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THE IMPACT OF INFLATION ON FINANCIAL DEVELOPMENT IN SOUTH AFRICA

BY

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(200910001)

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DECLARATIONS

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DEDICATION

This dissertation is dedicated to my family, especially my parents, Mr. T. and Mrs. H Muzvanya for their love and support during my years of studying. Without their continued support and counsel, I could not have accomplished this study.

ABSTRACT

Growing theoretical and empirical studies have predicted different influences that inflation has on financial development in different economies. This dissertation observes the impact South Africa's inflation has on financial development over the period between 1990 and 2012. Monetary policy framework in South Africa has, to a greater extent, assisted in monitoring the movement of the consumer price index. Although inflation does affect financial sector performance, the study also looked into other variables that have an effect like private credit, money supply and gross domestic product.

To test for stationarity to avoid spurious regression, the ADF test and the PP test were used. To determine the long- and short-run relationship, the Johansen Maximum Likelihood test and VECM models were used.

Results of the study indicated that money supply and inflation have a negative effect on financial development. In addition, apart from money supply and inflation the findings revealed that private credit and gross domestic product play a significant part in financial sector performance. The study recommends that the South African Reserve Bank should keep the inflation rate within its target range (3-6%). This would ensure price stability and restore investor confidence in the financial sector, which then improves financial sector development.

Keywords: inflation, financial development, Vector Auto-regression Model, South Africa.

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LIST OF ACRONYMS AND ABBREVIATIONS

ADF	Augmented Dickey-Fuller
ADL	autoregressive distributed lag
JB	Jarque Bera
CPI	consumer price index
DBSA	Development Bank of Southern Africa
ECM	Error Correction Model
FD	financial development
FSB	Financial Service Board
FPE	final prediction error
GDP	gross domestic product
GMM	generalised method of moments
HQ	Hannan Quinn
ICT	information and communication technology
IMF	International Monetary Fund
INF	inflation
JSE	Johannesburg Stock Exchange
LM	Langrange multiplier
M3	measure of money supply
OECD	Organization for Economic Cooperation and Development
OLS	ordinary least squares
PC	private credit
POLS	pooled ordinary least squares
PP	Phillips-Perron test
SABE	South African Bond Exchange
SARB	South African Reserve Bank
SAVCA	South African venture capital
SIC	Schwarz information criteria

1

OVERVIEW AND BACKGROUND OF STUDY

1.1 BACKGROUND OF THE STUDY

It is generally held that growth in the financial sector enhances economic development. "A large body of evidence associates financial sector enhancement and economic enlargement, yet a few cases have been thoroughly explored to show how inflation rate affects this relationship" (Rousseau & Yilmazkuday, 2009:1). Studies that have been done so far effectively highlighted the relationship between inflation and financial development. However, it has been found that high inflation rates negatively affect financial development of an economy, which in turn affects economic growth.

A system that promotes efficient financial intermediation is important to develop well-functioning economies. Financial development is defined as an enhancement in quantity, quality and effectiveness of financial intermediaries (Choong & Chan, 2011:2018). It can also be defined as the improvement in mobilisation and pooling of savings, invention of information for potential investments and allocation of capital that will enhance economic growth. These financial roles impact on savings and investment decisions, which in turn affect economic growth. Boyd, Levine & Smith (2001:223) have shown the relation between inflation and financial repression and the fact that the financial sector is less advanced as the inflation rate increases.

According to Lee and Wong (2005:50), inflation is a major obstacle in promoting economic growth through its negative effect on financial development. Price stability is a great concern of many nations and can be achieved through the implementation of a monetary policy framework. It then follows that policymakers are duty-bound to aim at a low inflation rate. This will stabilise and improve the performance of the economy.

In 1990, inflation targeting was pioneered in England and then introduced and implemented in countries like Canada, Brazil and South Africa after success was determined. The target was set at 2%, stated in terms of the annual inflation rate established on the Consumer Price Index (CPI). "The main objective of implementing the monetary policy was to deliver price stability and a low inflation rate" (Vickers, 1999:3). Central banks implement the monetary policy framework with the aim to support growth and minimise variability of inflation and output.

