	44.74	0.01
2	0.08	39.65	59.78	0.57
3	0.09	38.19	60.93	0.88
4	0.11	34.93	63.63	1.44
5	0.12	36.23	60.95	2.82

Variance Decomposition of $lnRGDPPC_t$

Period	Standard Error	$lnM2GDP_t$	$lnRGDPPC_t$	$lnRINV_t$
1	0.02	0.00	58.31	41.69
2	0.04	2.18	40.27	57.54
3	0.04	3.79	37.28	58.94
4	0.04	4.23	34.71	61.06
5	0.05	3.81	30.36	65.83

Variance Decomposition of $lnRINV_t$

Period	Standard Error	$lnM2GDP_t$	$lnRGDPPC_t$	$lnRINV_t$
1	0.04	0.00	0.00	100.00
2	0.08	0.00	7.26	92.73
3	0.10	0.01	5.75	94.24
4	0.11	3.37	7.01	89.62
5	0.13	7.00	15.26	77.75

Model 2: M2CGDP, Economic Growth and Investment

Variance Decomposition of $lnM2CGDP_t$

Period	Standard Error	$lnM2CGDP_t$	$lnRGDPPC_t$	$lnRINV_t$
1	0.05	100.00	0.00	0.00
2	0.06	71.80	27.10	1.10
3	0.07	65.00	33.79	1.21
4	0.08	70.42	26.87	2.71
5	0.10	74.89	15.62	9.49

Variance Decomposition of $lnRGDPPC_t$

Period	Standard Error	$lnM2CGDP_t$	$lnRGDPPC_t$	$lnRINV_t$
1	0.01	7.35	92.65	0.00
2	0.03	27.45	68.49	4.06
3	0.04	55.70	39.76	4.54
4	0.05	77.76	19.83	2.41
5	0.07	83.80	11.83	4.37

Variance Decomposition of $lnRINV_t$

Period	Standard Error	$lnM2CGDP_t$	$lnRGDPPC_t$	$lnRINV_t$
1	0.04	4.38	0.44	95.18
2	0.06	4.27	23.25	72.48
3	0.07	17.10	30.09	52.81
4	0.10	47.04	17.27	35.70
5	0.13	65.85	14.26	19.89

Table 7. Variance Decomposition Results (Cont.)

Model 3: PRIVS, Economic Growth and Investment

Variance Decomposition of $lnPRIVS_t$

Period	Standard Error	$lnPRIVS_t$	$lnRGDPPC_t$	$lnRINV_t$
1	0.04	100.00	0.00	0.00
2	0.07	80.43	19.22	0.35
3	0.09	73.82	25.97	0.22
4	0.10	68.78	31.01	0.21
5	0.11	64.16	35.44	0.40

Variance Decomposition of $lnRGDPPC_t$

Period	Standard Error	$lnPRIVS_t$	$lnRGDPPC_t$	$lnRINV_t$
1	0.02	8.92	91.08	0.00
2	0.04	10.42	86.30	3.28
3	0.05	9.59	86.63	3.79
4	0.05	9.77	86.79	3.44
5	0.05	10.40	85.12	4.48

Variance Decomposition of $lnRINV_t$

Period	Standard Error	$lnPRIVS_t$	$lnRGDPPC_t$	$lnRINV_t$
1	0.04	2.29	24.94	72.76
2	0.09	2.81	53.35	43.84
3	0.12	2.30	60.17	37.53
4	0.14	2.10	62.39	35.52
5	0.15	2.15	62.51	35.34

Model 4: CREDR, Economic Growth and Investment

Variance Decomposition of $lnCREDR_t$

Period	Standard Error	$lnCREDR_t$	$lnRGDPPC_t$	$lnRINV_t$
1	0.03	100.00	0.00	0.00
2	0.04	96.48	2.08	1.44
3	0.05	96.74	1.39	1.87
4	0.07	86.00	11.16	2.80
5	0.08	72.02	25.65	2.33

Variance Decomposition of $lnRGDPPC_t$

Period	Standard Error	$lnCREDR_t$	$lnRGDPPC_t$	$lnRINV_t$
1	0.03	39.79	60.21	0.00
2	0.05	50.30	45.63	4.06
3	0.06	55.06	39.53	5.41
4	0.07	57.87	37.37	4.76
5	0.08	56.18	39.37	4.45

Variance Decomposition of $lnRINV_t$

Period	Standard Error	$lnCREDR_t$	$lnRGDPPC_t$	$lnRINV_t$
1	0.04	26.08	35.85	38.07
2	0.09	37.59	39.64	22.77
3	0.12	47.37	34.08	18.55
4	0.14	50.72	34.92	14.36
5	0.16	43.96	44.24	11.80

Table 7. Variance Decomposition Results (Cont.)

Model 5: CREDR, Economic Growth and Investment

Variance Decomposition of $lnLLB_t$

Period	Standard Error	$lnLLB_t$	$lnRGDPPC_t$	$lnRINV_t$
1	0.04	100.00	0.00	0.00
2	0.06	87.60	11.77	0.63
3	0.08	79.65	18.06	2.29
4	0.10	78.42	18.50	3.08
5	0.11	78.58	17.87	3.55

Variance Decomposition of $lnRGDPPC_t$

Period	Standard Error	$lnLLB_t$	$lnRGDPPC_t$	$lnRINV_t$
1	0.02	8.78	91.22	0.00
2	0.03	21.00	78.43	0.57
3	0.04	31.24	67.71	1.06
4	0.05	42.88	54.76	2.36
5	0.05	48.55	48.92	2.53

Variance Decomposition of $lnRINV_t$

Period	Standard Error	$lnLLB_t$	$lnRGDPPC_t$	$lnRINV_t$
1	0.04	0.78	16.22	82.99
2	0.07	4.60	50.47	44.93
3	0.09	9.17	56.29	34.54
4	0.10	10.89	57.19	31.93
5	0.10	11.57	56.77	31.66

Note: Residual diagnostics were performed for each VAR system to ensure reliability and stability of results.

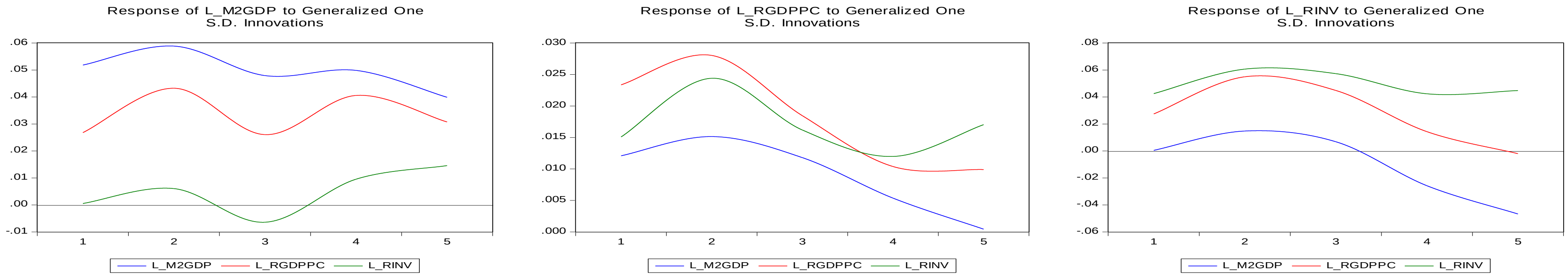
Model 3 uses $PRIVS$ as the financial development proxy. The results of the variance decompositon under this model illustrate a 64.16 per cent contribution to financial development by its own innovative shock, and a one standard deviation shock to economic growth and investment explains financial development by 35.44 per cent and 0.40 per cent, respectively. Economic growth, under Model 3, is explained to a large extent by its own shock, at 85.12 per cent. A sizeable contribution of 10.40 per cent is made by financial development, while only 4.48 per cent of economic growth is explained by investment. The forecast error variance for investment, at the end of five years, is explained by 35.34 per cent of its own innovations, 62.51 per cent by economic growth, and 2.15 per cent by financial development. The results provided by Model 4 suggest that, after five years, 72.02 per cent of financial development's forecast error is explained by its own innovation. A substantial portion of financial development is generated by economic growth at 25.65 per cent, but investment only contributes 2.33 per cent. The results for economic growth under Model 4 are similar to Model

2 where the largest portion is generated by innovative shocks stemming from financial development, whereas investment only contributes 4.45 per cent.

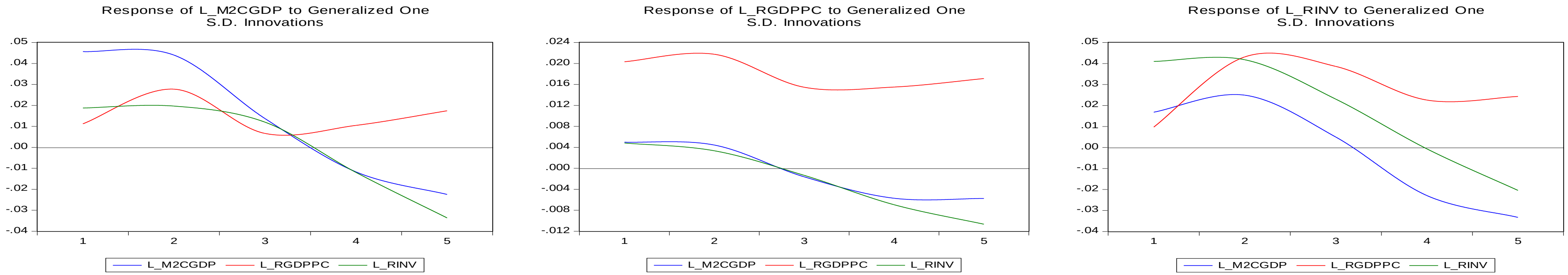
Financial development and economic growth contribute almost equally to investment, at 43.96 per cent and 44.24 per cent, respectively. The remaining 11.80 per cent is explained by investment's own innovative shocks. Finally, Model 5 indicates that 78.58 per cent of financial development is caused by its own innovations, while 17.87 per cent and 3.55 per cent of its forecast error is explained by economic growth and investment, respectively. Near equal portions of economic growth is explained by its own innovative shocks, as well as the shocks stemming from financial development. Investment contributes marginally to explaining economic growth, at 2.53 per cent. Lastly, 56.77 per cent of investment is explained by economic growth, 31.66 by investment itself and 11.57 per cent by financial development.

Based on the above analysis, the conclusion can be drawn that, for the majority of financial development proxies employed, a bi-directional causality exists between financial development and economic growth. It is only when $M2GDP$ is used that the results suggest a unidirectional relationship, flowing from economic growth to financial development. This may be caused by the fact that, in developing countries, a significant proportion of M2 comprises currency held outside the countries' banks. Consequently, an increase in $M2GDP$ reflects an increased use of currency instead of increasing bank deposits, thus providing a less indicative measure of the relationship between economic growth and financial development (Abu-Bader & Abu-Qarn, 2008). Furthermore, considering the marginal contributions provided by investment, the question may arise as to whether the inclusion of investment in the preceding analysis was beneficial. In order to ascertain its importance, it should be noted that investment was mainly included to limit the risk of a misspecification bias. Therefore, considering the diagnostic results, especially the Ramsey reset test, it can be seen that the inclusion of investment was indeed beneficial in this regard, with the results suggesting no evidence of a misspecification in any of the five regression models.

Model 1: M2GDP, Economic Growth and Investment



Model 2: M2CGDP, Economic Growth and Investment



Model 3: PRIVS, Economic Growth and Investment

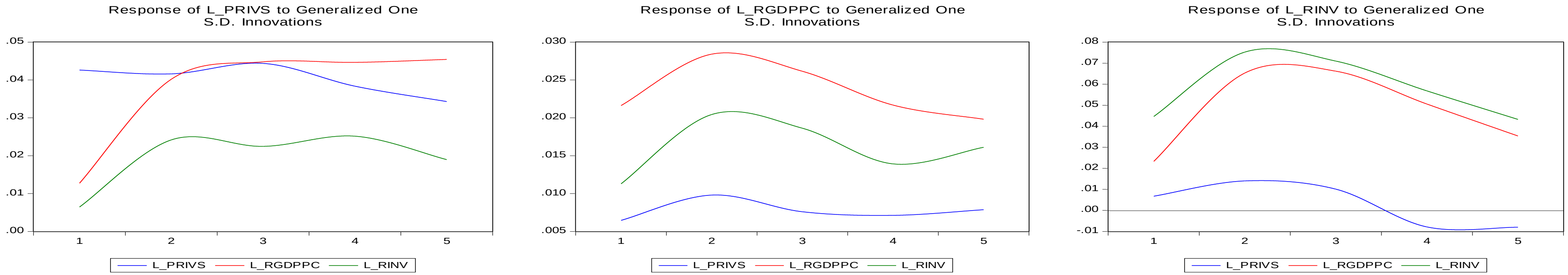
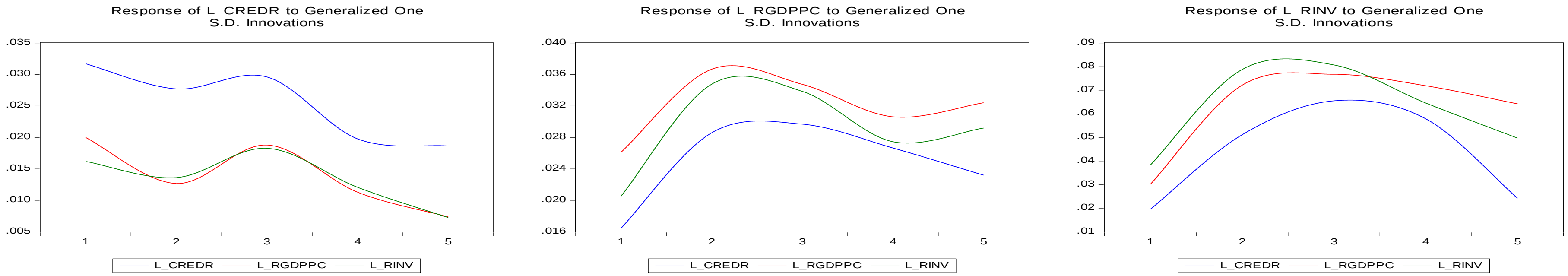


Figure 3. Impulse Response Function – Response to Generalised One Standard Deviation Innovations ± 2 Standard Errors

Model 4: CREDR, Economic Growth and Investment



Model 5: LLB, Economic Growth and Investment

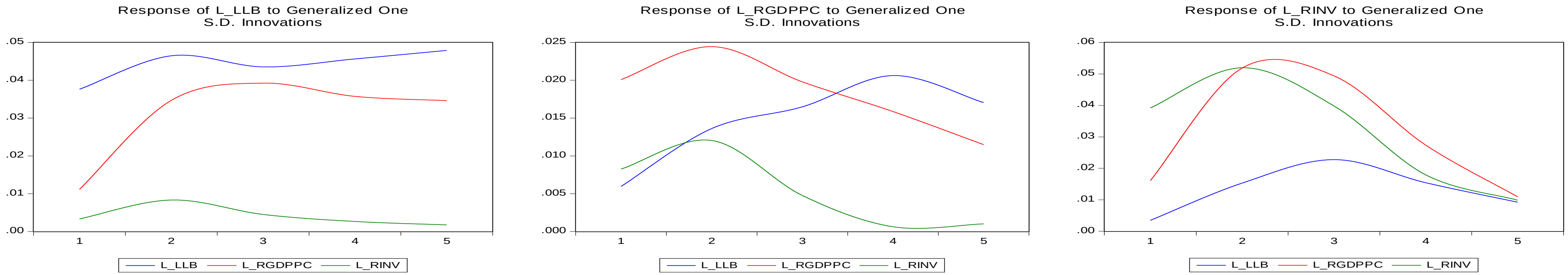


Figure 3. Impulse Response Function – Response to Generalised One Standard Deviation Innovations ± 2 Standard Errors (Cont.)

In terms of investment, the majority of results generated by the decomposition analysis imply a unidirectional relationship flowing from economic growth. The bi-directional hypothesis between investment and economic growth is only supported when $M2GDP$ is employed, while a unidirectional causality is found flowing from financial development to investment when $M2CGDP$ is used.

Analysis of the relationship between financial development, economic growth and investment can also be performed via impulse response functions, which are regarded as an alternative approach to variance decomposition analysis (Narayan & Smyth, 2006; Shahbaz, 2012b; Rahman & Shahbaz, 2013; Shahbaz, Sbia, Hamdi, & Rehman, 2014). For the current study, a generalised approach is applied to the impulse response functions, rather than the Choleskey orthogonalisation approach, due to the generalised approach's invariance to ordering of the variables within the VAR system (Rahman & Shahbaz, 2013). The results of the impulse response functions are presented in Figure 1, above. It can be observed that financial development responds positively to a one standard deviation innovative shock in economic growth and investment. This holds true for all models, with the exception of Model 2. Similarly, for Model 1, Model 3, Model 4 and Model 5, the response of economic growth is positive due to innovative shocks stemming from financial development and investment. Finally, the impulse response functions, where investment is the dependent variable, show that investment responds positively to shocks in economic growth for Models 2 to 5. For Model 1, the response that investment has to shocks in economic growth tends to converge to a neutral position. The impulse response analysis, therefore, supports the general conclusion regarding the causal relationships between financial development, economic growth and investment as provided by the variance decomposition analysis.

2.6 Summary and Conclusion

The aim of the current study was to examine the dynamic causal relationship between financial development and economic growth in South Africa, specifically concentrating on banking sector development. In order to contribute to the development of a consensus view regarding this relationship, as well as to provide possible policy recommendations for economic development, the current study attempted to overcome the limitations of previous studies in this area of research. The three main limitations of previous studies were identified as the following: firstly, the majority of these studies relied significantly on a bivariate causality framework which may, therefore, have exposed them to an omitted variable or misspecification bias. The second limitation revolves around these studies' use of the cointegration techniques, which have been proved to become inappropriate for small samples, namely the residual-based cointegration test and maximum-likelihood-estimation approach, developed by Engle and Granger (1987), Johansen (1988), and Johansen and Juselius (1990). Lastly, these studies mainly employed a cross-sectional methodology which fails to consider country specific characteristics.

In an attempt to address these limitations, the study employed a time-series analysis approach for the period 1969 to 2013. The study also incorporated investment into the causality framework as a third variable in order to develop a simple tri-variate model and reduce the risk of an omitted variable or misspecification bias. Furthermore, the recently developed ARDL-bounds testing procedure was used to examine the cointegration between financial development, economic growth and investment in South Africa. Apart from this, the study also attempted to capture the development of the financial sector, concentrating on the banking sector, by employing five distinct financial development proxies. These proxies included the ratio of broad money stock to GDP, the ratio of broad money stock minus currency to GDP, the ratio of private sector credit to GDP, the ratio of non-financial private credit to total credit, and the ratio of liquid liabilities to GDP. Moreover, the study endeavoured to overcome the limitations surrounding the VECM Granger causality approach by including an additional methodology, namely the IAA.

The results generated by the current study provided both in-sample and forecast results. The in-sample results given by the VECM Granger approach showed that, for the majority of financial development proxies used, a bi-directional causal relationship existed between financial development and economic growth in the short-run. In the long-run, however, the results are indicative of a unidirectional relationship flowing from economic growth to financial development, thus providing support for the demand-following hypothesis. The results for investment varied significantly, depending on the financial development proxy used. For $M2GDP$ and $PRIVS$, the results showed evidence of a bi-directional relationship between investment and financial development, and investment and economic growth. When $M2CGDP$ and $CREDR$ were used, the results indicated that a bi-directional relationship existed between investment and economic growth in both the short-and long-run, while bi-directionality was only found in the long-run for investment and financial development.

The forecast results provided by the IAA showed that for four of the five proxies used, a bi-directional relationship existed between financial development and economic growth. It is only when $M2GDP$ was used that evidence was found of a unidirectional causal flow from economic growth to financial development. In terms of investment, the majority of results implied a unidirectional relationship flowing from economic growth. A bi-directional hypothesis between investment and economic growth was only supported when $M2GDP$ was employed, while a unidirectional causality was found flowing from financial development to investment when $M2CGDP$ was used. To conclude, the results of the study were mainly indicative of a bi-directional causal relationship between financial development and economic growth in the short-run, while a demand-following hypothesis is found to prevail in the long-run. Also, the results indicated a unidirectional causal flow from economic growth to investment, with these results applicable in both the short- and long-run.

In a broader context, following the literature, the finance-growth dynamics as found in the current study point to the fact that these results are rather specific to developing countries, specifically those with an open and rapidly developing financial market. It is thus recommended by this study, following these results, that economic development policies in South Africa should essentially concentrate on pro-growth policies, but also intensify financial development in the short-run. Successful implementation of such policies over the short- and long-run should strengthen financial development and economic growth in South Africa.

Chapter Three: Stock Market Development

3.1 Introduction

As mentioned in the introduction of the second chapter, economists have studied the dynamic causal relationship that exists between financial development and economic growth by largely concentrating on banking sector development as a proxy for financial development. In recent years, however, emphasis has shifted from bank-based measures of financial development to stock market indicators, with the reason being the significant growth of the global stock market industry over the last three decades (Deb & Mukherjee, 2008; Seetanah, Sannassee, & Lamport, 2008). Studies by Demirguc-Kunt and Levine (1996) and Arestis and Demetriades (1997) have estimated that world stock market capitalisation had grown from $4.7 trillion in the mid-1980s to $15.2 trillion in the mid-1990s.[7] Singh (1997) identified a twenty-fivefold increase in the value of shares traded on stock markets in developing countries between 1983 and 1992. Furthermore, Demirguc-Kunt and Levine (1996) found evidence of a 15 per cent increase in total value of shares traded on emerging stock markets between 1985 and 1994. A report by the World Federation of Exchanges (WFE) indicated that global market capitalisation increased to a substantial 64 trillion in 2014, which signifies that global market capitalisation has increased more than threefold in the last two decades (World Federation of Exchanges, 2014). These results show that the roles of stock markets have grown considerably in recent years, and so also their potential impact on economic development.

Consequently, the growing importance of stock market development has led researchers to increasingly use stock market development as a proxy for financial development. Even so, studies exploring the dynamic causal link between stock market development and economic growth, especially in developing countries, are very limited. In cases where such studies have been undertaken, researchers found that the empirical results proved to be largely inconclusive regarding the relationship between stock market development and economic growth. These studies were, however, able to identify that the relationship in question differs significantly from country to country and also changes overtime. Regrettably, the majority of these studies also suffer from the same three limitations as introduced in the second chapter. To recap, these limitations include the following. These studies use bi-variate causality frameworks, which may expose them to omitted variable or

7 Milanovic (2005) calculated that over the same period, global economic production grew, on average, by a mere 1.6 per cent. Consequently, the argument can be made that the global economy and global market capitalisation exhibited disproportional growth during this period. This disproportionality signifies the importance of studying the relationship between financial development and economic growth while employing stock market development as a financial development proxy.

misspecification bias. In most cases, these studies also used cross-sectional approaches which fail to consider country-specific factors.[8] Lastly, as can be recalled, a substantial portion of these studies applied cointegration techniques that are regarded as inappropriate for studies with small sample sizes. These techniques include Engle and Granger's (1987) residual-based cointegration test and the maximum-likelihood-estimation test developed by Johansen (1988) and further expanded by Johansen and Juselius (1990). In addition to these limitations, the study by Odhiambo (2010a) is, to the best available knowledge, the only study undertaken to examine the relationship between stock market development and economic growth in South Africa.

Therefore, against the backdrop of the study undertaken in the second chapter, the current chapter will attempt to investigate whether a causal relationship exists between stock market development and economic growth in South Africa. Furthermore, the study will aim to identify whether the causal relationship between financial development and economic growth changes when stock market indicators are used as financial development proxies. In order to achieve these objectives, the study will employ the same methodology as that of the second chapter, namely the ARDL-Bounds procedure, VECM Granger causality approach, and the Innovative Accounting Approach.

The use of the same methodology is largely motivated by the ability to compare results, not only with the study in the second chapter, but also with previous studies. Apart from this, the current study will also incorporate investment into the causality framework so as to develop a simple tri-variate model. To overcome the limitation posed by cross-sectional data, the study will employ time-series data for South Africa over the period 1989 to 2013. Lastly, the stock market development proxies that will be used include the ratio of market capitalisation to GDP, the ratio of total value of shares traded to GDP, the turnover ratio, and stock market volatility calculated over a four quarter moving standard deviation, as well as an equally weighted stock market development index which combines the four former indicators.

The rest of the chapter is structured as follows. Section two will provide a theoretical and empirical review of available literature surrounding the topic in question. A brief description of the data, as well as the data sources, will be given in section three. Section four deals with the methodology, while section five presents the findings of the empirical analysis. Section five concludes the chapter.

8 For more information on the problem of using a cross-sectional approach, see Quah (1993), Caselli *et al*. (1996), Ghirmay (2004), and Odhiambo (2008; 2009a).

3.2 Literature Review

3.2.1 Theoretical review

There exist four possible channels through which stock market development can advance economic growth. The first channel is through risk or portfolio diversification. According to Acemoglu and Zilibotti (1997) and Capasso (2008), diversification, brought on by the development of stock market development, offers firms the opportunity to engage in specialised production and enhances economic growth by means of efficiency gains. Resource allocation is also improved through risk diversification offered by internationally integrated stock markets, which assists in accelerating economic growth (Obstfeld, 1994). Saint-Paul (1992) and Devereux and Smith (1994) contend that improved development of stock markets offer investors improved channels for diversifying risk, which drives the demand for high-return investment. These high-return investments offer a positive influence for economic growth by driving higher levels of investment in the economy.

N'Zue (2006) has made the assertion that savings mobilisation and better resource allocation present the second channel through which stock market development influences economic growth. Large, efficient stock markets are able to ease capital accumulation and savings mobilisation within an economy (Greenwood & Smith, 1997). This means that the number of feasible investment projects within the economy increases and, since they require significant capital injections, stock market development can help enhance economic efficiency and thereby accelerate long-run growth. Bencivenga and Smith (1991) argue that, by improving the liquidity of the stock market, stock market development contributes to economic growth. Lack of liquidity in a stock market will result in the loss of many profitable long-term investments and hence, economic growth. This follows investors' reluctance to tie up their funds for long periods of time. Lack of liquidity in the stock market also hampers efficient allocation of resources and capital. The development of the stock market, focusing on improved liquidity, is therefore important. It will enable firms to favourably acquire equity capital by allowing investors to easily sell shares in the market. Owing to this, a more liquid stock market facilitates the efficient allocation of resources and capital, which is essential for long-term economic growth (Levine, 1991).

Research by Neusser and Kugler (1998) extends this argument and asserts that the cost of foreign capital is reduced by improved liquidity offered by a more developed equity market. Given that foreign capital is essential for economic development, it offers a vehicle for influencing economic growth. Liquidity can also facilitate economic growth by increasing investor incentive for firm information which causes improved corporate governance. Holmstrom and Tirole (1993) argue that the improvement in corporate governance facilitates economic growth. Other studies that conform to the view of savings mobilisation and resource allocation, as a channel through which stock market development influences economic growth, include Hicks (1969), Levine and Zervos (1998a; 1998b), and Adjasi and Biekpe (2006).

Mitigation of the principal–agent problem offers the third channel through which stock market development can improve economic growth in an economy (Adjasi & Biekpe, 2006). Empirical studies by McConnell, Diamond and Verrecchia (1982) and Jensen and Murphy (1990) show that the principal–agent problem is mitigated by means of a more efficient stock market, which assists in tying manager compensation to stock performance. As a result, the interests of managers and shareholders become more aligned. Consequently, providing managers with incentives to make proper investment decisions and providing disincentives to operate on the basis of their personal interests emphasize the role of equity markets to improving growth. Laffont and Tirole (1988), together with Scharfstein (1988), argue that well-functioning stock markets improve corporate governance and control and thus promote efficient resource allocation and economic growth.

The final channel through which stock market development operates is information availability. Researchers, such as Atje and Jovanovic (1993), Caporale, Howells and Soliman (2004), and Adjasi and Biekpe (2006), hold the view that stock markets have access to more market-related information than financial intermediaries. This means that development of stock markets offers more efficient allocation of resources due to improved information and thereby translates into better economic growth. Kyle (1984) and Holmstrom and Tirole (1993) argue that investors are able to use the information provided by the stock market to generate profits on price changes. Levine and Zervos (1996) extend this argument and state that the ability to profit from information will incentivize investors to research and monitor firms for new information. Therefore, firms will be pressured to improve corporate governance which, as was seen in the previous section, increases economic growth. Furthermore, Levine and Zervos (1996) argue that well-developed stock markets can offer a different stimulus for investment and growth, due to the fact that stock markets offer different forms of financial services, compared with financial intermediaries.

King and Levine (1993b) found evidence that equity markets are able to generate information about the technological state of the economy, as well as information on entrepreneurial activity, which offers an information system conducive to productivity growth and thus, economic growth. Lee (2001) asserts that, given its ability to generate information and reflect market fundamentals of firms in the real sector, a well-developed stock market operating in conjunction with a banking sector offers a better financial system than does a pure bank system. In a more radical view, Perotti and Van Oijen (2001) have argued that through information availability and accessibility, diverse equity ownership becomes possible which, in turn, produces a constituency for political stability and therefore encourages economic growth.

Counter-arguments to the view of stock market importance are numerous and include Singh (1971; 1997), Stiglitz (1985), Boyd and Prescott (1986), Shleifer and Vishny (1986), Shleifer and Summers (1988), Bhide (1993), Adjasi and Biekpe (2006), Sarkar (2006), and Naceur and Ghazouani (2007). These researchers argue that too much emphasis is given to stock market development and its influence on economic growth. Singh (1971) states that the takeover mechanism of a well-functioning stock market fails to perform a disciplinary function, which means that competitive selection within the market focuses more on the size of a firm than on its performance. Therefore, a higher probability of survival exists for a large inefficient firm than for a small efficient firm. This argument is further expanded in Singh (1997) where it is argued that the pricing and takeover mechanism of a developed stock market fails to generate new wealth by means of organic growth. Stiglitz (1985) concludes that improved stock market liquidity will not increase investors' incentive for acquiring new information about firms. The reason for this conclusion is that an efficient well-functioning stock market tends to reflect new information almost instantaneously through prices changes. As a result, investors will reduce the use of their resources to obtain new information.

It terms of improved resource allocation, Boyd and Prescott (1986) argue that banking sector development is more important for promoting economic growth than stock market development, because banks offer better resource allocation than stock markets do. By encouraging the dissemination of ownership which impedes economic growth, Shleifer and Vishny (1986) argue that enhanced stock market development has a negative impact on economic growth. Bhide (1993) maintains that increased liquidity brought on by stock market development will have a negative effect on investors' commitment to investment positions and on their incentive to exercise corporate control. Failure to exercise corporate control will, therefore, have an adverse effect on economic growth. Apart from this, Naceur and Ghazouani (2007) put forward the argument that the benefits of liquidity depend significantly on a threshold level and that only after the threshold level has been reached, will liquidity exert a positive influence on GDP.

3.2.2 Empirical review

The history of studies on the stock market-growth nexus is considerably shorter and more limited than those focusing on banking sector development. Spears (1991), Pardy (1992), and Atje and Jovanovic (1993) pioneered the work on the stock market-growth nexus when they identified a strong correlation between stock market development and a country's real GDP per capita. Studies following these seminal works were Levine and Zervos (1996; 1998), Korajczyk (1996), Filer, Hanonsek and Campas (1999), and Rousseau and Wachtel (2000).

These studies supported the view of a strong stock market-growth correlation. Using panel data on 41 countries over the period 1976 to 1993, Levine and Zervos (1996) determined that a particularly strong relationship exists between different proxies of stock market activity and the real sector, especially for developing countries. Furthermore, they concluded that after controlling for numerous economic and political aspects, stock markets and banks offer different and unique financial services and are, therefore, jointly significant for growth in the real sector. Korajczyk (1996) investigated whether capital accumulation and economic growth are positively correlated with effective international stock market integration. The study employed a cross-sectional approach, together with a constructed measure of deviation that could be applied across countries. The results yielded a positive correlation between stock market integration and economic growth, implying that stock market development is advantageous for growth. Levine and Zervos (1998) extended the previous work of Levine and Zervos (1993) and again came to the same conclusion. Additionally, they identified that even after controlling for economic and political factors, the size, volatility and international integration of stock markets are not robustly linked to economic growth.

Examining the stock market-growth nexus, Filer, Hanonsek and Campas (1999) argued that a well-functioning stock market offers a significant driver of growth for developing countries. Applying a pure cross-sectional empirical approach on annual data for 1980 to 1995, Filer, Hanonsek and Campas (1999) estimated vector auto regressions for 47 countries. Their results demonstrate that stock market liquidity takes the leading role in positively influencing real sector GDP. Moreover, the study contributed significantly to the literature by incorporating panel techniques in the methodology. Nevertheless, these studies, as well as the pioneering studies, suffered from significant statistical problems. These statistical caveats included unmeasured cross-country heterogeneity, endogeneity issues, simultaneity and variable omission, which tend to lead to spurious regression results.

Subsequently, researchers started using larger data sets, longer time series, and more recently developed statistical techniques in an attempt to rectify these statistical problems. Applying panel regression analysis on a sample of 64 countries over the period 1981 to 1998, Durham (2002) found that positive results for the stock market-growth relationship depend heavily on the inclusion of higher income countries into the regression analysis. These results, therefore, limit the relevance that a positive relationship, between stock market development and growth, has on low-income countries. Extending these results, Minier (2003) investigated whether the correlation between stock market development and economic growth differed on the basis of a country's level of financial and economic development. The results illustrated that a positive correlation does not hold, given low levels of market capitalisation, which indicated that results are country specific. A study by Rioja and Valev (2004) employed data from 74 countries and claimed that the stock market-growth nexus tends to differ between countries, thus offering additional support to the studies by Durham and Minier.

Alam and Hasan (2003) investigated the causal relationship between equity market development and economic growth in the United States. The methodology employed by the study included a Johansen-Juselius co-integration test and a vector error correction model. The results of the co-integration test indicated that a long-run relationship exists between the two variables, and the associated causality ordering indicated that stock market development holds important information for identifying future changes in economic growth. Supporting this view is Bahadur (2006), who claims that predictions of future economic growth can be made based on stock market development. The study also found that causality between stock market development and growth was only found when using real variables. By using panel data for the period 1976 to 1998, Beck and Levine (2004) investigated the independent impact of stock market and bank sector development on growth. They applied the GMM technique which was designed for dynamic panel data sets. The methodology considered and made provision for previously critiqued statistical problems, such as variable omission, simultaneity and unmeasured country-specific effects. The results indicated that the expansion of both stock markets and banks positively influence economic growth.

Addressing whether stock market development causes economic growth, Caporale, Howells and Soliman (2004) examined the causal link between stock market development, financial development and economic growth. The examination was performed using the empirical technique developed by Toda and Yamamoto (1995) which enables testing for causality in VAR processes. The results obtained from examining data across seven countries suggested that a well-functioning stock market can foster economic growth through faster capital accumulation and more efficient resource allocation. While investigating the relationship between stock market development, economic growth, financial liberalisation policies, foreign portfolio investment, and country risk, El-Wassal

(2005) identified that, for 40 emerging economies between the periods 1980 to 2000, a demand-following effect exists between stock market development and economic growth. These findings were generated using a Two Stages Least Squares methodology, combined with a Fixed Effect technique. Love and Zicchino (2006) applied a VAR methodology to firm-level panel data for 36 countries, and they were able to generate results with important implications for growth. The results suggest that improved liquidity of stock markets offer firms the ability to acquire capital more easily, thus facilitating the allocation of capital, increased investment and thereby, increased economic growth. Other studies that have also employed vector models include the country-specific studies by N'Zue (2006), Agrawalla and Tuteja (2007), and Shahbaz, Ahmed and Ali, (2008). These studies maintain that a supply-side relationship exists for Ghana, India and Pakistan. Yartey (2007) found that banking sector development led stock market development in developing countries. His results identified that a 1 per cent increase in banking sector development generated a 0.6 per cent increase in stock market development. The results were robust, after controlling for macroeconomic stability, economic development and institutional quality of the legal and political sectors. Following the literature review, a brief description of the data and data sources will be given in the next section.