From 1992, inflation targeting in United Kingdom (UK) was run under flexible inflation targeting. It later changed in 1997 giving the Bank of England full independence in setting monetary policy which proved to have enhanced economic growth in the UK.

Following central banks around the world, South Africa recognised the possible adverse effects of a high inflation rate on the economy, especially in the financial sector. They implemented the Inflation Targeting Rate between 3–6% to operate their monetary policy.

From 1990-1999, the South African monetary policy framework was based on money supply targeting. Formal inflation targeting which is currently governing the economy was introduced in 2000. It is, therefore, believed that creating a stable environment helps in attaining a stable financial intermediary in the long run, which enhances economic growth. However, setting a threshold level in South Africa affects financial development, and positively so if the level of inflation is within the target. Alternatively, financial development is affected negatively if the inflation rate is above the set level (Abdullah & Bawa, 2012:43). It is of great importance to establish whether the actual inflation rate experienced by South Africa falls within the targeted range and if it adversely influences the performance of the financial sector.

Implementation of inflation targeting in South Africa has given room for supply shocks and some discretion should be exercised to avoid losses in output and jobs (Carson, Enoch & Dziobek, 2002: 65). According to the Government of United States (2007: 2202), it is believed that losses in jobs may be a result of a nationwide excessive salary and wage hike. When wage prices increase, prices of goods also increase, which results in an increase in inflation. The South African Reserve Bank closely monitors economic development and ensures that the inflation rate stays within the target rate. This study will analyse the effect that inflation targeting has on financial development and economic growth from 1990-2012 in South Africa. It will take into consideration the two monetary policy regimes that were introduced during this period in determining the results.

1.2 STATEMENT OF THE PROBLEM

According to Kahn (1984:1), inflation is the number one public enemy and policies to combat it are usually accompanied by exhortations to tighten belts for the long-term good of the economy. This means that inflation does have a negative effect on the economy. Mundell (1963:282) and Tobin (1965: 679) also argued that it drives away allocation of portfolio from money into capital, which leads to low returns on capital and positive investment. Low return

on capital and investment implies that high inflation rate has an unfavourable effect on financial sector development. However, it is also believed that inflation does have a negative effect on financial development which might encourage economic growth. English (1999:2) postulated that a high inflation rate encourages households to substitute transactional services for money balances. This means that the financial sector will be boosted and hence, inflation will have a positive impact on financial development in an economy and in turn, boost the economic growth. High inflation rate can either boost or distort financial sector development.

A high inflation rate distorts decisions, prices, and savings; discourages investment; and inhibits economic growth (Croce &Khan, 2000). Inflation is consequently a serious problem for a government and the economy as a whole, which can be sustained through the introduction of monetary policy. Inflation targeting was, however, introduced as a tool to maintain price stability, encourage savings and investments in an economy, which are necessary tools for financial development and economic growth (Van der Merwe, 2004:11).

With the introduction of inflation targeting, one can determine whether or not the inflation rate falls within the targeted range. Even if it falls within the targeted range, it will be interesting to know if it has an effect in the financial sector and to what extent. Controlling the inflation rate and maintaining it within the target rate is anticipated to have a positive influence on financial sector advancement, whereas if it is not monitored and too high, a negative effect on economic growth is expected.

New Zealand introduced inflation targeting in the late 1980s, and other countries also adopted it to operate and maintain price stability. The South African Reserve Bank recognised possible adverse effects of a high inflation rate on the economy, especially in the financial sector and implemented the inflation target rate of 3%–6%. It is of great importance to establish whether the actual inflation rate experienced by South Africa falls within the target range and if it adversely influences the performance of the financial sector. Similar studies have been conducted before but used different variables as the ones in this study.

Limiting monetary policy solely to price stability cannot guarantee that the economy will improve since a low inflation rate does not necessarily lead to high and stable economic growth (Epstein, 2007:7). The attention is mainly on stabilising instead of development with the assumption that economic growth, poverty reduction, and employment creation are established following stabilisation of the financial sector. South Africa has managed to reduce the inflation

rate through inflation targeting, hoping for gains in employment and an increase in economic growth, but this has not yet fully materialised.