3.3 Data Description, Sources and Definitions

3.3.1 Data Description

It was noted by Beck and Levine (2004) that no direct measure is available to evaluate the relationship between stock market development and economic growth. Subsequently, taking this absence into account, the present study will use five distinct stock market indicators with which to gauge the causal relationship between financial development and economic growth. The use of five indicators may seem excessive; however, a larger number of indicators should provide a better consensus regarding the relationship under study.[9] Owing to this, the applied stock market development proxies are as follows. The first measure was taken from the work of Levine (1991), Bencivenga, Smith and Starr (1995) and Levine and Zervos (1996). This indicator, henceforth known as $STTR$ or the turnover ratio, is used to measure stock market liquidity and is calculated as the ratio of total value of shares traded on a country's domestic exchange to the total value of listed shares. The ratio thus indicates a stock market's trading volume relative to the size of the market itself. The rationale behind the use of this measure is the fact that illiquid markets tend to discourage long-term investments, whereas more liquid stock markets offer more incentive for investors to invest in long-term assets,

9 The use of five indicators is further motivated by the fact that the majority of previous studies have implemented no more than three proxies and, as such, have consistently provided inconclusive results.

seeing as they will be able to readily sell these assets. As a result, an increase in this measure should indicate a more liquid market which, in turn, has the potential to generate faster economic growth through more efficient resource allocation.

The second indicator, known in the current study as $STTV$ or the value traded ratio, is the ratio of total value of shares traded to real GDP. According to Levine and Zervos (1996), the value traded ratio serves as a second measure of stock market liquidity. Recent studies by Levine and Zervos (1998a), Rousseau and Wachtel (2000), and Beck and Levine (2004) have, however, argued that the value traded ratio suffers from a significant shortcoming. This shortcoming is based on the fact that stock markets are primarily forward looking, which means that higher anticipated economic growth will generate higher share prices. Given that the value traded ratio is a product of price and quantity divided by economic growth, it has the potential to increase without an increase in the number of transactions in the market. This follows the fact that a price element, related to the stock market, is not captured in the ratio's denominator, as is the case with the turnover ratio.

Market capitalisation ratio, or MC, is the third measure of stock market development that will be used. Market capitalisation ratio is calculated as the ratio of the total value of shares listed on a country's exchange, divided by real GDP. This measure's main shortcoming is its lack of theoretical support. Levine and Zervos (1998) state that it is highly unlikely for resource allocation and economic growth to be influenced by the mere listing of shares. Nonetheless, the study will use this measure due to its ability to indicate whether a stock market is growing. If so, it might be possible to suggest that stock market growth is the result of increased stock market development. Furthermore, it is assumed that the ability to mobilise capital and diversify risk is positively correlated with the size of the stock market, thus a larger stock market should provide increased investment incentive and consequently higher growth.

The fourth indicator is stock market volatility, or VOL. The use of stock market volatility follows the work of Arestis, Demetriades and Luintel (2001) and Deb and Mukherjee (2008) who maintain that stock market volatility provides a measure of a market's ability to efficiently and effectively allocate investment resources. Lastly, an equally weighted stock market development index will be used, as was the case in Seetanah, Sannassee and Lamport (2008). The purpose of this index is to combine the four former indicators into a single index in order to identify the joint influence that these indicators may have on the relationship between financial development and economic growth. This indicator will be referred to as $DEVIN$. As was the case in the previous chapter, the ratio of real private investment to real GDP, referred to as $RINV$, will be used as an investment indicator for the purpose of developing a tri-variate model and limiting the risk of an omitted variable or model specification bias. Furthermore, the economic growth proxy used in the second chapter, $RGDPPC$, will also be employed in the current chapter.

3.3.2 Data Source and Variable Definitions

In contrast to the first study, this study employs quarterly time series data covering the period 1989 to 2013 for all variables. The shorter time period was motivated by data availability. In spite of this, the quarterly frequency offers a sufficiently large sample. The SARB, The World Bank and The JSE provide the sources from which all data were collected. The variables that will be used in the regression analysis are defined as follows:

1. $STTR$ = the ratio of total value of shares traded to the total value of listed shares. Total value of trades data were deflated using the consumer price index (2010 = 100).

2. $STTV$ = the ratio of total value of shares traded to real GDP.

3. MC = the ratio of market capitalisation or value of listed shares to real GDP. Market capitalisation was deflated using the consumer price index (2010 = 100).

4. VOL = stock market volatility calculated over a four-quarter moving standard deviation.

5. $DEVIN$ = an equally weighted stock market development index which combines $STTR$, $STTV$, MC and VOL.[10]

6. $RGDPPC$ = real per capita GDP (2010 = 100).

7. $RINV$ = the investment rate calculated as the ratio of real private investment to real GDP (2010 = 100).

All variables were calculated using real terms (constant 2010 prices) for both the numerator and denominator. As mentioned in the second chapter, the use of real values is justified to eliminate the effects of price level changes on regression results, thereby mitigating the risk of spurious regressions. Lastly, all variables employed are transformed into their natural logarithmic forms for the purpose of ensuring an approximately normal distribution for each variable. Also, logarithmic transformation assists in providing a non-linear relationship between the dependent and independent variables, while simultaneously preserving the linearity of the regression model. The following

10 The equally weighted index was generated by the author following the method applied in (Seetanah, Sannassee, & Lamport, 2008).

section will examine the empirical methodology that will be used to study the relationship between stock market development, economic growth and investment.

3.4 Empirical Methodology

The current study will employ the same methodology as that used in chapter two, namely the ARDL-Bounds procedure, VECM Granger causality testing, and the IAA. The reason for using the same methodology is for the purpose of comparing results between the two studies. However, since these techniques have been discussed extensively in the previous chapter, the current chapter will only provide the various ARDL and VECM models to be regressed using the stock market indicators.[11] Consequently, thirty distinct equations will be used, divided equally between the ARDL and VECM models. The ARDL models are presented as the following unrestricted error-correction models.

Model 1c: STTR, Economic Growth and Investment

$$\Delta lnSTTR_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta lnSTTR_{t-i} + \sum_{i=0}^{n} \alpha_{2i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \alpha_{3i} \Delta lnRGDPPC_{t-i} + \alpha_4 lnSTTR_{t-1} + \alpha_5 lnRINV_{t-1} + \alpha_6 lnRGDPPC_{t-1} + e_{1t} \quad (31)$$

$$\Delta lnRGDPPC_t = \gamma_0 + \sum_{i=1}^{n} \gamma_{1i} \Delta lnRGDPPC_{t-i} + \sum_{i=0}^{n} \gamma_{2i} \Delta lnSTTR_{t-i} + \sum_{i=0}^{n} \gamma_{3i} \Delta lnRINV_{t-i} + \gamma_4 lnRGDPPC_{t-1} + \gamma_5 lnSTTR_{t-1} + \gamma_6 lnRINV_{t-1} + e_{2t} \quad (32)$$

$$\Delta lnRINV_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \beta_{2i} \Delta lnSTTR_{t-i} + \sum_{i=0}^{n} \beta_{3i} \Delta lnRGDPPC_{t-i} + \beta_4 lnRINV_{t-1} + \beta_5 lnSTTR_{t-1} + \beta_6 lnRGDPPC_{t-1} + e_{3t} \quad (33)$$

Model 2c: STTV, Economic Growth and Investment

$$\Delta lnSTTV_t = \delta_0 + \sum_{i=1}^{n} \delta_{1i} \Delta lnSTTV_{t-i} + \sum_{i=0}^{n} \delta_{2i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \delta_{3i} \Delta lnRGDPPC_{t-i} + \delta_4 lnSTTV_{t-1} + \delta_5 lnRINV_{t-1} + \delta_6 lnRGDPPC_{t-1} + \varepsilon_{1t} \quad (34)$$

$$\Delta lnRGDPPC_t = \vartheta_0 + \sum_{i=1}^{n} \vartheta_{1i} \Delta lnRGDPPC_{t-i} + \sum_{i=0}^{n} \vartheta_{2i} \Delta lnSTTV_{t-i} + \sum_{i=0}^{n} \vartheta_{3i} \Delta lnRINV_{t-i} + \vartheta_4 lnRGDPPC_{t-1} + \vartheta_5 lnSTTV_{t-1} + \vartheta_6 lnRINV_{t-1} + \varepsilon_{2t} \quad (35)$$

11 For detail on the empirical methodology, see section 2.4 in Chapter Two.

$$\Delta lnRINV_t = \theta_0 + \sum_{i=1}^{n} \theta_{1i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \theta_{2i} \Delta lnSTTV_{t-i} + \sum_{i=0}^{n} \theta_{3i} \Delta lnRGDPPC_{t-i} + \theta_4 lnRINV_{t-1} + \theta_5 lnSTTV_{t-1} + \theta_6 lnRGDPPC_{t-1} + \varepsilon_{3t} \quad (36)$$

Model 3c: MC, Economic Growth and Investment

$$\Delta lnMC = \lambda_0 + \sum_{i=1}^{n} \lambda_{1i} \Delta lnMC_{t-i} + \sum_{i=0}^{n} \lambda_{2i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \lambda_{3i} \Delta lnRGDPPC_{t-i} + \lambda_4 lnMC_{t-1} + \lambda_5 lnRINV_{t-1} + \lambda_6 lnRGDPPC_{t-1} + \epsilon_{1t} \quad (37)$$

$$\Delta lnRGDPPC_t = \pi_0 + \sum_{i=1}^{n} \pi_{1i} \Delta lnRGDPPC_{t-i} + \sum_{i=0}^{n} \pi_{2i} \Delta lnMC_{t-i} + \sum_{i=0}^{n} \pi_{3i} \Delta lnRINV_{t-i} + \pi_4 lnRGDPPC_{t-1} + \pi_5 lnMC_{t-1} + \pi_6 lnRINV_{t-1} + \epsilon_{2t} \quad (38)$$

$$\Delta lnRINV_t = \xi_0 + \sum_{i=1}^{n} \xi_{1i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \xi_{2i} \Delta lnMC_{t-i} + \sum_{i=0}^{n} \xi \Delta lnRGDPPC_{t-i} + \xi_4 lnRINV_{t-1} + \xi_5 lnMC_{t-1} + \xi_6 lnRGDPPC_{t-1} + \epsilon_{3t} \quad (39)$$

Model 4c: VOL, Economic Growth and Investment

$$\Delta lnVOL_t = \phi_0 + \sum_{i=1}^{n} \phi_{1i} \Delta lnVOL_{t-i} + \sum_{i=0}^{n} \phi_{2i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \phi_{3i} \Delta lnRGDPPC_{t-i} + \phi_4 lnVOL_{t-1} + \phi_5 lnRINV_{t-1} + \phi_6 lnRGDPPC_{t-1} + \varphi_{1t} \quad (40)$$

$$\Delta lnRGDPPC_t = \varrho_0 + \sum_{i=1}^{n} \varrho_{1i} \Delta lnRGDPPC_{t-i} + \sum_{i=0}^{n} \varrho_{2i} \Delta lnVOL_{t-i} + \sum_{i=0}^{n} \varrho_{3i} \Delta lnRINV_{t-i} + \varrho_4 lnRGDPPC_{t-1} + \varrho_5 lnVOL_{t-1} + \varrho_6 lnRINV_{t-1} + \varphi_{2t} \quad (41)$$

$$\Delta lnRINV_t = \psi_0 + \sum_{i=1}^{n} \psi_{1i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \psi_{2i} \Delta lnVOL_{t-i} + \sum_{i=0}^{n} \psi_{3i} \Delta lnRGDPPC_{t-i} + \psi_4 lnRINV_{t-1} + \psi_5 lnVOL + \psi_6 lnRGDPPC_{t-1} + \varphi_{3t} \quad (42)$$

Model 5c: DEVIN, Economic Growth and Investment

$$\Delta lnDEVIN_t = \tau_0 + \sum_{i=1}^{n} \tau_{1i}\, \Delta lnDEVIN_{t-i} + \sum_{i=0}^{n} \tau_{2i}\, \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \tau_{3i}\, \Delta lnRGDPPC_{t-i} + \tau_4 lnDEVIN_{t-1} + \tau_5 lnRINV_{t-1} + \tau_6 lnRGDPPC_{t-1} + \omega_{1t} \quad (43)$$

$$\Delta lnRGDPPC_t = \upsilon_0 + \sum_{i=1}^{n} \upsilon_{1i}\, \Delta lnRGDPPC_{t-i} + \sum_{i=0}^{n} \upsilon_{2i}\, \Delta lnDEVIN_{t-i} + \sum_{i=0}^{n} \upsilon_{3i}\, \Delta lnRINV_{t-i} + \upsilon_4 lnRGDPPC_{t-1} + \upsilon_5 lnDEVIN_{t-1} + \upsilon_6 lnRINV_{t-1} + \omega_{2t} \quad (44)$$

$$\Delta lnRINV_t = \varphi_0 + \sum_{i=1}^{n} \varphi_{1i}\, \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \varphi_{2i}\, \Delta lnDEVIN_{t-i} + \sum_{i=0}^{n} \varphi_{3i}\, \Delta lnRGDPPC_{t-i} + \varphi_4 lnRINV_{t-1} + \varphi_5 lnDEVIN_{t-1} + \varphi_6 lnRGDPPC_{t-1} + \omega_{3t} \quad (45)$$

where: $lnSTTR$ represents the logarithmic transformation of the ratio of total value of shares traded to market capitalisation; $lnSTTV$ represents the logarithmic transformation of the ratio of total value of shares traded to real GDP; $lnMC$ represents the logarithmic transformation of the ratio of market capitalisation (total value of listed shares) to real GDP; $lnVOL$ represents the logarithmic transformation of stock market volatility; $lnDEVIN$ represents the logarithmic transformation of the equally weighted index; $lnRINV$ represents the logarithmic transformation of the rate of investment; $lnRGDPPC$ represent the logarithmic transformation of real GDP per capita; e_t, ε_t, ϵ_t, φ_t and ω_t denote white noise error terms; Δ denotes a first difference operator.

Similarly, the VECM equations are as follows:

Model 1d: STTR, Economic Growth and Investment

$$\Delta lnSTTR_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i}\, \Delta lnSTTR_{t-i} + \sum_{i=0}^{n} \alpha_{2i}\, \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \alpha_{3i}\, \Delta lnRGDPPC_{t-i} + \eta_1 ECM_{t-1} + e_{1t} \quad (46)$$

$$\Delta lnRGDPPC_t = \gamma_0 + \sum_{i=1}^{n} \gamma_{1i}\, \Delta lnRGDPPC_{t-i} + \sum_{i=0}^{n} \gamma_{2i}\, \Delta lnSTTR_{t-i} + \sum_{i=0}^{n} \gamma_{3i}\, \Delta lnRINV_{t-i} + \eta_3 ECM_{t-1} + e_{2t} \quad (47)$$

$$\Delta lnRINV_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i}\, \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \beta_{2i}\, \Delta lnSTTR_{t-i} + \sum_{i=0}^{n} \beta_{3i}\, \Delta lnRGDPPC_{t-i} + \eta_2 ECM_{t-1} + e_{3t} \quad (48)$$

Model 2d: STTV, Economic Growth and Investment

$$\Delta lnSTTV_t = \delta_0 + \sum_{i=1}^{n} \delta_{1i} \Delta lnSTTV_{t-i} + \sum_{i=0}^{n} \delta_{2i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \delta_{3i} \Delta lnRGDPPC_{t-i} + \mu_1 ECM_{t-1} + \varepsilon_{1t} \quad (49)$$

$$\Delta lnRGDPPC_t = \vartheta_0 + \sum_{i=1}^{n} \vartheta_{1i} \Delta lnRGDPPC_{t-i} + \sum_{i=0}^{n} \vartheta_{2i} \Delta lnSTTV_{t-i} + \sum_{i=0}^{n} \vartheta_{3i} \Delta lnRINV_{t-i} + \mu_3 ECM_{t-1} + \varepsilon_{2t} \quad (50)$$

$$\Delta lnRINV_t = \theta_0 + \sum_{i=1}^{n} \theta_{1i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \theta_{2i} \Delta lnSTTV_{t-i} + \sum_{i=0}^{n} \theta_{3i} \Delta lnRGDPPC_{t-i} + \mu_2 ECM_{t-1} + \varepsilon_{3t} \quad (51)$$

Model 3d: MC, Economic Growth and Investment

$$\Delta lnMC = \lambda_0 + \sum_{i=1}^{n} \lambda_{1i} \Delta lnMC_{t-i} + \sum_{i=0}^{n} \lambda_{2i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \lambda_{3i} \Delta lnRGDPPC_{t-i} + \varpi_1 ECM_{t-1} + \epsilon_{1t} \quad (52)$$

$$\Delta lnRGDPPC_t = \pi_0 + \sum_{i=1}^{n} \pi_{1i} \Delta lnRGDPPC_{t-i} + \sum_{i=0}^{n} \pi_{2i} \Delta lnMC_{t-i} + \sum_{i=0}^{n} \pi_{3i} \Delta lnRINV_{t-i} + \varpi_3 ECM_{t-1} + \epsilon_{2t} \quad (53)$$

$$\Delta lnRINV_t = \xi_0 + \sum_{i=1}^{n} \xi_{1i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \xi_{2i} \Delta lnMC_{t-i} + \sum_{i=0}^{n} \xi \Delta lnRGDPPC_{t-i} + \varpi_2 ECM_{t-1} + \epsilon_{3t} \quad (54)$$

Model 4d: VOL, Economic Growth and Investment

$$\Delta lnVOL = \phi_0 + \sum_{i=1}^{n} \phi_{1i} \Delta lnVOL_{t-i} + \sum_{i=0}^{n} \phi_{2i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \phi_{3i} \Delta lnRGDPPC_{t-i} + \zeta_1 ECM_{t-1} + \varphi_{1t} \quad (55)$$

$$\Delta lnRGDPPC_t = \varrho_0 + \sum_{i=1}^{n} \varrho_{1i} \Delta lnRGDPPC_{t-i} + \sum_{i=0}^{n} \varrho_{2i} \Delta lnVOL_{t-i} + \sum_{i=0}^{n} \varrho_{3i} \Delta lnRINV_{t-i} + \zeta_3 ECM_{t-1} + \varphi_{2t} \quad (56)$$

$$\Delta lnRINV_t = \psi_0 + \sum_{i=1}^{n} \psi_{1i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \psi_{2i} \Delta lnVOL_{t-i} + \sum_{i=0}^{n} \psi_{3i} \Delta lnRGDPPC_{t-i} + \zeta_2 ECM_{t-1} + \varphi_{3t} \quad (57)$$

Model 5d: DEVIN, Economic Growth and Investment

$$\Delta lnLLB_t = \tau_0 + \sum_{i=1}^{n} \tau_{1i} \Delta lnLLB_{t-i} + \sum_{i=0}^{n} \tau_{2i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \tau_{3i} \Delta lnRGDPPC_{t-i} + \sigma_1 ECM_{t-1} + \omega_{1t} \quad (58)$$

$$\Delta lnRGDPPC_t = \upsilon_0 + \sum_{i=1}^{n} \upsilon_{1i} \Delta lnRGDPPC_{t-i} + \sum_{i=0}^{n} \upsilon_{2i} \Delta lnLLB_{t-i} + \sum_{i=0}^{n} \upsilon_{3i} \Delta lnRINV_{t-i} + \sigma_3 ECM_{t-1} + \omega_{2t} \quad (59)$$

$$\Delta lnRINV_t = \varphi_0 + \sum_{i=1}^{n} \varphi_{1i} \Delta lnRINV_{t-i} + \sum_{i=0}^{n} \varphi_{2i} \Delta lnLLB_{t-i} + \sum_{i=0}^{n} \varphi_{3i} \Delta lnRGDPPC_{t-i} + \sigma_2 ECM_{t-1} + \omega_{3t} \quad (60)$$

where ECM_{t-1} represents the lagged error correction term obtained from the long-run equilibrium relationships observed in Equations (31) to (45); α_0, γ_0, β_0, δ_0, ϑ_0, θ_0, λ_0, π_0, ξ_0, ϕ_0, ϱ_0, ψ_0, τ_0, υ_0 and φ_0 denote the constant terms of the VECM equations; e_{1t}, ε_{1t}, ϵ_{3t}, φ_{3t} and ω_{3t} denote residual terms which, according to Rahman and Shahbaz (2013), are assumed to be normally distributed with a mean of zero and a constant variance.