Many researchers have used different methodologies to reach a consensus, concluding that a strong negative relationship is felt between inflation and financial development in various economies. Wahid *et al.* (2011:149) found that there is an inverse association between inflation and financial development in Bangladesh. Pollin & Zhu (2006:11-2) also concluded that inflation benefits economic growth.

Given that a high inflation rate leads to a negative effect on financial sector performance and economic advancement, it is also significant to evaluate the effects it has on the South African economy. Has the introduction of inflation targeting been beneficial to the financial sector in South Africa? What are the policy implications that can be introduced in South African economy in achieving a low inflation rate and monitoring them to keep inflation within the targeted range? Is the relationship between financial development and inflation rate attained in the short or long run?

1.3 PURPOSE OF THE STUDY

The overall aim of the study is to examine the impact of inflation on financial development in South Africa.

The objectives are:

- Providing an overview of inflationary and financial sector developments in South Africa;
- Empirically examining the impact inflation has on financial sector development;
- Analysing the long-term association between financial sector development and inflation in the South African economy
- Based on the results of the study, making conclusions and policy recommendations.

1.4 HYPOTHESIS OF THE STUDY

H_0: Inflation does not adversely influence financial development

H_1: Inflation adversely influence financial development

1.5 JUSTIFICATION OF THE STUDY

There has been a considerable amount of research that have been piloted on the impact of inflation on financial development with conflicting result. Results from empirical studies

carried out so far, shows that in Sub-Saharan countries, few studies have been piloted. Lack of consent on the connection between inflation and financial development has been evident in the few studies that have been carried out so far. Empirical results showed that most of the studies that were conducted in the past relied on cross-sectional or panel data, not focusing on specific countries. Thus, there is shortage of empirical literature on inflation and financial development in Africa and specifically in South Africa.

Inflation has both direct and indirect effects on the financial sector and economic growth (Rosseau & Watchel, 2000:1947). An increase in the inflation rate will directly affect the transactional and informational costs, which limit growth in the South African economy. The financial sector will, however, be repressed making it impossible to put ceilings on the nominal interest payable on bank deposits and there will be higher price inflation domestically, which will reduce the average real interest rate across all categories.

This study focuses on the impact inflation has on financial development in South Africa and analyses whether the implementation of inflation targeting affects financial development and economic growth. Results will be pertinent, used for policy implications and answer empirical questions of the impact of inflation on financial development. New policies will be of great importance from a policy point of view since it will be providing information on how to liberalise the financial sector of South Africa and make sure that the inflation rate is kept within the target inflation rate.

1.6 ORGANIZATION OF THE STUDY

The outline of this dissertation starts with Chapter 1giving an overall introduction to the research issue. Chapter two gives a background and overview of inflation, financial development and other explanatory variables used in the study leading to chapter three of literature review. The literature of the study is divided into theoretical and empirical literature giving a detailed insight of findings from previous studies. Model specifications and methodology used in the study are explained in Chapter 4. This gives Chapter 5 the platform to analyse and present results of the actual data used. Last but not least, policy recommendations and conclusions are presented in Chapter 6, thus giving a summary of the whole study.

2

AN OVERVIEW OF SOUTH AFRICAN INFLATION AND FINANCIAL DEVELOPMENT

2.1 INTRODUCTION

The main objective of this section is to give an outline of financial development and inflation in South Africa. The chapter serves to highlight trends in the performance of the financial sector with considerations being made to the monetary policy that shapes the financial sector and it also presents inflation patterns in South Africa. The first part of the chapter discusses trends and developments in the financial sector, with the second part concentrating on trends in inflation. The last section of the chapter links the trends in the financial sector and inflation trends.

2.2 FINANCIAL MARKET DEVELOPMENT IN SOUTH AFRICA

South Africa is ranked third for financial markets development in the Global Competitiveness Index (World Economic Forum Report, 2013). It has a well-functioning financial intermediation process and efficient financial sector performance. The finance, real estate and business service sectors comprise the biggest stake of approximately 21.1% of its gross domestic product (GDP) and the second largest sector being manufacturing, which constitutes a 15.4% stake (Young, 2015). The South African financial services and banking sector is recognised internationally due to a solid legal and regulatory framework.

The financial sector has continually added to the economy's total real annual growth despite the drowning of the economy at some point. In 2007 and 2008 the sector contributed approximately 1.5 % to South Africa's growth and in 2009 a negative growth rate of (-1.5%) was experienced. Although there was negative economic growth, the financial sector still added 0.2% to economic growth (National Treasury, 2015:58).

The South African economy is ideal for other African countries as well as several international economies thus promoting economic growth. This is evident by different foreign financial intermediaries operating in South Africa such as the Bank of China, Bank of Taiwan, Citibank, Deutsche Bank AG and HSBC Bank, etc.

2.2.1 Institutions in the South African financial sector

The South African Reserve Bank (SARB), being the national bank of South Africa, has the main objective of maintaining price stability as well as sustaining economic growth (Mboweni, 2000). It sets monetary policy framework and decides on the interest rates to be run in the economy. While the SARB supervises the banking sector, on the other hand, the non-banking financial sector is managed by the Financial Service Board (FSB). Mboweni (2000), highlighted that all the registered international and local banks are signified and represented by the Banking Association of South Africa. The main sub-committees administering credit risk, capital supervision and the SA Securities Lending Association.

In the World, Economic Forum's Global Competitiveness Report 2012/2013, the South African financial sector was ranked second for private institutions and third in financial markets development (National Treasury, 2015). The primary financial service markets encompass the following markets; National Stock Exchange (NSE), Johannesburg Securities Exchange (JSE), SA Futures Exchange (SAFEX) and Alternative Exchange (AltX). The JSE, being the major stock exchange on the African continent, is constantly ranked in the top 20 derivative exchanges. According to the National Treasury (2015), the AltX is a division of the JSE, which draws various small- and medium-sized high-growth companies in South Africa.

Based on the findings of the OECD (2015), the most competitive financial sectors are merchant and investment banking with companies such as Rand Merchant Bank and Investec being most prominent. Investec is listed on both the JSE and the London Stock Exchange, as it takes part in the capital markets, private banking and asset management with more than 6 700 employees in its global operations (OECD, 2015). As per the Southern African Venture Capital Association (2015), there is an increase in the private equity industry and as well as the capital funding sector. This notion is supported by an estimate value of more than R100 billion in the private equity and the R830 million in the venture capital funding sector. Although 35% of investment was channelled to Information and Communications Technology (ICT) between 2009 and 2012, health and pharmaceutical ventures also attracted 25% of investment (OECD, 2015). This whole process attracted billions of rand in funding of which 80% came from South African institutions. It adheres to the objective of the Development Bank of Southern Africa (DBSA), where they were accountable for about R22.6 billion towards funding private equity and venture capital sectors.

2.2.2 The financial sector's role in South Africa

The financial sector is the main sector of the South African economy that has an effect on the life of each and every citizen. According to Ludinand and Grobler (2013), financial services give an opportunity to citizens, to engage in daily economic transactions, saving and reserving wealth to meet future ambitions and retirement needs, and insure against personal and economic disasters. The financial sector enables economic growth, job creation and sustainable development in economy.

The financial crisis of 2007/2008, however, emphasised the enormous costs of a poorly structured financial services sector. Though South Africa's financial institutions were solid during the crisis, the indirect impact through job losses was distressing. A stable financial services sector that is reachable to everyone is required to promote economic growth and development in South Africa (National Treasury, 2015).

Although the South African economy has a sound macroeconomic foundation and regulatory framework, it was also adversely affected by the financial crisis compared to other international countries (G-20). The effect resulted in close to one million job losses as well as low levels of economic growth. Year 2007 experienced significantly lower levels of growth although growth had finally recovered since year 2000. The South African government initiated a new growth path with the aim of increasing the growth rate to 6% and creating at least five million jobs by the year 2020 (StatsSA, 2016). The President of the Republic of South Africa (Jacob Zuma), committed the economy to the G-20 with four commitments which will strengthen financial stability. The obligations are in the following four areas:

"A stronger regulatory framework – developing suitable principles for weak areas of the financial regulation.