3.5 Empirical Test Results

3.5.1 Descriptive Statistics and Stationarity Tests

Table 8, below, shows the descriptive statistics for each variable employed in the current chapter's empirical methodology. In contrast to the second chapter, the Jarque-Bera statistic indicates that not all the variables are normally distributed, which could be explained by the presence of outliers over the sample period. Dummy variables for the years 1994, 2007 and 2008 were also incorporated to make provision for potential structural breaks, thereby improving the stability of the regression models.[12] Similarly to Chapter Two, dummy variables were included in a stepwise fashion and tested on the basis of their statistical significance.

As mentioned before, the application of stationarity tests are not a prerequisite for the ARDL-bounds testing procedure (Shahbaz & Dube, 2012). Nonetheless, stationarity tests offer the assurance that no variables integrated of order two or higher will be used in the regression models. As a result, stationarity tests serve to ensure compliance with the ARDL approach's assumption of all variables being I(0) or I(1). In addition, the identification and exclusion of I(2) variables provided by stationarity tests assist in providing valid cointegration results, since the inclusion of an I(2) variable will render the computed F-statistic invalid, and therefore invalidate the cointegration results. As per the methodology, the stationarity tests applied include the PP unit root test and the Dickey-Fuller-GLS test developed by Phillips and Perron (1988) and Eliot *et al.* (1996), respectively. Both these

12 The three dummy variables for the years 1994, 2007 and 2008 are included to represent South Africa's political transition and the period spanning the global financial crisis, respectively.

tests offer strong power in testing for stationarity amongst variables, above that offered by the commonly used ADF test.

Table 8. Descriptive Statistics for Each Series over the Sample Period

	$lnSTTR$	$lnSTTV$	$lnMC$	$lnVOL$	$lnDEVIN$	$lnRGDPPC$	$lnRINV$
Mean	-1.45	-1.01	-0.53	-4.60	-0.52	10.76	-1.84
Median	-1.02	-0.56	-0.58	-4.61	-0.45	10.73	-1.90
Maximum	-0.43	0.38	-0.18	-3.38	0.19	10.93	-1.48
Minimum	-2.97	-1.46	-0.78	-5.46	-1.51	10.65	-2.08
Standard Dev	0.09	0.08	0.15	0.39	0.42	0.09	0.17
Skewness	-0.57	-0.53	0.82	0.33	-0.34	0.57	0.47
Kurtosis	1.62	1.77	2.62	2.96	2.53	1.81	1.92
Jacque-Bera	2.84	5.98	5.37	1.79	2.76	4.85	8.23
Probability	0.25	0.05	0.07	0.41	0.25	0.09	0.02
	$\Delta lnSTTR$	$\Delta lnSTTV$	$\Delta lnMC$	$\Delta lnVOL$	$\Delta lnDEVIN$	$\Delta lnRGDPPC$	$\Delta lnRINV$
Mean	0.02	0.03	0.01	-0.01	0.01	0.00	0.00
Median	0.02	0.03	0.02	-0.08	0.02	0.00	0.01
Maximum	0.34	0.28	0.36	1.33	0.31	0.01	0.04
Minimum	-0.13	-0.15	-0.43	-0.86	-0.40	-0.02	-0.08
Standard Dev	0.07	0.07	0.11	0.37	0.08	0.01	0.02
Skewness	0.91	0.30	0.06	0.71	-0.72	-1.11	-1.16
Kurtosis	5.82	3.98	3.94	3.88	2.75	3.95	2.11
Jacque-Bera	4.71	5.21	0.42	11.16	4.48	4.40	9.85
Probability	0.11	0.07	0.56	0.00	0.11	0.12	0.01

The results of these tests are shown in Table 9, below. The results are illustrated in both the level and first difference form to offer indication of I(0) and I(1) variables. Robustness of results was also ensured by performing the Dickey-Fuller-GLS test with an intercept, as well as both a trend and intercept. In addition to an intercept and trend and intercept, the PP test was performed with neither a trend nor intercept. From the results in Table 9, it can be seen that all the variables, except for $lnVOL$, have a unit root in level form. After differencing the variables, the results indicated that all variables are stationary up to a 10% level of significance. The null hypothesis of non-stationarity was therefore rejected by both unit root tests for all variables under study in their first difference form. Hence, all variables were included in the regression analysis following the fact that no I(2) variables were identified and needed to be excluded.

Table 9. Stationarity Tests of Variables in Level and First Difference Form

Dickey-Fuller GLS Test in Level				Phillips-Perron (PP) Test in Level			
Variable	Intercept	Trend and Intercept	No Trend or Intercept	Variable	Intercept	Trend and Intercept	No Trend or Intercept
$lnSTTR$	0.00(4)	-1.48(4)	N/A	$lnSTTR$	-1.19[5]	-1.70[5]	0.42[5]
$lnSTTV$	-1.13(5)	-2.45(5)	N/A	$lnSTTV$	-1.27[6]	-1.17[6]	-0.11[6]
$lnMC$	-1.20(5)	-2.29(5)	N/A	$lnMC$	-2.49[4]	-2.67[4]	-0.34[4]
$lnVOL$	-4.79(0)***	-5.01(0)***	N/A	$lnVOL$	-5.41[3]***	-5.57[3]***	-1.75[2]*
$lnDEVIN$	-0.54(5)	-2.04(5)	N/A	$lnDEVIN$	-1.62[4]	-1.85[4]	-0.13[4]
$lnRGDPPC$	-0.22(1)	-1.14(1)	N/A	$lnRGDPPC$	0.62[6]	-2.79[6]	1.36[6]
$lnRINV$	-0.16(1)	-2.05(1)	N/A	$lnRINV$	-0.45[4]	-2.04[4]	1.20[4]
Dickey-Fuller GLS Test in First Difference				**Phillips-Perron (PP) Test in First Difference**			
Variable	Intercept	Trend and Intercept	No Trend or Intercept	Variable	Intercept	Trend and Intercept	No Trend or Intercept
$\Delta lnSTTR$	-4.85(3)***	-4.63(3)***	N/A	$\Delta lnSTTR$	-4.19[5]***	-4.23[5]***	-4.18[5]***
$\Delta lnSTTV$	-2.33(4)**	-2.84(4)*	N/A	$\Delta lnSTTV$	-3.51[5]***	-3.60[5]**	-3.48[5]***
$\Delta lnMC$	-4.08(4)***	-4.53(0)***	N/A	$\Delta lnMC$	-5.92[4]***	-5.89[4]***	-5.94[4]***
$\Delta lnVOL$	-10.43(0)***	-12.13(0)***	N/A	$\Delta lnVOL$	-16.66[8]***	-16.55[8]***	-15.74[7]***
$\Delta lnDEVIN$	-3.60(4)***	-3.92(4)***	N/A	$\Delta lnDEVIN$	-5.73[4]***	-5.72[4]***	-5.72[4]***
$\Delta lnRGDPPC$	-2.10(1)**	-3.93(0)***	N/A	$\Delta lnRGDPPC$	-3.40[4]***	-3.96[5]***	-3.21[4]***
$\Delta lnRINV$	-4.58(0)***	-5.23(0)***	N/A	$\Delta lnRINV$	-5.73[1]***	-5.77[1]***	-5.65[1]***

Note:

1. ***, ** and * illustrates statistical significance at the 1%, 5% and 10% levels, respectively.

2. The Newey and West (1987) bandwidth, represented by the value in brackets, was used to select the truncation lag for the PP tests. The critical values, represented by the value in parentheses, identified by Elliot, Rothenberg and Stock (1996) were used for the Dickey-Fuller GLS test.

3.5.2 ARDL-Bounds Test

Following the same method applied in the previous chapter, the two stages of the ARDL-bounds testing approach were used to determine the cointegration relationship between stock market development, economic growth and investment. The first stage was to identify an initial lag length on the basis of the AIC and SBC. Therefore, an initial lag length for each variable used in Equations (31) to (45) was obtained, whereafter Hendry's "general to specific" approach was used to generate parsimonious models for the unrestricted Models 1c to 5c. This approach, thus, offers the advantage of providing an optimal lag for each variable under study within the five ARDL models. Following the ARDL approach, the second stage is applying the bounds F-test to Equations (31) to (45) in order to determine whether the null hypothesis of no cointegration can be rejected for the variables under study. Table 10, below, provides the results of the ARDL-bounds test for each dependent variable employed under its specific unrestricted model.

Table 10. Bounds F-test Results for ARDL Cointegration Models

Model 1c: STTR, Economic Growth and Investment

	Dependent Variable	Optimal lag length	F-statistics
$F_{STTR}(STTR \| RGDPPC,\ RINV)$	$\Delta lnSTTR_t$	4, 6, 6	4.85**
$F_{RGDPPC}(RGDPPC \| STTR,\ RINV)$	$\Delta lnRGDPPC_t$	4, 6, 5	2.87
$F_{RINV}(RINV \| RGDPPC,\ STTR)$	$\Delta lnRINV_t$	1, 4, 3	2.10

Model 2c: STTV, Economic Growth and Investment

	Dependent Variable	Optimal lag length	F-statistics
$F_{STTV}(STTV \| RGDPPC,\ RINV)$	$\Delta lnSTTV_t$	8, 0, 5	7.85***
$F_{RGDPPC}(RGDPPC \| STTV,\ RINV)$	$\Delta lnRGDPPC_t$	4, 0, 5	3.97
$F_{RINV}(RINV \| RGDPPC,\ STTV)$	$\Delta lnRINV_t$	1, 4, 2	1.85

Model 3c: MC, Economic Growth and Investment

	Dependent Variable	Optimal lag length	F-statistics
$F_{MC}(MC \| RGDPPC,\ RINV)$	$\Delta lnMC_t$	6, 0, 8	14.81***
$F_{RGDPPC}(RGDPPC \| MC,\ RINV)$	$\Delta lnRGDPPC_t$	4, 8, 8	2.54
$F_{RINV}(RINV \| RGDPPC,\ MC)$	$\Delta lnRINV_t$	1, 1, 0	2.25

Model 4c: VOL, Economic Growth and Investment

	Dependent Variable	Optimal lag length	F-statistics
$F_{VOL}(VOL \| RGDPPC,\ RINV)$	$\Delta lnVOL_t$	7, 7, 8	11.10***
$F_{RGDPPC}(RGDPPC \| VOL,\ RINV)$	$\Delta lnRGDPPC_t$	4, 1, 5	0.56
$F_{RINV}(RINV \| RGDPPC,\ VOL)$	$\Delta lnRINV_t$	1, 4, 7	3.95

Model 5c: DEVIN, Economic Growth and Investment

	Dependent Variable	Optimal lag length	F-statistics
$F_{DEVIN}(DEVIN \| RGDPPC,\ RINV)$	$\Delta lnDEVIN_t$	8, 4, 8	4.20*
$F_{RGDPPC}(RGDPPC \| DEVIN,\ RINV)$	$\Delta lnRGDPPC_t$	8, 1, 5	3.80
$F_{RINV}(RINV \| RGDPPC,\ DEVIN)$	$\Delta lnRINV_t$	1, 0, 0	3.03

Asymptotic Critical Values

Significance Level	Lower Bound [I(0)]	Upper Bound [I(1)]
1%	5.15	6.36
5%	3.79	4.85
10%	3.17	4.14

Note:

1. ***, ** and * illustrate rejection of bounds test null hypothesis at the 1%, 5% and 10% levels, respectively.
2. Asymptotic critical values taken from Pesaran *et al* (2001:300), CI(iii).
3. According to Pesaran *et al* (2001), critical values are given by $k+1$ for CI(i), CI(iii) and CI(v), therefore $k=2$ for the current study.

The reported results for Model 1c provide evidence of cointegration only when $STTR$ is employed as a dependent variable, while the use of $RGDPPC$ and $RINV$ as dependent variables offer no indication of a cointegration relationship. The cointegration relationship for Model 1c is statistically significant up to a 5% level. The results for Models 2c to 4c are similar, with the null hypothesis of no cointegration being rejected up to a 1% level of significance, given that a financial development or stock market proxy is applied as the dependent variable in all three cases. For these three models, the application of $RGDPPC$ and $RINV$ also offer no evidence of cointegration. Lastly, Model 5c offers similar results to those observed in the four prior models, with cointegration, significant up to a 10% level, being found only when the stock market proxy, DEVIN, is employed as the dependent variable. The results presented in Table 10, therefore, imply that only equations $STTR$, $STTV$, MC, VOL and $DEVIN$ will be estimated with an error-correction term when performing the Granger causality tests to offer short, long and joint causality results. For the remainder of equations, only short-run Granger causality will be estimated, given that no long-run relationship was found to exist within these equations

Table 11. Diagnostic Test Results for ARDL Cointegration Models - Models 1c to 5a

Model 1c: STTR, Economic Growth and Investment

Diagnostic Tests	Dependent Variable					
	$\Delta lnSTTR_t$		$\Delta lnRGDPPC_t$		$\Delta lnRINV_t$	
	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
Jarque-Bera Test	JB: 0.14	0.94	JB: 0.17	0.90	JB: 0.35	0.83
Breusch-Godfrey LM Test	F: 1.14 [6]	0.35	F: 0.92 [6]	0.49	F: 0.88 [8]	0.57
ARCH Test	F: 1.00 [6]	0.43	F: 1.02 [6]	0.42	F: 0.45 [8]	0.88
Ramsey RESET Test	F: 2.27 [1]	0.14	F: 0.03 [1]	0.87	F: 0.60 [1]	0.45
R-Squared	0.60		0.76		0.53	
Adjusted R-Squared	0.55		0.73		0.48	

Model 2c: STTV, Economic Growth and Investment

Diagnostic Tests	Dependent Variable					
	$\Delta lnSTTV_t$		$\Delta lnRGDPPC_t$		$\Delta lnRINV_t$	
	Statistic	Prob.	Statistic	Prob.	Statistic	0.79
Jarque-Bera Test	JB: 0.53	0.64	JB: 0.37	0.80	JB: 0.45	0.32
Breusch-Godfrey LM Test	F: 1.32 [8]	0.25	F: 1.40 [5]	0.23	F: 1.18 [4]	0.31
ARCH Test	F: 1.23 [8]	0.29	F: 1.83 [5]	0.12	F: 1.20 [4]	0.18
Ramsey RESET Test	F: 0.07 [1]	0.80	F: 0.48 [1]	0.49	F: 1.79 [1]	0.79
R-Squared	0.71		0.75		0.52	
Adjusted R-Squared	0.66		0.72		0.49	

Model 3c: MC, Economic Growth and Investment

Diagnostic Tests	Dependent Variable					
	$\Delta lnMC_t$		$\Delta lnRGDPPC_t$		$\Delta lnRINV_t$	
	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
Jarque-Bera Test	JB: 0.88	0.50	JB: 0.66	0.23	JB: 0.15	0.93
Breusch-Godfrey LM Test	F: 1.34 [8]	0.24	F: 0.80 [8]	0.61	F: 0.17 [1]	0.68
ARCH Test	F: 1.06 [8]	0.40	F: 0.74 [8]	0.65	F: 0.07 [1]	0.79
Ramsey RESET Test	F: 0.00 [1]	0.98	F: 1.38 [1]	0.24	F: 1.39 [1]	0.24
R-Squared	0.73		0.78		0.52	
Adjusted R-Squared	0.69		0.73		0.48	

Table 11. Diagnostic Test Results for ARDL Cointegration Models - Models 1c to 5a (Cont.)