Effective supervision – solidifying the effectiveness, governance and domestic and international coordination of the country regulators.

Crisis resolution and addressing systemic institutions –ensuring that failures in the market do not affect the broader financial system.

International assessment and peer review – regular review of the regulatory system and practices against the international standards" (National Treasury, 2015)

The new framework also sets out four main objectives of the South African financial markets:

i. Financial stability

Just like any other market, the financial services markets in South Africa functions in a globalised environment. A shift in one country can effortlessly be spread and felt in another economy due to international trade with devastating impact (IMF, 2015:1). To ensure job creation and continued economic growth, increased international trade is required to further financial sector integration. This, nonetheless increases financial stability and improves financial sector supervision.

ii. Consumer protection and market conduct

High fees and unfair treatment of customers is commonly experienced in the South African financial sector. Savings instruments are limited as well as expensive for savers, especially among the poor whilst access to credit is a challenge to those on the borrowing side. In the banking sector, it was discovered that bank charges are excessively high. Lastly in the insurance sector, the finance minister, with the help of the industry, in 2005 observed the practices of uncontrollable charging by the insurance industry (SARB, 2014)

iii. Access expanding through financial inclusion

To improve the right of use in financial services, sustainable economic growth and development will be sponsored in the whole economy, including the rural areas. By focusing on greater access of the poor and middle class, South African government will ensure that these transformation objectives are implemented effectively (SARB, 2014). Government has created a framework that allows co-operative banks to enter the financial service market. This will, in turn, improve access to micro insurance products.

2.2.3 Regulatory role in the financial sector

The financial sector encompasses various bodies like banks, securities markets, etc. to offer frameworks for executing monetary policy (IMF, 2015). The financial catastrophe of 2007/2008 has revealed that an unbalanced financial system can experience extensive negative alarms in different economies. Hence, a well-structured financial system is vital for financial stability and stimulating economic performance through job creation. The attention of guidelines must not only be focused on individual institutions but also on the system in its entirety.

2.2.4 Principles behind reforming the financial regulatory system in South Africa

The financial regulatory structure in South Africa is governed by the following principles:

Principle 1: Financial service providers have to be regulated or licensed for their service

Entrance into the financial market must be regulated by an appropriate licensing and registration process, depending on the services provided. Providers of financial services should only be permitted to operate within the regulatory boundary. The provision of funds or capital will be valid once the service providers have been properly licensed (National Treasury, 2014). In addition to that, financial regulations like risk management, compliance and sound corporate governance standards are crucial and relevant.

Principle 2: Transparency in regulation and supervision

Supervision and regulation should consider the nature and scale of risk in the current market. The most efficient way of achieving this is by investment in human capital as it develops skills needed to monitor and prevent risks in financial transactions (National Treasury, 2014).

Principle 3: Intensive, intrusive an and effective supervision

High quality supervision needs suitable resources and productive working relationship with other organisations involved. Every supervision relationship must be regulated and abide to the provided act (National Treasury, 2014). Supervisors should have a clear and definite obligation coupled with accountability to avoid negligence. There is a requirement to build up the quality of supervision. The supervisors essentially need to have the capability to work efficiently and improve the financial sector.

Principle 4: Provision of an operational framework for regulators by the government and legislation

The policy framework yet to be implemented will be transparent and all proposals approved by the Parliament. Regardless of the basis that policies are not established by regulators, it is difficult to clarify what constitutes policy and invest into regulators accordingly (National Treasury, 2014).

2.2.5 Financial liberalisation and financial sector development

According to Ucer (1998), financial liberalisation leads to the lessening of regulations on the financial sector industry. Financial liberalisation is a process most commonly related to setting up of interest rates and its effect on the financial sector by the state government. On the other hand, financial liberalisation is identified as the freeing up of interest rates. It is therefore a process involving an expansive set of processes towards the removal of different restrictions in the financial sector. Some of the critical reforms involve the elimination of limitations on the

banking sector asset portfolios, globalisation of the local financial industry and structural changes to the institutional framework of the monetary policy to allow smooth implementation of the reforms (Ucer, 1998).

As the costs of financial liberalisation became clear in the 1990s, most developing countries turned to financial liberalisation with the assistance of international development organisations like the IMF and the World Bank. Stabilisation of the political environment during the 1990s-paved way for the South African financial industry to integrate with the global financial system.

On 13 March 1995, the Government of South Africa abolished the closed rand-based financial system in favour of an open capital market. This was implemented through reduction of foreign exchange controls on non-resident capital. This development allowed foreign investors easy access to the South African Bond Exchange, (SABE) and JSE. Results of this development were phenomenal. Based on the results from the SARB statistics since 1998, trading on the JSE surged significantly, improving liquidity on the market by 30% on average. Foreign participation on the JSE increased to net purchases of R40.60 billion from R0.19 billion during the period 1994 – 1999 and net bond purchases rose to R4.3 billion from R1.88 billion. During the same period, 30% and 80% of the turnover on the JSE and SABE respectively, was contributed by non-residents (Tswamuno *et al.*, 2007:85).

Financial liberalisation offers substantial benefits to economies if implemented holistically and properly. Due to globalisation of the financial industry, local industry participants are enabled to establish foreign markets and compete globally. Equally, foreign companies are also offered an opportunity to penetrate and compete in local markets. This openness facilitates strong competition on the global market that is good for improved quality of products and services in local markets at competitive prices (Ucer, 1998). Furthermore, participation by foreign players in local markets results in the inflow of the much needed foreign direct investment that has broader and significant economic effect.

2.2.6 Trends in financial sector development

This study will use the stock market capitalisation to size the developments in the financial sector. The trends in the stock market capitalisation are shown in Figure 2.1 below.

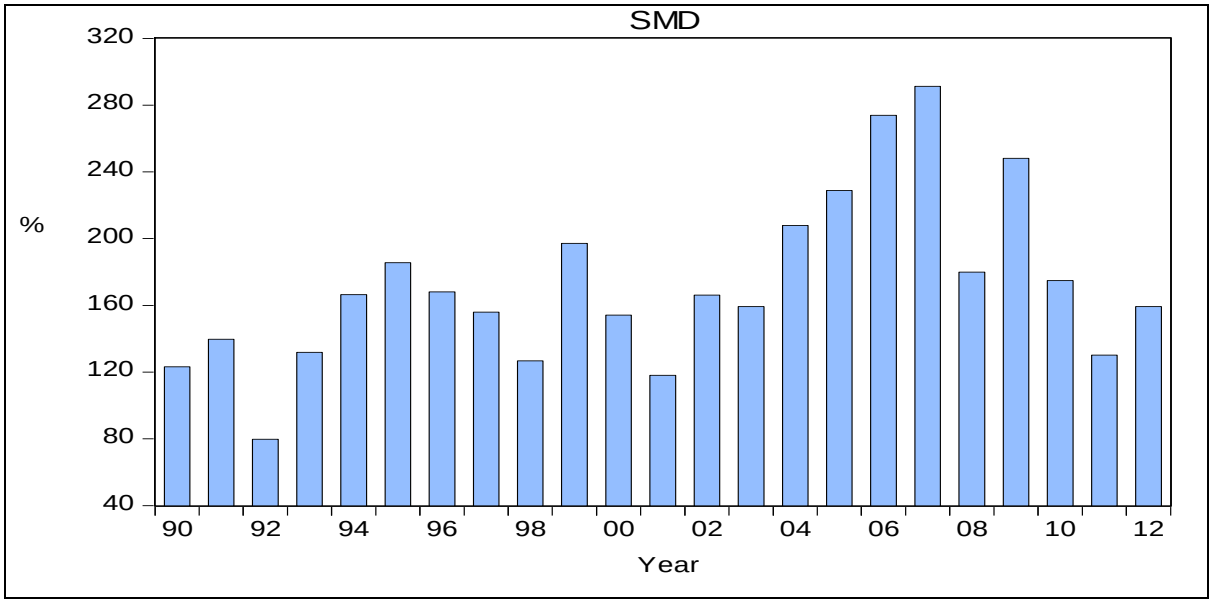

Figure 2.1: Stock market capitalization as a proxy for financial development

Source: South African Reserve Bank (2015)

Figure 2.1 shows that the stock market capitalisation has been on the rise since 1990. However, it has some down swings in some years, like 1998 and 2001. From 2001 it has been on the rise but it fell again in 2008. The fall in stock market capitalisation might have been caused by the global financial crisis which led to falls in stock market performance globally. However, after the financial crises the stock market capitalisation rose again.