Model 4c: VOL, Economic Growth and Investment

Diagnostic Tests	Dependent Variable					
	$\Delta lnVOL_t$		$\Delta lnRGDPPC_t$		$\Delta lnRINV_t$	
	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
Jarque-Bera Test	JB: 2.59	0.27	JB: 0.58	0.61	JB: 0.38	0.79
Breusch-Godfrey LM Test	F: 1.24 [8]	0.29	F: 0.78 [5]	0.57	F: 0.52 [7]	0.82
ARCH Test	F: 0.40 [8]	0.92	F: 1.66 [5]	0.16	F: 1.22 [7]	0.30
Ramsey RESET Test	F: 0.25 [1]	0.62	F: 0.11 [1]	0.74	F: 2.35 [1]	0.13
R-Squared	0.57		0.75		0.54	
Adjusted R-Squared	0.49		0.72		0.49	

Model 5c: DEVIN, Economic Growth and Investment

Diagnostic Tests	Dependent Variable					
	$\Delta lnDEVIN_t$		$\Delta lnRGDPPC_t$		$\Delta lnRINV_t$	
	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
Jarque-Bera Test	JB: 2.64	0.14	JB: 0.43	0.56	JB: 2.09	0.40
Breusch-Godfrey LM Test	F: 0.91 [8]	0.51	F: 1.33 [8]	0.24	F: 0.17 [1]	0.68
ARCH Test	F: 1.55 [8]	0.16	F: 0.31 [8]	0.96	F: 0.21 [8]	0.97
Ramsey RESET Test	F: 2.61 [1]	0.11	F: 2.72 [1]	0.10	F: 2.86 [1]	0.10
R-Squared	0.72		0.79		0.52	
Adjusted R-Squared	0.66		0.75		0.48	

Note: Numbers in brackets indicate the lag length included.

The validity and robustness of cointegration results were confirmed by exposing each ARDL model to a series of diagnostic and stability tests, as was the case in the previous chapter. These test results are presented in Table 11, above. In terms of normality, the Jarque-Bera statistic indicated that the residuals of all regression equations are normally distributed. The results of the Breusch-Godfrey LM test, which examines the serial correlation of the residuals, showed that the null hypothesis of autocorrelation can be rejected, implying that none of the equations suffered from serial correlation. Test results for the ARCH test for heteroskedasticity indicated that no evidence of heteroskedasticity could be found in the residuals of any of the ARDL models. The ARCH test for heteroskedasticity was used, given the advantage it holds in offering more reliable results for autoregressive models, as was noted in Chapter Two. Finally, the results of the Ramsey reset test showed that none of the ARDL models suffered from general misspecification errors. These results thus provide evidence of statistically significant and stable cointegration models that offer sound results.

Table 12. VECM Granger Causality Analysis

Model 1d: STTR, Economic Growth and Investment

Type of Granger Causality

Dependent Variable	Short-Run			Long-Run	Joint (Short-Run and Long-Run)		
	$\Delta lnSTTR_t$	$\Delta lnRGDPPC_t$	$\Delta lnRINV_t$	ECT_{t-1}	$\Delta lnSTTR_t, ECT_{t-1}$	$\Delta lnRGDPPC_t, ECT_{t-1}$	$\Delta lnRINV_t, ECT_{t-1}$
	F-statistic [p-values]			[t-statistic]	F-statistic [p-values]		
$\Delta lnSTTR_t$	-	0.88 [0.35]	8.72*** [0.00]	-0.11*** [-2.73]	-	3.74** [0.03]	6.18*** [0.00]
$\Delta lnRGDPPC_t$	1.72 [0.19]	-	11.54*** [0.00]	-	-	-	-
$\Delta lnRINV_t$	0.46 [0.50]	9.15*** [0.00]	-	-	-	-	-

Model 2d: STTV, Economic Growth and Investment

Type of Granger Causality

Dependent Variable	Short-Run			Long-Run	Joint (Short-Run and Long-Run)		
	$\Delta lnSTTV_t$	$\Delta lnRGDPPC_t$	$\Delta lnRINV_t$	ECT_{t-1}	$\Delta lnSTTV_t, ECT_{t-1}$	$\Delta lnRGDPPC_t, ECT_{t-1}$	$\Delta lnRINV_t, ECT_{t-1}$
	F-statistic [p-values]			[t-statistic]	F-statistic [p-values]		
$\Delta lnSTTV_t$	-	9.66*** [0.00]	2.14 [0.12]	-0.08** [-2.83]	-	7.72*** [0.00]	4.18** [0.01]
$\Delta lnRGDPPC_t$	4.33*** [0.00]	-	12.48*** [0.00]	-	-	-	-
$\Delta lnRINV_t$	1.22 [0.27]	8.92*** [0.00]	-	-	-	-	-

Model 3d: MC, Economic Growth and Investment

Type of Granger Causality

Dependent Variable	Short-Run			Long-Run	Joint (Short-Run and Long-Run)		
	$\Delta lnMC_t$	$\Delta lnRGDPPC_t$	$\Delta lnRINV_t$	ECT_{t-1}	$\Delta lnMC_t, ECT_{t-1}$	$\Delta lnRGDPPC_t, ECT_{t-1}$	$\Delta lnRINV_t, ECT_{t-1}$
	F-statistic [p-values]			[t-statistic]	F-statistic [p-values]		
$\Delta lnMC_t$	-	6.51*** [0.00]	9.06*** [0.00]	-0.10*** [-2.96]	-	7.67*** [0.00]	10.60*** [0.00]
$\Delta lnRGDPPC_t$	2.67* [0.08]	-	8.11*** [0.00]	-	-	-	-
$\Delta lnRINV_t$	3.28* [0.07]	24.85*** [0.00]	-	-	-	-	-

Table 12. VECM Granger Causality Analysis (Cont.)

Model 4d: VOL, Economic Growth and Investment							
	Type of Granger Causality						
	Short-Run			Long-Run	Joint (Short-Run and Long-Run)		
Dependent Variable	$\Delta lnVOL_t$	$\Delta lnRGDPPC_t$	$\Delta lnRINV_t$	ECT_{t-1}	$\Delta lnVOL_t, ECT_{t-1}$	$\Delta lnRGDPPC_t, ECT_{t-1}$	$\Delta lnRINV_t, ECT_{t-1}$
	F-statistic [p-values]			[t-statistic]	F-statistic [p-values]		
$\Delta lnVOL_t$	-	5.80*** [0.00]	7.07*** [0.00]	-0.08*** [-5.31]	-	10.96*** [0.00]	12.44*** [0.00]
$\Delta lnRGDPPC_t$	5.78** [0.02]	-	6.17*** [0.00]	-	-	-	-
$\Delta lnRINV_t$	5.07*** [0.00]	9.20*** [0.00]	-	-	-	-	-

Model 5d: DEVIN, Economic Growth and Investment							
	Type of Granger Causality						
	Short-Run			Long-Run	Joint (Short-Run and Long-Run)		
Dependent Variable	$\Delta lnDEVIN_t$	$\Delta lnRGDPPC_t$	$\Delta lnRINV_t$	ECT_{t-1}	$\Delta lnDEVIN_t, ECT_{t-1}$	$\Delta lnRGDPPC_t, ECT_{t-1}$	$\Delta lnRINV_t, ECT_{t-1}$
	F-statistic [p-values]			[t-statistic]	F-statistic [p-values]		
$\Delta lnDEVIN_t$	-	10.12*** [0.00]	6.34*** [0.00]	-0.12** [-1.93]	-	6.91*** [0.00]	6.36** [0.00]
$\Delta lnRGDPPC_t$	4.53** [0.01]	-	8.84*** [0.00]	-	-	-	-
$\Delta lnRINV_t$	7.30** [0.01]	11.75*** [0.00]	-	-	-	-	-

Note: ***, ** and * illustrates statistical significance at the 1%, 5% and 10% levels, respectively.

3.5.3 Granger Causality Analysis on the Basis of Vector Error Correction Models

The next step in the methodology, after having found evidence of long-run cointegration relationships between stock market development, economic growth and investment, is the analysis of the causal relationships between the variables under study, using the Granger causality approach. As mentioned above, those equations that offered long-run cointegration were estimated with an error-correction term which makes possible the examination of short, long and joint causality. For those equations that showed no evidence of long-run cointegration, only short-run causality will be analysed. As with the previous chapter, the short-run causality is examined using a Wald or F-test to identify the joint statistical significance of the lagged differences of explanatory variables, while the long-run causality is examined by the statistical significance of the lagged error-correction term's coefficient. Joint causality is similarly examined by using a Wald or F-test to identify the joint statistical significance of both the lagged differences of explanatory variables and the lagged error-correction term.

The results of the Granger causality tests are presented in Table 12, above. The results for Model 1d, where $STTR$ is used as a stock market proxy, show that stock market development is Granger caused by investment in the short-run, but Granger caused by both economic growth and investment in the long-run. Investment is found to Granger cause economic growth in the short-run, but no long-run causality exists, given the failure to identify long-run cointegration. Lastly, economic growth was found to Granger cause investment in the short-run, with no long-run causality being evident. The results for Model 1d are, therefore, indicative of a short-run unidirectional relationship flowing from investment to stock market development, as well as a long-run unidirectional relationship flowing from both economic growth and investment to stock market development. In addition, evidence of a short-run bi-directional causal relationship also exists between economic growth and investment.

In contrast to the short-run causality between stock market development and investment found in Model 1d, economic growth is found to Granger cause stock market development in Model 2d when $STTV$ is used as a stock market development proxy. The results of long-run causality with regard to stock market development are consistent with Model 1d, with both economic growth and investment Granger causing stock market development. In the short-run, both stock market development and investment are found to Granger cause economic growth. Lastly, investment is found to be Granger caused by economic growth only in the short-run. Consequently, the results from Model 2d provide evidence of a long-run unidirectional relationship flowing from both economic growth and investment to stock market development. Furthermore, two short-run bi-directional causal relationships exist, the first between stock market development and economic growth and the second between economic growth and investment.

Table 13. Diagnostic Test Results for VECM Models - Models 1d to 5d

Model 1d: STTR, Economic Growth and Investment

Diagnostic Tests	Dependent Variable					
	$\Delta lnSTTR_t$		$\Delta lnRGDPPC_t$		$\Delta lnRINV_t$	
	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
Jarque-Bera Test	JB: 2.96	0.20	JB: 1.06	0.51	JB: 2.50	0.28
Breusch-Godfrey LM Test	F: 1.00 [5]	0.42	F: 0.95 [8]	0.48	F: 0.80 [4]	0.53
ARCH Test	F: 2.27 [5]	0.26	F: 1.14 [8]	0.35	F: 0.89 [4]	0.47
Ramsey RESET Test	F: 10.49 [1]	0.19	F: 0.00 [1]	0.96	F: 0.66 [1]	0.42
R-Squared	0.55		0.75		0.45	
Adjusted R-Squared	0.52		0.72		0.41	

Model 2d: STTV, Economic Growth and Investment

Diagnostic Tests	Dependent Variable					
	$\Delta lnSTTV_t$		$\Delta lnRGDPPC_t$		$\Delta lnRINV_t$	
	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
Jarque-Bera Test	JB: 1.43	0.45	JB: 1.32	0.38	JB: 0.21	0.97
Breusch-Godfrey LM Test	F: 1.83 [5]	0.12	F: 0.51 [6]	0.80	F: 0.68 [4]	0.61
ARCH Test	F: 1.63 [5]	0.16	F: 1.85 [6]	0.10	F: 0.89 [4]	0.47
Ramsey RESET Test	F: 1.38 [1]	0.24	F: 0.54 [1]	0.47	F: 0.87 [1]	0.35
R-Squared	0.67		0.79		0.46	
Adjusted R-Squared	0.64		0.75		0.42	

Model 3d: MC, Economic Growth and Investment

Diagnostic Tests	Dependent Variable					
	$\Delta lnMC_t$		$\Delta lnRGDPPC_t$		$\Delta lnRINV_t$	
	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
Jarque-Bera Test	JB: 0.57	0.75	JB: 0.66	0.72	JB: 0.70	0.69
Breusch-Godfrey LM Test	F: 1.29 [8]	0.26	F: 1.39 [8]	0.22	F: 0.06 [1]	0.81
ARCH Test	F: 1.44 [8]	0.20	F: 1.23 [8]	0.29	F: 0.21 [1]	0.65
Ramsey RESET Test	F: 0.35 [1]	0.56	F: 0.03 [1]	0.86	F: 0.76 [1]	0.39
R-Squared	0.72		0.75		0.43	
Adjusted R-Squared	0.67		0.72		0.41	

Model 4d: VOL, Economic Growth and Investment

Diagnostic Tests	Dependent Variable					
	$\Delta lnVOL_t$		$\Delta lnRGDPPC_t$		$\Delta lnRINV_t$	
	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
Jarque-Bera Test	JB: 0.82	0.60	JB: 0.85	0.55	JB: 0.37	0.83
Breusch-Godfrey LM Test	F: 0.56 [7]	0.78	F: 0.60 [5]	0.70	F: 0.63 [7]	0.73
ARCH Test	F: 0.43 [7]	0.88	F: 1.73 [5]	0.14	F: 0.29 [7]	0.96
Ramsey RESET Test	F: 1.79 [1]	0.19	F: 0.07 [1]	0.81	F: 0.34 [1]	0.56
R-Squared	0.51		0.76		0.47	
Adjusted R-Squared	0.45		0.74		0.43	

Table 13. Diagnostic Test Results for VECM Models - Models 1d to 5d (Cont.)

Model 5d: DEVIN, Economic Growth and Investment

Diagnostic Tests	Dependent Variable					
	$\Delta lnDEVIN_t$		$\Delta lnRGDPPC_t$		$\Delta lnRINV_t$	
	Statistic	Prob.	Statistic	Prob.	Statistic	Prob.
Jarque-Bera Test	JB: 0.77	0.58	JB: 1.13	0.39	JB: 1.50	0.23
Breusch-Godfrey LM Test	F: 0.94 [8]	0.49	F: 1.63 [8]	0.13	F: 1.13 [4]	0.35
ARCH Test	F: 1.37 [8]	0.23	F: 1.30 [8]	0.26	F: 1.07 [4]	0.38
Ramsey RESET Test	F: 1.03 [1]	0.31	F: 0.07 [1]	0.79	F: 1.74 [1]	0.19
R-Squared	0.70		0.76		0.46	
Adjusted R-Squared	0.65		0.73		0.43	

Note: Numbers in brackets indicate the lag length included.

The Granger causality results for Models 3d are similar to that of Model 2d with evidence of a unidirectional relationship being found flowing from economic growth and investment to stock market development in the long-run. In the short-run, stock market development is Granger caused by both economic growth and investment. In addition, stock market development and investment is found to Granger cause economic growth, while investment is being caused by both stock market development and economic growth. As a result, evidence of short-run bi-directional causality is found between stock market development and economic growth, stock market development and investment and economic growth and investment.

Models 4d and 5d exhibit the same results as Model 3d, with a long-run unidirectional relationship flowing to stock market development. Also, the results point to the same three short-run bi-directional causal relationships examined in Model 3d. The only observable difference between Models 4d and 5d and Model 3d is the fact that the results of the last two models are more statistically significant than those offered by Model 3d. The statistical significance of the F-statistics and the coefficients of the error-correction terms were used to confirm the results for both short- and long-run causality for all five models. Furthermore, the statistical significance of the joint causality analysis supports the above-explained findings.

The results of the diagnostic and stability tests to which the VECM Granger causality equations were subjected are presented in Table 13, above. As was noted, these tests are performed to provide assurance regarding the soundness of results. The Jarque-Bera statistic showed that the residuals of all VECM equations were normally distributed. The results of the Breusch-Godfrey LM test indicated that none of the equations suffered from serial correlation. The presence of heteroscedasticity was rejected by the ARCH test results, signifying that none of the equations suffered from heteroscedasticity problems. Lastly, the results of the Ramsey reset test pointed to the fact that no misspecification errors were made when regressing the VECM equations. Owing to these results, the findings of the Granger causality analysis are stable and reliable.

3.5.4 Innovative Accounting Approach

Owing to the statement made in section 2.5.4, regarding the inability of the VECM Granger causality approach to capture the relative strength of causal relationships beyond a selected sample period, the IAA was applied. The application of the IAA not only offers comparison with the study in Chapter Two, but also offers an out-of-sample means of examining the causal relationships between stock market development, economic growth and investment. In addition, the IAA offers a means of identifying the degree of exogeneity of each variable beyond the selected sample period. As noted, the IAA is comprised of a variance decomposition analysis and impulse response functions. To ensure consistency and comparison with the previous chapter, the current study will also employ a five-year time horizon. Furthermore, the selected time horizon should offer more reliable decomposition and impulse response results, given the smaller standard errors over the shorter time period.

Table 14, below, offers a summary of the results provided by the variance decomposition over a five-year period. The results for Model 1, where $STTR$ is used as a proxy for stock market development, indicate that 77.32 per cent of stock market development is caused by its own innovations, while 9.69 per cent and 12.99 per cent of its forecast error is explained by economic growth and investment, respectively. Economic growth is explained by 91.36 per cent of its own innovative shocks, with marginal contributions flowing from stock market development and investment, at 6.45 per cent and 2.19 per cent, respectively. In terms of investment, economic growth explains 74.68 per cent, while 20.36 per cent is explained by investment itself and 4.96 per cent is explained by stock market development.

The results provided by Model 2 suggest that, after the five-year period, 65.43 per cent of stock market development's forecast error is explained by its own innovation. A sizeable portion of stock market development is generated by investment, at 23.94 per cent, with economic growth only contributing 10.62 per cent. The results for economic growth under Model 2 are similar to Model 1 where the largest portion is generated by its own innovative shocks, whereas stock market development and investment contribute 15.07 per cent and 2.31 per cent, respectively. Stock market development and economic growth contribute 14.38 per cent and 66.26 per cent to investment, respectively. The remaining 19.36 per cent is explained by investment's own innovative shock.