2.3 MONETARY POLICY FRAMEWORK IN SOUTH AFRICA

The evolution of the monetary policy system has been of boundless importance to the South African economy and other African countries. Development of monetary system in one nation results in the development of other individual countries due to trends in international trade. Therefore, the implication of monetary policy in South Africa is not only for itself but for other nations within and outside of Africa (Munitich, 1998). Monetary policy is crucial to macroeconomic policy, as the real and financial sectors of the economy are inherently linked, which influences economic growth, inflation, exchange rates and unemployment. It is believed that good reputation and sound monetary policy attracts foreign investment and encourages long-term investment (Aron & Muellbauer, 2005:7).

Price stability, control of money supply and a low unemployment rate are great concerns of many nations in promoting economic growth and stability. However, price stability has become the main goal of monetary policy for many central banks in the past decades. Maumela (2010:3) highlighted that a stable inflation rate contributes indirectly to other monetary policy objectives

such as economic growth, employment, exchange rate stability and even some distributional objectives such as an income distribution goal. Monetary authorities still stress price firmness as an important pillar of the current monetary policy framework (Abbey, 2012:227). This means that price stability does not only create necessary circumstances for effective financial growth, it undoubtedly acts as a means in promoting social cohesion, economic growth and job creation. A monetary policy framework can, however, be well-defined as a way in which the monetary authorities of a nation controls the money supply, obtainability and accessibility of money and cost of money with the main aim of ensuring long-term stability in the economy. The South African Reserve Bank adopted a monetary policy framework to attain and maintain long-term price stability.

The monetary policy system in South Africa has been successful in adapting to economic and development glitches internationally and locally. There has been a change in monetary policy regime in South Africa since the 1960s – adapting from direct regimes in the 1970s to money supply targeting from 1990–1999 and recently to the execution of inflation targeting framework from year 2000 up to date (Ncube & Ndou, 2013:4-6). The evolution of the South African monetary policy framework has been noteworthy. Although these frameworks were implemented, South Africa has experienced two major monetary policies from the 1980s until now (Ellyne & Veller, 2011:7).

A system of money supply targeting was put in place between 1986 and 1999. The main objective was to target money supply that brought a clear description of money (Thlaku, 2011:6). During this period, a significant improvement was noticed in pursuing a lower inflation rate. However, informal inflation targeting generated doubts among the public on the monetary policy regulations adopted by the regulators. For example, in the 1990s, the bank credit extensions and money supply were above the recommendations of the authorities for a considerable period. This was contrary to general expectations that the public had and could understand. In 2000, the SARB implemented an inflation targeting regime, which is still the current monetary policy framework. The main objective was to keep the inflation rate within the targeted band of 3%–6%. Setting up an inflation rate target band was believed to help the economy in protecting the value of the currency as well as trade with other nations. All the regimes that were employed by the SARB had one specific goal of maintaining price stability with the general goal of enhancing long-term economic growth.

2.3.1 Monetary policy and inflation targeting in South Africa

Although most nations have adopted an inflation targeting policy, the choice of the target varies among nations. Inflation targeting is when the reserve bank of a nation sets inflation rate or a target band, announces it to the general public and will use different policies to maintain that target. The inflation targeting policy is constructed on the assumption that an increase in consumer price levels hinders the effectiveness of economic growth (Maumela, 2010:13). Lowering the inflation rate allows relative prices to be observed clearly in the economy and acts a result of inflationary expectations.

Roberts (1997:175) argued that the effects of inflation unquestionably exist. A crucial difference has been noted between high unbalanced levels of inflation and a low stable inflation rate. It is, however, believed that lowering a relatively low inflation rate will not necessarily have a positive influence on economic growth. Conversely lowering a moderate consumer price index will undoubtedly have a bigger impact on production and employment in the economy.