Table 14. Variance Decomposition Results

Model 1: STTR, Economic Growth and Investment

Variance Decomposition of $lnSTTR_t$

Period	Standard Error	$lnSTTR_t$	$lnRGDPPC_t$	$lnRINV_t$
1	0.05	100.00	0.00	0.00
5	0.24	98.84	0.83	0.33
10	0.38	90.83	4.47	4.70
15	0.49	82.46	8.20	9.34
20	0.54	77.32	9.69	12.99

Variance Decomposition of $lnRGDPPC_t$

Period	Standard Error	$lnSTTR_{t_t}$	$lnRGDPPC_t$	$lnRINV_t$
1	0.00	0.03	99.97	0.00
5	0.02	0.03	95.92	4.05
10	0.03	0.07	97.07	2.86
15	0.04	1.50	96.65	1.85
20	0.05	6.45	91.36	2.19

Variance Decomposition of $lnRINV_t$

Period	Standard Error	$lnSTTR_t$	$lnRGDPPC_t$	$lnRINV_t$
1	0.02	0.72	8.89	90.39
5	0.05	0.84	34.90	64.27
10	0.08	1.02	67.58	31.40
15	0.09	1.57	75.43	23.00
20	0.10	4.96	74.68	20.36

Model 2: STTV, Economic Growth and Investment

Variance Decomposition of $lnSTTV_t$

Period	Standard Error	$lnSTTV_t$	$lnRGDPPC_t$	$lnRINV_t$
1	0.05	100.00	0.00	0.00
5	0.20	94.01	2.92	3.07
10	0.32	77.61	9.57	12.82
15	0.40	69.55	11.75	18.70
20	0.46	65.43	10.62	23.94

Variance Decomposition of $lnRGDPPC_t$

Period	Standard Error	$lnSTTV_t$	$lnRGDPPC_t$	$lnRINV_t$
1	0.00	14.15	85.85	0.00
5	0.02	11.62	83.67	4.71
10	0.03	9.98	85.94	4.08
15	0.04	11.89	85.48	2.63
20	0.05	15.07	82.63	2.31

Variance Decomposition of $lnRINV_t$

Period	Standard Error	$lnSTTV_t$	$lnRGDPPC_t$	$lnRINV_t$
1	0.02	2.03	6.56	91.41
5	0.05	4.66	28.50	66.84
10	0.07	9.14	58.59	32.26
15	0.09	11.35	66.26	22.39
20	0.10	14.38	66.26	19.36

Table 14. Variance Decomposition Results (Cont.)

Model 3: MC, Economic Growth and Investment

Variance Decomposition of $lnMC_t$

Period	Standard Error	$lnMC_t$	$lnRGDPPC_t$	$lnRINV_t$
1	0.08	100.00	0.00	0.00
5	0.22	56.61	17.45	25.94
10	0.27	37.24	34.57	28.19
15	0.28	36.15	37.04	26.82
20	0.29	33.98	37.80	28.21

Variance Decomposition of $lnRGDPPC_t$

Period	Standard Error	$lnMC_t$	$lnRGDPPC_t$	$lnRINV_t$
1	0.00	0.90	99.10	0.00
5	0.02	5.42	92.60	1.98
10	0.04	5.36	93.91	0.73
15	0.05	4.20	94.67	1.13
20	0.07	4.24	93.11	2.65

Variance Decomposition of $lnRINV_t$

Period	Standard Error	$lnMC_t$	$lnRGDPPC_t$	$lnRINV_t$
1	0.02	5.11	9.83	85.06
5	0.04	3.76	36.11	60.12
10	0.08	10.12	65.06	24.82
15	0.11	7.40	75.94	16.65
20	0.14	6.23	79.63	14.14

Model 4: VOL, Economic Growth and Investment

Variance Decomposition of $lnVOL_t$

Period	Standard Error	$lnVOL_t$	$lnRGDPPC_t$	$lnRINV_t$
1	0.33	100.00	0.00	0.00
5	0.39	97.01	0.05	2.94
10	0.39	95.25	0.66	4.09
15	0.39	94.14	1.72	4.14
20	0.40	93.08	2.74	4.18

Variance Decomposition of $lnRGDPPC_t$

Period	Standard Error	$lnVOL_t$	$lnRGDPPC_t$	$lnRINV_t$
1	0.00	0.08	99.92	0.00
5	0.02	5.45	93.21	1.34
10	0.04	4.98	94.39	0.63
15	0.05	4.99	93.38	1.63
20	0.06	5.30	91.40	3.30

Variance Decomposition of $lnRINV_t$

Period	Standard Error	$lnVOL_t$	$lnRGDPPC_t$	$lnRINV_t$
1	0.02	3.79	11.18	85.02
5	0.06	3.18	38.49	58.34
10	0.09	6.99	60.72	32.28
15	0.11	7.13	69.86	23.01
20	0.13	6.99	73.79	19.21

Table 14. Variance Decomposition Results (Cont.)

Model 5: DEVIN, Economic Growth and Investment

Variance Decomposition of $lnDEVIN_t$

Period	Standard Error	$lnDEVIN_t$	$lnRGDPPC_t$	$lnRINV_t$
1	0.07	100.00	0.00	0.00
5	0.20	77.12	13.62	9.26
10	0.27	53.61	30.27	16.12
15	0.30	49.40	33.45	17.15
20	0.33	47.34	34.01	18.66

Variance Decomposition of $lnRGDPPC_t$

Period	Standard Error	$lnDEVIN_t$	$lnRGDPPC_t$	$lnRINV_t$
1	0.00	7.47	92.53	0.00
5	0.02	16.49	79.63	3.88
10	0.04	23.67	74.22	2.10
15	0.05	26.20	72.29	1.50
20	0.06	28.04	69.53	2.43

Variance Decomposition of $lnRINV_t$

Period	Standard Error	$lnDEVIN_t$	$lnRGDPPC_t$	$lnRINV_t$
1	0.02	1.80	9.93	88.26
5	0.04	2.03	31.42	66.55
10	0.07	22.64	50.13	27.23
15	0.10	29.26	54.43	16.31
20	0.12	30.26	55.38	14.36

Note: Residual diagnostics were performed for each VAR system to ensure reliability and stability of results.

Model 3 employs MC as the stock market development proxy. The results offered by the variance decomposition under this model illustrate a 33.98 per cent contribution to stock market development by its own innovative shock, while a one standard deviation shock to economic growth explains stock market development by 37.80 per cent. The remaining 28.21 per cent is explained by investment. Economic growth, under Model 3, is explained to a large extent by its own shock, at 93.11 per cent. A 4.24 per cent contribution is made by stock market development, while a marginal 2.65 per cent of economic growth is explained by investment. The forecast error variance for investment can be explained by 14.14 per cent of its own innovation, 79.63 per cent by economic growth and 6.23 per cent by stock market development.

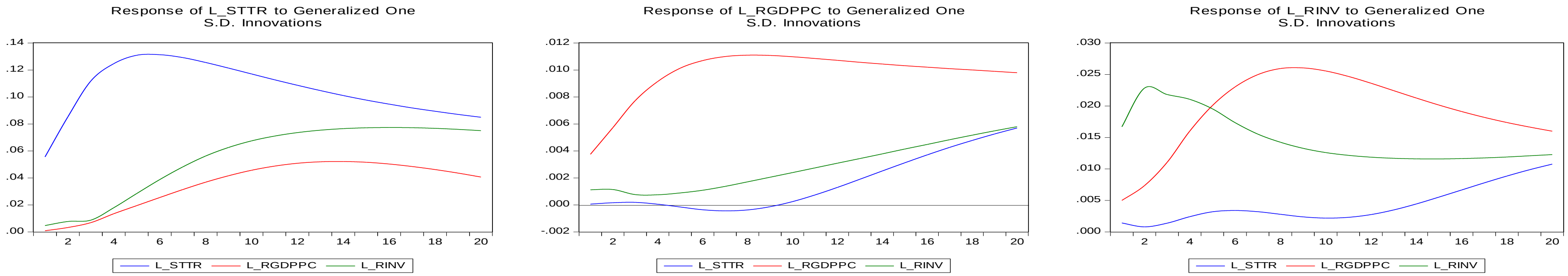
The decomposition results offered by Model 4 show that stock market development, in terms of improving volatility in the market, is largely caused by itself at 93.08 per cent, while only 2.74 per cent and 4.18 per cent stem from economic growth and investment, respectively. Stock market development explains economic growth by a mere 5.30 per cent, with economic growth explaining itself by 91.40 per cent. A minimal portion is contributed by investment, at 3.30 per cent. Investment is mainly caused by innovative shocks to economic growth, at 73.79 per cent. The remainder of investment is proportionally caused by stock market development and investment itself, at 6.99 per cent and 19.21 per cent.

Lastly, the results for Model 5 indicate that stock market development is explained by 47.34 per cent of its own innovative shock, with economic growth and investment explaining stock market development by 34.01 per cent and 18.66 per cent through their innovative shocks. When economic growth is used as the dependent variable in the VAR system, innovative shocks stemming from economic growth itself account for 69.53 per cent of economic growth. The remainder of economic growth is explained by 28.04 per cent of stock market development, with a marginal portion of 2.43 per cent being explained by investment. Finally, 55.38 per cent of investment is explained by innovative shocks stemming from economic growth, while stock market development and investment itself contribute 30.26 per cent and 14.36 per cent, respectively.

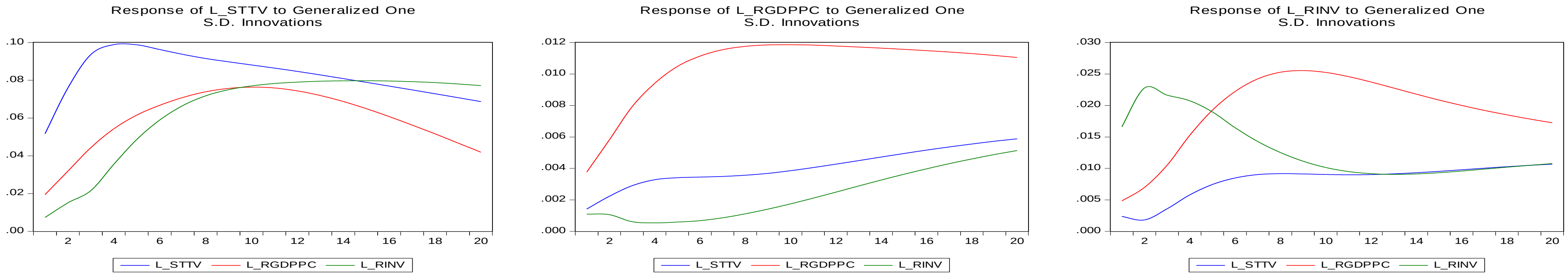
The above analysis, therefore, provides three important conclusions. Firstly, a bi-directional causal relationship is found between stock market development and economic growth when MC and $DEVIN$ are used as stock market development proxies. For the remaining models, no definitively strong relationship is found to exist between stock market development and economic growth. The second conclusion is related to the strong unidirectional relationship that flows from economic growth to investment. This conclusion holds in all five cases. Lastly, a semi-strong unidirectional causal flow exists between investment and stock market development with causality flowing to stock market development. This conclusion holds true for all models, with the exception of Model 4.

As stated previously, impulse response functions, which are regarded as an alternative approach to variance decomposition analysis, offer an additional means of analysing the relationship between stock market development, economic growth and investment. As per the previous chapter, a generalised approach is used following the advantage that the approach holds in terms of being invariant to variable ordering within the VAR system. Figure 4, below, presents the results of the impulse response functions. From these results, it can be observed that stock market development responds positively to a one standard deviation shock in itself, economic growth and investment. This positive response is found in all models, although in Model 4 the responses are found to converge to a neutral position. In the same way, the responses of economic growth are positive, given a shock to economic growth, stock market development or investment. It can also be observed that, in all cases, economic growth itself has the largest positive response to a one standard deviation shock. Lastly, the results offered by investment show that investment responds positively to shocks in itself, economic growth or investment. This holds in all cases except where VOL serves as the stock market proxy, in which case the response is negative and consistent with expectations. It can also be seen that shocks to economic growth generate the largest positive response to investment. Consequently, given these results, the impulse response functions support the general conclusion drawn from the variance decomposition analysis regarding the causal relationship between stock market development, economic growth and investment.

Model 1: STTR, Economic Growth and Investment



Model 2: STTV, Economic Growth and Investment



Model 3: MC, Economic Growth and Investment

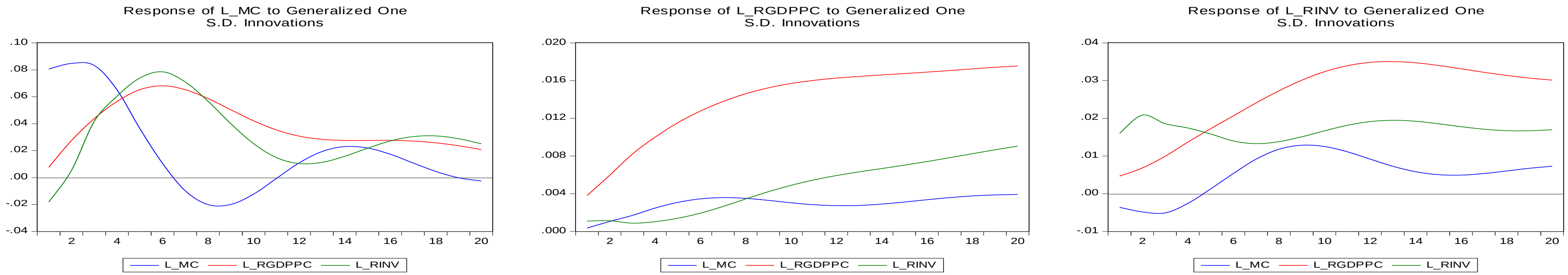
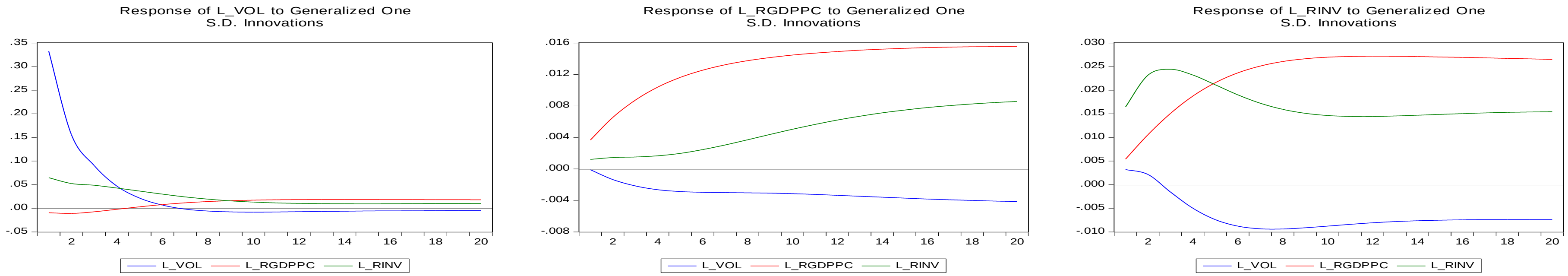


Figure 4. Impulse Response Function – Response to Generalised One Standard Deviation Innovations ± 2 Standard Errors

Model 4: VOL, Economic Growth and Investment



Model 5: DEVIN, Economic Growth and Investment

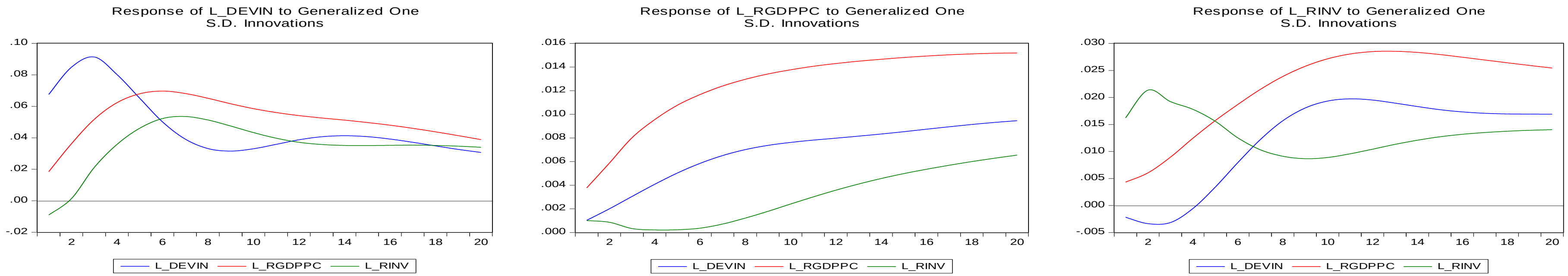


Figure 4. Impulse Response Function – Response to Generalised One Standard Deviation Innovations ± 2 Standard Errors

3.6 Summary and Conclusion

The objective of the current study was to examine the dynamic causal relationship between financial development, proxied by stock market development, economic growth and investment in South Africa. In addition, the study attempted to determine whether the causal relationship changes, given the use of stock market indicators as opposed to banking sector development indicators. In order to achieve these objectives, the current study, taking into account the limitations of previous studies, employed the following methodologies, namely the ARDL-bounds testing procedure, the VECM Granger causality approach, and the IAA. The ARDL-bounds testing procedure was applied as a cointegration test in order to overcome the limitations of the residual-based cointegration test and maximum-likelihood-estimation approach, developed by Engle and Granger (1987), Johansen (1988), and Johansen and Juselius (1990). Apart from this, the IAA was used in order to overcome the out-of-sample limitations of the VECM Granger causality approach.

The study also used a time-series analysis approach for the period 1989 to 2013 in order to address the limitations of a cross-sectional methodology, specifically its failure to consider country-specific characteristics. Furthermore, the study developed a simple tri-variate model to reduce the risk of an omitted variable or misspecification bias by incorporating investment, as a third variable, into the causality framework. Apart from this, the study employed five distinct stock market development indicators in order to sufficiently capture the development of South Africa's stock market and offer more conclusive results through consensus. The five indicators used comprise the ratio of market capitalisation to GDP, the ratio of total value of shares traded to GDP, the turnover ratio, and stock market volatility calculated over a four quarter moving standard deviation, as well as an equally weighted stock market development index which combines the four former indicators.

The application of the above-mentioned methodologies generated both in-sample and forecast results. After ensuring that none of the variables were I(2) and testing the cointegration relationships of each regression model, the VECM Granger approach was used to produce the in-sample results. These in-sample results showed that for all five proxies used, only one long-run causal relationship existed, more specifically, a unidirectional causal relationship flowing from economic growth and investment to stock market development. The short-run results, however, differed depending on the stock market indicator used. For $STTR$ the results were indicative of a short-run unidirectional relationship flowing from investment to stock market development. When using $STTV$, the short-run relationship changed from investment to economic growth flowing to stock market development. For both $STTR$ and $STTV$, a short-run unidirectional relationship was found flowing from economic growth to investment. The results for the remaining three indicators were found to be the same, with three short-run bi-directional relationships being identified, namely between stock market development and economic growth, stock market development and investment, and economic growth and investment. The forecast results were provided by the IAA, with the conclusions drawn from these results being as follows. Firstly, a bi-directional causal relationship was only found between stock market development and economic growth when MC and $DEVIN$ were used as stock market development proxies. For the remaining models, no definitively strong relationship was found to exist between stock market development and economic growth. The second conclusion was related to the strong unidirectional relationship that flowed from economic growth to investment. This conclusion held in all five cases. Lastly, a semi-strong unidirectional causal flow was found between investment and stock market development, with causality flowing to stock market development. This conclusion held true for all models, with the exception of Model 4.

In conclusion, the results generated by the study were divided by in-sample and forecast results. The in-sample results were mainly indicative of a bi-directional relationship between stock market development and economic growth. In contrast, the forecast results offered no definitively strong relationship between stock market development and economic growth. Instead, the results showed a strong unidirectional causal flow from economic growth to investment and a weaker flow from investment to stock market development in the majority of cases. Consequently, these results offer support for the work of Durham (2002), Minier (2003) and Rioja and Valev (2004) who argue that the significance of a country's stock market in respect of economic growth differs between countries and depends on country-specific characteristics.

As such, the in-sample results point to the fact that the establishment of the JSE was largely driven by a need to service mining and financial companies, given the discovery of gold in the Witwatersrand in 1886. As shown by the in-sample results, the establishment of the JSE assisted in driving economic growth. Nevertheless, the significance of a country's stock market in terms of economic growth depends to a large extent on whether the country is a high-income country (Durham, 2002). Given that South Africa has not yet emerged to high-income status, the significance of the stock market has receded since its establishment and may continue to recede, as is evidenced by the forecast results. Following these results, it is therefore recommended that South African economic development policies be geared towards pro-growth policies with the view of increasing the country's income level and thus generating feedback effects. These feedback effects should in time lead to increased investment and thus increased stock market activity and development.

Chapter Four: Summary and Conclusion, Policy Recommendations and Implications for Future Research

4.1 Introduction

The objective of this study was to examine the causal relationship between financial development and economic growth in South Africa. More specifically, the study aimed at answering two distinct questions:

1 – Does a consistent relationship exist between South Africa's financial development and economic growth?

2 – Does South Africa's finance–growth relationship differ when using stock market development as a form of financial development?

In order to provide answers to these questions, two separate studies were undertaken in Chapters Two and Three, respectively.

The aim of the current chapter is to provide a conclusion to the study by reviewing the empirical results, providing policy recommendations, and briefly mentioning the implications that the current study holds for future research with regard to the causal relationship between South Africa's financial development and economic growth. The chapter is, therefore, divided into four sections. Section two provides a summary of the empirical results generated in Chapters Two and Three. Policy recommendations are discussed in Section three before providing future research implications in Section four. Lastly, Section five concludes the chapter.

4.2 Summary of Results

Two sets of empirical findings are provided by the study. The first relates to the use of banking sector development proxies in Chapter Two and the second relates to the stock market development proxies employed in Chapter Three. The same methodology was employed in both chapters to ensure comparison; in addition, a simple tri-variate model was used rather than the commonly used bi-variate model in order to limit the risk of a variable omission or misspecification bias. To develop the tri-variate model, investment was included as the third variable following its theoretical links with financial development and economic growth. As such, the two studies offered results, not only of the finance–growth relationship, but also the causal relationship between financial development, economic growth and investment.

The empirical findings provided by Chapter Two offered both in-sample and forecast results. Evidence of a short-run bi-directional causal relationship was found to exist between financial development and economic growth in the short-run, given the in-sample results generated by the VECM Granger approach. This relationship was found to hold true for the majority of financial development proxies used. In contrast, support for a demand-following relationship was found in the long-run, with the results being indicative of a unidirectional relationship flowing from economic growth to financial development.

Depending on the financial development proxy used, the in-sample results related to investment varied significantly, for example the results showed evidence of a bi-directional causal relationship between investment and financial development and investment and economic growth when $M2GDP$ and $PRIVS$ are used. When $M2CGDP$ and $CREDR$ were used, the results indicated that a bi-directional relationship existed between investment and economic growth in both the short-and long-run, while bi-directionality was only found in the long-run for investment and financial development.

The forecast results provided by the IAA showed that for four of the five proxies used, a bi-directional relationship existed between financial development and economic growth. It is only when $M2GDP$ was used that evidence was found of a unidirectional causal flow from economic growth to financial development. In terms of investment, the majority of results implied a unidirectional relationship flowing from economic growth. A bi-directional hypothesis between investment and economic growth was only supported when $M2GDP$ was employed, while a unidirectional causality was found flowing from financial development to investment when $M2CGDP$ was used.

Similarly, in-sample and forecast results were also provided by the study in Chapter Three. The in-sample results showed that for all five proxies used, only a single long-run causal relationship was identified. More specifically, the long-run relationship identified was a unidirectional causal relationship flowing from economic growth and investment to stock market development. The short-run results, on the contrary, were reliant on the stock market indicator used. For $STTR$ the results were indicative of a short-run unidirectional relationship flowing from investment to stock market development. The short-run results, when using $STTV$, showed evidence of a unidirectional relationship flowing from economic growth to stock market development. In the case of both $STTR$ and $STTV$, a short-run unidirectional relationship was found flowing from economic growth to investment.

The empirical findings for the remaining three indicators were found to be the same, with three short-run bi-directional relationships being identified, namely between stock market development and economic growth, stock market development and investment, and economic growth and investment. With respect to the forecast results provided by the IAA, three important conclusions were drawn. Firstly, only when employing MC and $DEVIN$ as stock market development proxies was a bi-directional causal relationship found between stock market development and economic growth. For the remaining models, no definitively strong relationship was found to exist between stock market development and economic growth. The second conclusion, which held true for all five models, was related to the strong unidirectional relationship that flowed from economic growth to investment. Lastly, a semi-strong unidirectional causal flow was found between investment and stock market development, with causality flowing to stock market development. This conclusion held true for all models, with the exception of Model 4.

Consequently, these results provided answers to the questions identified in the introduction and thus assisted in achieving the objectives of the study. With reference to the first question, when employing banking sector indicators, the in-sample results provided evidence of a bi-directional relationship between financial development and economic growth in the short-run suggesting a changing relationship in the South African case. In the long-run the relationship between South Africa's financial development and economic growth was found to be consistent with the study of Odhiambo (2010), with a unidirectional relationship flowing from economic growth to financial development. In terms of the forecast results, empirical findings pointed to a possible changing relationship between financial development and economic growth, given a forecasted bi-directional relationship compared with the demand-following and supply-leading relationships identified by the two previous studies.

Comparing these results with the results generated by the use of stock market development indicators, the empirical findings illustrated that the relationship between financial development and economic growth does indeed change. Furthermore, the results were largely inconclusive regarding any specific relationship that exists between financial development and economic growth, with the relationship varying depending on the stock market proxy used. Apart from this, in the relationship between economic growth and investment, a unidirectional relationship flowing from economic growth to investment was found to remain consistent throughout the results of both studies.

4.3 Policy Recommendations

The empirical findings of this study have important policy implications for development policies in South Africa. Given the results, it is recommended that economic development policies should concentrate essentially on pro-growth policies in the long-run, but also intensify financial development in the short-run to take advantage of the identified short-run bi-directional relationship. The pro-growth policies available to government are numerous. It is recommended that country-specific supply chain strategies be developed in order to improve South Africa's supply and demand networks. Additionally, support could be provided to the supply chain strategies by undertaking infrastructure investments and implementing domestic regulatory reforms in order to overcome supply chain barriers in South Africa.

It is suggested that government should reaffirm the infrastructure development plan as set out in the National Development Plan (NDP), as well as encourage private sector investment in its infrastructure programme in order to provide improved efficiency in infrastructure development and lower government's debt burden. Furthermore, government could establish a level of alignment between South Africa's education system and labour force needs that is conducive to skills development. As part of the recommended policies, it is also recommended that government provide greater support to entrepreneurs through the removal of barriers inhibiting new business start-ups and the growing of existing businesses. Apart from this, structural reforms in the labour market will lead to improved adaptability, flexibility and mobility across South Africa's labour market.

It is also recommended that financial development be geared towards further developing South Africa's banking sector and its interconnectedness with economic growth, as opposed to stock market sector development, given the more conclusive results provided by the banking sector indicators. Moreover, given the consistent relationship identified between economic growth and investment, as well as sufficiently implemented growth policies, potential feedback effects could in time be generated with economic growth causing increased investment and thus increased stock market activity and development.

Successful implementation of such development policies over the short- and long-run should strengthen financial development, economic growth and investment in South Africa. It is, however, necessary to consistently re-evaluate this relationship to ensure that development policies implemented are still appropriate, given the possible changing nature of the relationship between financial development, economic growth and investment.

4.4 Recommendations for Future Research

It is imperative that further research be performed in order to validate the results of the current study and thereby further contribute to the general consensus regarding the causal relationship between South Africa's financial development, economic growth and investment. It is recommended that future research consider different proxies when representing financial development, as well as consider the application of different methodological techniques. For instance, as far as is known following the literature review, no research has been done in South Africa in terms of identifying a finance-growth-investment relationship using a generalised method of moments. Further recommendation for future research is the use of a longer sample period when employing stock market development indicators. It can also be argued that different monetary policy regimes have different effects on the relationship in question, thus limiting the sample period to South Africa's current monetary policy regime could be beneficial for future research.

In addition, an important implication for further research is the variable choice representing economic growth. Further research could attempt to employ gross value added per sector by using a total gross value added variable, calculated as the sum of value added from all sectors in the South African economy. It is important, however, to ensure that the investment variable employed is appropriate, given the economic growth variable used. In this regard, it would be most suitable to use investment per sector as a proxy for investment. Lastly, future research could use a different third variable to develop the tri-variate model. Possible variables should, however, embody theoretical links with the remaining two variables of finance and growth in order to be appropriate. One such variable that can be considered is poverty, as advocated by Odhiambo (2009).

4.5 Conclusion

To conclude, the results of this study have offered a means of achieving the set objectives. The empirical findings in Chapter Two provided evidence of a long-run causal relationship, consistent with the study by Odhiambo (2010). The short-run results, on the other hand, were not found to be consistent with any previous study, with the forecast results being indicative of a possible changing short-run relationship. The results provided in Chapter Three suggested that the causal relationship does change when using stock market development indicators. Unfortunately, the use of stock market indicators generated largely inconclusive results, except for a unidirectional causal relationship flowing from economic growth to investment. This relationship was found to be applicable in both the short- and long-run and consistent throughout the study, thus the results from both Chapters Two and Three.

Following the results, it was recommended that development policies be geared towards pro-growth policies, such as labour market reforms and restructuring of the country's education system to increase skills development. Furthermore, it was recommended that development policies concentrate on further developing South Africa's banking sector as it offers a significant and conducive channel through which growth can be driven in South Africa. Implications for future research was also discussed and included aspects such as the application of different variables to proxy financial development and economic growth, more select sample periods and different methodological techniques. It was also suggested that a different third variable be used to develop the tri-variate model, for example, poverty.

To sum up, the proper identification and development of a general consensus regarding the causal relationship in question is of significant importance to ensure that the correct policies are implemented to drive economic growth and financial development in South Africa. In return, through feedback effects, investment should also increase which will help to further drive the activity and development of South Africa’s stock market. It is, however, imperative that the policy recommendations that are presented in the current study, as well as those to be presented in further studies, be implemented timeously and effectively if the South African economy is to succeed in overcoming its challenges.

References

Abu-Bader, S., & Abu-Qarn, A. 2008. Financial development and economic growth: The Egyptian experience. *Journal of Policy Modeling,* 30(1):887-898.

Acemoglu, D., & Zilibotti, F. 1997. Was Prometheus unbound by chance? Risk, diversification and growth. *Journal of political economy*, 105(4):709-751.

Adjasi, C., & Biekpe, N. 2006. Stock market development and economic growth: The case of selected African countries. *African Development Review*, 18(1):144-161.

Agbetsiafa, D. 2004. The finance growth nexus: Evidence from Sub-Saharan Africa. *Savings and Development*, 28(3):271-288.

Agrawalla, R., & Tuteja, S. 2007. Causality between stock market development and economic growth: A case study for India. *Journal of Management Research*, 7(3):158-168.

Ahmed, S., & Ansari, M. 1998. Financial sector development and economic growth: The South-Asian experience. *Journal of Asian Economics*, 9(3):503-517.

Akinboade, O. 1998. Financial development and economic growth in Botswana: A test for causality. *Savings and Development*, 22(3):331-348.

Alam, M., & Hasan, T. 2003. The causality between stock market development and economic growth: Evidence from the United States. *Studies in Economics and Finance*, 21(1):93-104.

Al-Yousif, Y. 2002. Financial development and economic growth: Another look at the evidence from developing countries. *Review of Financial Economics*, 11(2):131-150.

Arestis, P., & Demetriades, P. 1997. Financial development and economic growth: Assessing the evidence. *The Economic Journal*, 107(442):783-799.

Arestis, P., Demetriades, P., & Luintel, K. 2001. Financial development and economic growth: The role of stock markets. *Journal of Money, Credit and Banking*, 33(1):16-41.

Arouri, M., Uddin, G., Nawaz, K., Shahbaz, M., & Teulon, F. 2014. *Causal linkages between financial development, trade openness and economic growth: Fresh evidence from Innovative Accounting Approach in case of Bangladesh.* Department of research working paper No. 2014-037, Ipag Business School.

Atje, R., & Jovanovic, B. 1993. Stock markets and development. *European Economic Review*, 37(2):632-640.

Bahadur, G. 2006. Stock market and economic development: A causality test. *The Journal of Nepalese Business Studies*, 3(1):36-44.

Beck, T., & Levine, R. 2004. Stock markets, banks and growth: Panel evidence. *Journal of Banking and Finance*, 28(3):423-442.

Beck, T., Levine, R., & Loayza, N. 2000. Finance and the sources of growth. *Journal of Financial Economics*, 58(1):261-300.

Bencivenga, V., & Smith, B. 1991. Financial intermediation and endogenous growth. *The Review of Economics Studies*, 58(2):195-209.

Bencivenga, V., Smith, B., & Starr, R. 1995. Transaction costs, technological choice and endogenous growth. *Journal of Economic Theory*, 67(1):53-117.

Benoit, K. 2011. *Linear regression models with logarithmic transformations*. London: London School of Economics.

Bhattacharya, P., & Sivasubramanian, M. 2003. Financial development and economic growth in India: 1970-1971 to 1998-1999. *Applied Financial Economics*, 13(12):925-929.

Bhide, A. 1993. The hidden costs of stock market liquidity. *Journal of Financial Economics*, 34(1):31-51.

Boyd, J., & Prescott, E. 1986. Financial intermediary-coalition. *Journal of Economic Theory*, 38(2):211-232.

Calderon, C., & Liu, L. 2003. The direction of causality between financial development and economic growth. *Journal of Development Economics*, 72(1):321-334.

Campos, J., Ericsson, N.R, & Hendry, D. 2008. *General-to-specific modeling: An overview and selected bibliography*. FRB International Finance Discussion Paper No. 838.

Capasso, S. 2008. Endogenous information frictions, stock market development and economic growth. *The Manchester School*, 76(2):204-222.

Caporale, G., Howells, P., & Soliman, A. 2004. Stock market development and economic growth: The causal linkage. *Journal of Economic Development*, 29(1):33-50.

Caselli, F., Esquivel, G., & Lefort, F. 1996. Reopening the convergence debate: A new look at the cross-country growth empirics. *Journal of Economic Growth*, 1(3):363-389.

Choe, C., & Moosa, I. 1999. Financial system and economic growth: The Korean Experience. *World Development*, 27(6):1069-1082.

Christopoulos, D., & Tsionas, E. 2004. Financial development and economic growth: Evidence from panel unit root and cointegration tests. *Journal of Development Economics*, 73(1):55-74.

Chuah, H., & Thai, V. 2004. *Financial development and economic growth: Evidence from causality tests for the GCC countries.* IMF Working Paper Series No. Wp/04/XX.

Crichton, N., & de Silva, C. 1989. Financial development and economic growth: Trinidad and Tobago 1973-1987. *Social and Economic Studies,* 38(4):133-164.

De Gregorio, J., & Guidotti, P. 1995. Financial development and economic growth. *World Development*, 23(3):433-448.

Deb, S., & Mukherjee, J. 2008. Does stock market development cause economic growth? A time series analysis for the Indian Economy. *International Research Journal of Finance and Economics*, 21(2):142-149.

Demetrides, P., & Hussein, K. 1996. Does financial development cause economic growth? Time-series evidence from 16 countries. *Journal of Development Economics*, 51(2):387-411.

Demirguc-Kunt, A., & Levine, R. 1996. Stock markets, corporate finance and economic growth: An overview. *The World Bank Economic Review*, 10(2):223-239.

De Rato, R. 2007. *Economic Growth and Financial Market Development: A Strengthening Integration* [Interview] (22 August 2007).

Devereux, M., & Smith, G. 1994. International risk sharing and economic growth. *International Economic Review*, 35(4):535-550.

Dickey, D., & Fuller, W. 1979. Distribution of the estimators for autoregressive time series with a unit root. *Journal of American Statistical Association*, 74(366a):427-431.

Dickey, D., & Fuller, W. 1981. Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica*, 49(4):1057-1072.

Durham, J. 2002. The effects of stock market development on growth and private investment in lower-income countries. *Emerging Markets Review*, 3(3):211-232.

Elliot, G., Rothenberg, T., & Stock, J. 1996. Efficient tests for an autoregressive unit root. *Econometrica*, 64(11):813-836.

El-Wassal. 2005. Understanding the growth in emerging stock markets. *Journal of Emerging Market Finance*, 4(3):227-261.

Engle, R., & Granger, C. 1987. Cointegration and error correction: Representation, estimation and testing. *Econometrica*, 55(2):251-276.

Filer, R., Hanonsek, J., & Campas, N. 1999. *Do stock markets promote growth?* The Center for Economic Research and Graduate Education Working Paper Series No. 267.

Friedman, M., & Schwartz, A. 1963. *A monetary history of the United States.* Princeton: Princeton University Press.

Fry, M. 1995. *Money, interest and banking in economic development.* Baltimore: John Hopkins University Press.

Fry, M. 1997. In favour of financial liberalisation. *Economic Journal*, 107(1):754-770.

Gelb, A. 1989. *Financial policies, growth and efficiency.* World Bank Working Paper Series No. WPS 202.

Ghali, K. 1999. Financial development and economic growth: The Tunisian experience. *Review of Development Economics,* 3(3):310-322.

Ghirmay, T. 2004. Financial development and economic growth in Sub-Saharan African countries: Evidence from time series analysis. *African Development Review*, 16(3):415-432.

Graff, M. 1999. *Financial development and economic growth: A new empirical analysis.* Dresden University discussion paper series in Economics No. 5/99.

Greenwood, J., & Jovanovic, B. 1990. Financial development and economic growth. *Economic Development and Cultural Change*, 15(1):257-268.

Greenwood, J., & Smith, B. 1997. Financial markets in development and the development of financial markets. *Journal of Economic Dynamics and Control*, 21(1):145-181.

Gurley, J., & Shaw, E. 1955. Financial aspects of economic development. *The American Economic Review*, 45(5):515-538.

Habibullah, M., & Eng, Y. 2006. Does financial development cause economic growth? A panel dat dynamic analysis for the Asian developing countries. *Journal of the Asia pacific Economy*, 11(4):377-393.

Harris, R., & Sollis, R. 2003. *Applied time series modelling and forecasting*. New York: Wiley.

Hendry, D., & Ericsson, N. 1991. Modelling the demand for narrow money in the United Kingdom and the United States. *European Economic Review*, 35(4):833-881.

Hicks, J. 1969. Automatists, Hawtreyans and Keynesians. *Journal of Money, Credit and Banking*, 1(3):307-317.

Holmstrom, B., & Tirole, J. 1993. Market liquidity and performance monitoring. *Journal of Political Economy*, 101(4):678-709.

Hondroyiannis, G., Lolos, S., & Papapetrou, E. 2005. Financial markets and economic growth in Greece 1986-1999. *Journal of International Financial Markets, Institutions and Money*, 15(2):173-188.

Hsiao, C. 1979. Autoregressive modelling of the Canadian money and income data. *Journal of the American Statistical Association*, 74(367):553-560.

Ibrahim, M. 2005. Sectoral effects of monetary policy: Evidence from Malaysia. *Asian Economic Journal*, 19(1):83-102.

Ireland, P. 1994. Money and growth: An alternative approach. *American Economic Review*, 84(1):47-65.

Jalilian, H., & Kirkpatrick, C. 2002. Financial development and poverty reduction in developing countries. *International Journal of Finance and Economics*, 7(2):97-108.

Jensen, M., & Murphy, K. 1990. Performance pay and top management incentives. *Journal of Political Economy*, 98(2):225-264.

Johansen, S. 1988. Statistical analysis of conintegration vectors. *Journal of Economic Dynamics and Control*, 12(2):231-254.

Johansen, S., & Juselius, K. 1990. Maximum likelihood estimation and inference on cointegration with applications to the demand for money. *Oxford Bulletin of Economics and Statistics*, 52(2):169-210.

Jung, W. 1986. Financial development and economic growth: International evidence. *Journal of Economic Development and Cultural Change* , 34(1):333-346.

Khan, R., & Shahbaz, M. 2010. Old wine in new bottles: Saving-growth nexus - Innovative accounting technique in Pakistan. *Theoretical and Applied Economics*, 17(7):49-60.

King, R., & Levine, R. 1993a. Finance and growth: Schumpeter might be wrong. *Quarterly Journal of Economics*, 108(3):713-737.

King, R., & Levine, R. 1993b. Finance, entrepreneurship and growth. *Journal of Monetary Economics*, 32(3):513-542.

Korajczyk, R. 1996. A measure of stock market integration for development and emerging markets. *The World Bank Economic Review*, 10(2):267-289.

Kyle, A. 1984. Market structure, information, furtures markets and price formation. (*In* G. Storey, A. Schmitz, & A. Sarris, International agricultural trade: Advanced readings in price formation, market structure and price instability. Boulder: Westview Press. p. 516-537).

Laffont, J., & Tirole, J. 1988. Repeated auctions of incentives contracts, investment and bidding parity with an application to takeovers. *The RAND Journal of Economics*, 19(4):516-537.

Lee, K. 2001. *Note on study of the changes of financial system.* Department of Economics: University of Massachusetts.

Levich, R., & Thomas, L. 1993. The significance of technical trading rule profits in the foreign exchange market: A bootstrap approach. *Journal of International Money and Finance*, 12(5):451-474.

Levine, R. 1991. Stock markets, growth and tax policy. *The Journal of Finance*, 46(4): 1445-1465.

Levine, R. 1997. Financial development and economic growth: View and agenda. *Journal of Economic Literature*, 35(1):596-613.

Levine, R. 1998. The legal environment, banks and long-run economic growth. *Journal of Money, Credit and Banking*, 30(1):596-613.

Levine, R., & Zervos, S. 1993. What we have learned about policy and growth from cross-country regressions? *The American Economic Review*, 83(2):426-430.

Levine, R., & Zervos, S. 1996. Stock market development and long-run growth. *The World Bank Economic Review*, 10(2):323-339.

Levine, R., & Zervos, S. 1998a. Stock markets, banks and economic growth. *American Economic Review*, 88(3):537-558.

Levine, R., & Zervos, S. 1998b. Capital control liberalisation and stock market development. *World Development*, 26(7):1169-1183.

Levy, P. 1999. Sanctions on South Africa: What did they do. *The American Economic Review*, 9(2):415-420.

Lorde, T., Waithe, K., & Francis, B. 2010. The importance of electrical energy for economic growth in Barbados. *Energy Economics*, 32(6):1411-1420.

Love, I., & Zicchino, L. 2006. Financial development and dynamic investment behaviour: Evidence from panel VAR. *The Quarterly Review of Economics and Finance*, 46(2):190-210.

Lucas, R. 1988. On the mechanics of economic development. *Journal of Monetary Economics*, 23(3):3-42.

Luintel, R., & Khan, M. 1999. A quantitative re-assessment of the finance-growth nexus: Evidence from a multivariate VAR . *Journal of Development Economics*, 60(1):381-405.

Mah, J. 2000. An empirical examination of the disaggregated import demand of Korea - the case of information technology products. *Journal of Asian Economics*, 11(2):237-244.

McConnell, J., Diamond, D., & Verrecchia, R. 1982. Optimal managerial contracts and equilibrium security prices. *The Journal of Finance*, 37(2):275-287.

Mckinnon, R. 1973. *Money and capital in economic development.* Washington: The Brookings Institution.

Milanovic, B. 2005. *Worlds Apart.* New Jersey: Princeton University Press.

Minier, J. 2003. Are small stock markets different? *Journal of Monetary Economics*, 50(7):1593-1602.

Morley, B. 2006. Causality between economic growth and immigration: An ARDL bounds testing approach. *Economics Letters*, 90(1):72-76.

Naceur, S., & Ghazouani, S. 2007. Stock markets, banks and economic growth: Empirical evidence from the MENA region. *Research in International Business and Finance*, 21(2):297-315.

Narayan, P. 2005. The saving and investment nexus in China: Evidence from cointegration tests. *Applied Economics*, 37(17):1979-1990.

Narayan, P., & Smyth, R. 2004. Temporal causality and the dynamics of exports, human capital and real income in China. *International Journal of Applied Economics*, 1(1):24-45.

Narayan, P., & Smyth, R. 2005. Electricity consumption, employment and real income in Australia: Evidence from multivariate Granger causality tests. *Energy Policy*, 33(9):1109-1116.

Narayan, P., & Smyth, R. 2006. Higher education, real income and real investment in China: Evidence from Granger causality tests. *Education Economics*, 14(1):107-125.

Narayan, P., & Smyth, R. 2008. Energy consumption and real GDP in G7 countries: new evidence from panel cointegration with structural breaks. *Energy Economics*, 30(5):2331-2341.

Neusser, K., & Kugler, M. 1998. Manufacturing growth and financial development: Evidence from OECD countries. *Review of Economics and Statistics*, 80(4):638-646.

Newey, W., & West, K. 1987. A simple positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix. *Econometrica*, 55(10):703-708.

N'Zue, F. 2006. Stock market development and economic growth: Evidence from Cote D'lvoire. *African Development Review*, 18(1):123-143.

Obstfeld, M. 1994. Risk-taking, global diversification and growth. *American Economic Review*, 84(5):1310-1329.

Odedokun, M. 1996. Alternative econometric approaches for analysing the role of the financial sector in economic growth: Time series evidence from LDCs. *Journal of Development Economics*, 119-146.

Odhiambo, N. 2005. Financial development and economic growth in Tanzania: A dynamic causality test. *African Finance Journal*, 7(1):1-17.

Odhiambo, N. 2007. Supply-leading versus demand-following hypothesis: Empirical evidence from three SSA countries. *African Development Review*, 19(2):257-280.

Odhiambo, N. 2008. Financial depth, savings and economic growth in Kenya: A dynamic causal linkage. *Economic Modelling*, 25(4):704-713.

Odhiambo, N. 2009a. Finance-growth-poverty nexus in South Africa: A dynamic causality linkage. *The Journal of Socio-Economics*, 38(3):320-325.

Odhiambo, N. 2009b. Energy consumption and economic growth nexus in Tanzania: An ARDL bounds testing approach. *Energy Policy*, 37(2):617-622.

Odhiambo, N. 2010a. Stock Market development and economic growth in South Africa: An ARDL-bounds testing approach. (Unpublished manuscript for the World Business Institute).

Odhiambo, N. 2010b. Finance-investment-growth nexus in South Africa: An ARDL-bounds testing procedure. *Economic Change and Restructuring*, 43(3);205-219.

Pardy, R. 1992. *Institutional reform in emerging securities markets.* World Bank Policy Research Working Paper (Financial Policy and Systems) No. 907.

Patrick, H. 1966. Financial development and economic growth in underdeveloped countries. *Journal of Economic Development and Cultural Change*, 14(1):174-189.

Pattichis, C. 1999. Price and income elasticities of disaggregated import demand: results from UECMs and an application. *Applied Economics*, 31(9):1061-1071.

Paul, B., & Uddin, G. 2011. Energy and output dynamics in Bangladesh. *Energy Economics*, 33(3):480-487.

Perotti, E., & Van Oijen, P. 2001. Privatisation, political risk and stock market development. *Journal of International Money and Finance*, 20(1):43-69.

Pesaran, M., & Pesaran, B. 1997. *Working with Microfit 4.0: Interactive economic analysis.* Oxford: Oxford University Press.

Pesaran, M., & Shin, Y. 1998. An autoregressive distributed-lag modelling approach to cointegration analysis. *Econometric Society Monographs*, 31:371-413.

Pesaran, M., & Shin, Y. 1999. An autoregressive distributed lag approach to cointegration analysis. (*In* S. Strom, Econometric and economic theory in the 20th century. Cambridge: Cambridge University Press. p. 289-326).

Pesaran, M., Shin, Y., & Smith, R. 2001. Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16(3):289-326.

Phillips, P., & Perron, P. 1988. Testing for unit root in time series regression. *Biometrika*, 75(2):335-346.

Quah, D. 1993. Empirical cross-section dynamics in economic growth. *European Economic Journal*, 37(2):426-434.

Rahman, M., & Shahbaz, M. 2013. Do imports and foreign capital inflows lead economic growth? Cointegration and causality analysis in Pakistan. *South Asia Economic Journal*, 14(1):59-81.

Rajan, R., & Zingales, L. 1998. Financial dependence and growth. *American Economic Review*, 88(3):559-586.

Rioja, F., & Valev, N. 2004. Finance and the sources of growth at various stages of economic development. *Economic Enquiry*, 42(1):127-140.

Robinson, J. 1952. *The generalisation of the general theory in the rate of interest and other essays.* London: McMillan.

Robinson, J. 1962. *Essays in the theory of economic growth.* London: McMillan.

Rousseau, P., & Wachtel, P. 2000. Equity markets and growth: Cross-country evidence on timing and outcomes, 1980-1995. *Journal of Banking and Finance*, 24(12):1933-1957.

Saint-Paul, G. 1992. Technological choice, financial markets and economic development. *European Economic Review*, 36(4):763-781.

Sala-i-Martin, X. 1994. Cross sectional regressions and the empirics of economic growth. *European Economic Review*, 38(3):739-747.

Sarkar, P. 2006. *Stock market development, capital accumulation and growth in India since 1950.* MPRA Working Paper Series No. 5050.

Scharfstein, D. 1988. The disciplinary role of takeovers. *The Review of Economic Studies*, 55(2):185-199.

Schumpeter, J. 1911. *The theory of economic development.* Cambridge: Harvard University Press.

Schwert, G. 2002. Tests for unit roots: A Monte Carlo investigation. *Journal of Business and Economic Statistics*, 20(1):5-17.

Seetanah, B., Sannassee, V., & Lamport, M. 2008. *Stock market development and economic growth in developing countries: Evidence from a panel VAR framework.* University of Oxford CSAE Working Paper Series No. 041.

Shahbaz, M., Ahmed, N., & Ali, L. 2008. Stock market development and economic growth: ARDL causality in Pakistan. *International Research Journal of Finance and Economics*, 14(1):182-195.

Shahbaz, M. 2012a. Does trade openness affect long run growth? Cointegration, causality and forecast error variance decomposition tests for Pakistan. *Economic Modelling*, 29(6):2325-2339.

Shahbaz, M. 2012b. *Multivariate Granger causality between CO2 emissions, energy intensity, financial development and economic growth: Evidence from Portugal.* MPRA Working Paper Series No. 37774.

Shahbaz, M., & Dube, S. 2012. Revisiting the relationship between coal consumption and economic growth: Cointegration and causality analysis in Pakistan. *Applied Econometrics and International Development*, 12(1):1-13.

Shahbaz, M., Islam, F., & Aamir, N. 2012. Is devaluation contractionary? Empirical evidence from Pakistan. *Economic Change and Restructuring* , 45(4):299-316.

Shahbaz, M., Sbia, R., Hamdi, H., & Rehman, I. 2014. *The role of information communication technology and economic growth in recent electricity demand: Fresh information from combined cointegration approach in UAE.* MPRA Working Paper Series No. 53226.

Shahbaz, M., Shahbaz Shabbir, M., & Sabihuddin Butt, M. 2013. Effect of financial development on agricultural growth in Pakistan: New extensions from bounds test to level relationships and Granger causality tests. *International Journal of Social Economics*, 40(8):707-728.

Shahbaz, M., Tang, C., & Shabbir, M. 2011. Electricity consumption and economic growth nexus in Portugal using cointegration and causality approaches. *Energy Policy*, 39(6):3529-3536.

Shan, J. 2005. Does financial development "lead" economic growth? A vector autoregression appraisal. *Applied Economics*, 37(12):1353-1367.

Shan, J., Morris, A., & Sun, F. 2001. Financial development and economic growth: An egg-and-chicken problem? *Review of International Economics*, 9(3):443-454.

Shaw, E. 1973. *Financial deepening in economic development.* New York: Oxford University Press.

Shleifer, A., & Summers, L. 1988. Breach of trust in hostile takeovers. (*In* A. Auerbach, Corporate takeovers: Causes and consequences. Chicago: University of Chicago Press. p. 33-56).

Shleifer, A., & Vishny, R. 1986. Large shareholders and corporate control. *Journal of Political Economy*, 94(3):461-488.

Sims, C. 1980. Macroeconomics and reality. *Econometrica*, 48(1):1-48.

Singh, A. 1971. *Takeovers: The relevance to the stock markets and economic development.* Cambridge: Cambridge University Press.

Singh, A. 1997. Stock markets, financial liberalisation and economic development. *Economic Journal*, 107(442):771-782.

Singh, A., & Weisse, B. 1998. Emerging stock markets, portfolio capital flows and long-term economic growth: Micro and macroeconomic perspectives. *World Development Journal*, 26(1):607-622.

South African Reserve Bank. *Regulation and supervision: Bank supervision*. Retrieved from South African Reserve Bank: https://www.resbank.co.za. Date of access: 03 February. 2015.

Spears, A. 1991. Financial development and economic growth-causality tests. *Atlantic Economic Journal*, 19(3):66-74.

Spears, A. 1992. The role of financial intermediation in economic growth in Sub-Saharan Africa. *Canadian Journal of Development Studies*, 13(3):361-380.

Stiglitz, J. 1985. Credit markets and the control of capital. *Journal of Money, Credit and Banking*, 17(2):133-152.

Stiglitz, J. 1994. The role of the state in financial markets. (*In* Proceedings of the World Bank Annual Bank Conferences on Development Economics 1993. Washington: World Bank. p. 19-61).

Suleiman, A., & Aamer, A. 2008. Financial development and economic growth: Time series evidence from Egypt. *Journal of Policy Modelling*, 30(5):887-898.

Tang, T. 2004. Demand for broad money and expenditure components in Japan: An empirical study. *Japan and World Economy*, 16(4):487-502.

Tang, T. 2005. Revisiting South Korea's import demand behaviour: A cointegration analysis. *Asian Economic Journal*, 19(1):29-50.

Thakor, A. 1996. The design of financial systems: An overview. *Journal of Banking and Finance*, 20(5):917-948.

Toda, H., & Yamamoto, T. 1995. Statistical inference in vector autoregressions with possibly integrated processes. *Journal of Econometrics*, 66(1):225-250.

Waqabaca, C. 2004. *Financial development and economic growth in Fiji*. Reserve Bank of Fiji Working Paper Series No. 2004/03.

Wood, A. 1993. Financial development and economic growth in Barbados: Causal evidence. *Savings and Development*, 17(4):379-390.

World Economic Forum. 2013. *The Global Competitiveness Report 2013-2014*. Geneva: World Economic Forum.

World Federation of Exchanges. 2014. *2014 WFE Market Highlights*. London: World Federation of Exchanges.

Yartey, C. 2007. Macroeconomic and institutional determinants of stock market development in Africa. (*In* J. Okpara, Management and economic development in Sub-Saharan Africa: Theoretical and applied perspectives. London: Adonis and Abbey Publishers. p. 771-782).

Zang, H., & Kim, Y. 2007. Does financial development precede growth? Robinson and Lucas might be right. *Applied Economic Letters*, 14(1):15-19.

Zivot, E., & Wang, J. 2006. *Modeling Financial Time Series with S-PLUS®*. New York: Springer.