2.3.2 South African inflation trends 1990–2000

This section gives a brief overview of the historical experiences of inflation prior to the year 2000. The change in monetary policy (from monetary aggregates to inflation targeting) in 2000 compels this study to look at the experiences of the South African economy under monetary aggregates. Looking at this period allows us to see whether the inflation rate was high, moderate or low. Burger and Marinkov (2008:3) noted that, prior to 1989, the monetary policy framework was unsuccessful in holding and maintaining the inflation rate. The period between 1990 and 2000 experienced advancement in the pursuit of low inflation rate.

Burger and Marinkov (2008:4) stated that inflation reduced to single digit numbers by the early to mid-1990s, excluding a brief inflationary spell accompanying the Asian crisis. The assignment of the SARB in the 1990s was to protect the internal and external worthiness of the South African rand. Consequently, the SARB focused on attaining and maintaining a low and stable inflation rate as well as a stable exchange rate. Figure 2.2 shows the inflation trends from 1990 to 2000.

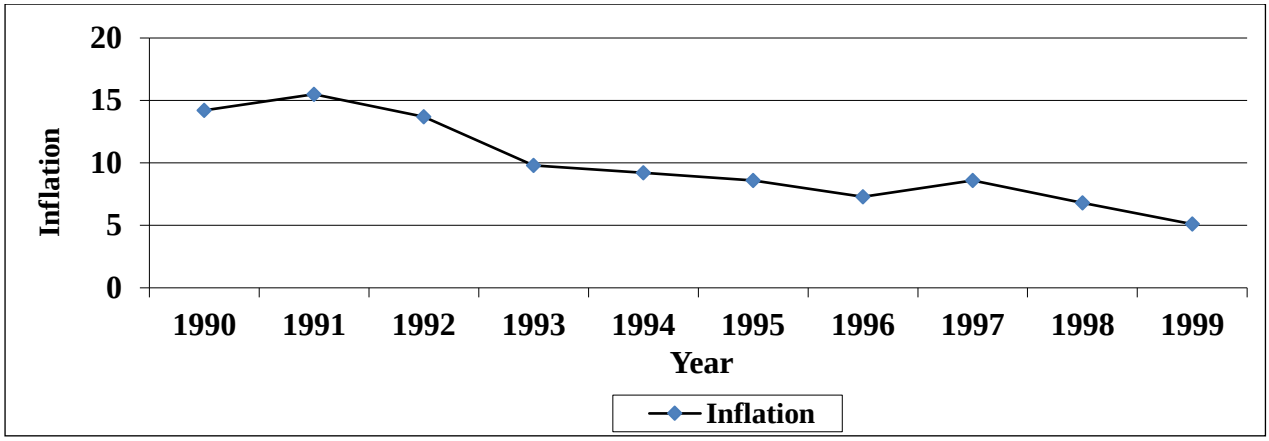

Figure 2.2: Inflation trends from 1990 to 1999

Source: South African Reserve Bank (2015)

Figure 2.2 shows that the inflation rate was high at the onset of the 1990s. It had been high in the preceding years and it remained so in the 1990s. It began to fall in 1993 when it reached an annual average of 9.8 from an average of 14.5% in the three preceding years. After 1993 it remained in the single digits and continued to fall until it reached an annual average of 5.4% in 2000. Burger and Marinkov (2008:5) maintained that given that the SARB actively reduced the inflation rate without officially setting an inflation target, the 1990s can be considered as a period of implicit inflation targeting compared to the clearly stated inflation targeting rule that was implemented later. Akinboade *et al.* (2002:213-14) held that the SARB attributed the slowdown in inflation during the first half of the 1990s to the constant application of monetary policy from the late 1980s and the effect of the drawn-out recession between 1989 and 1993 on inflation anticipations and wage settlements.

2.3.3 Trends in inflation after 2000

There was a change of monetary policy framework, that is, a shift from the monetary aggregates to inflation targeting in February 2000. Figure 2.3 shows the trends in inflation after the year 2000.

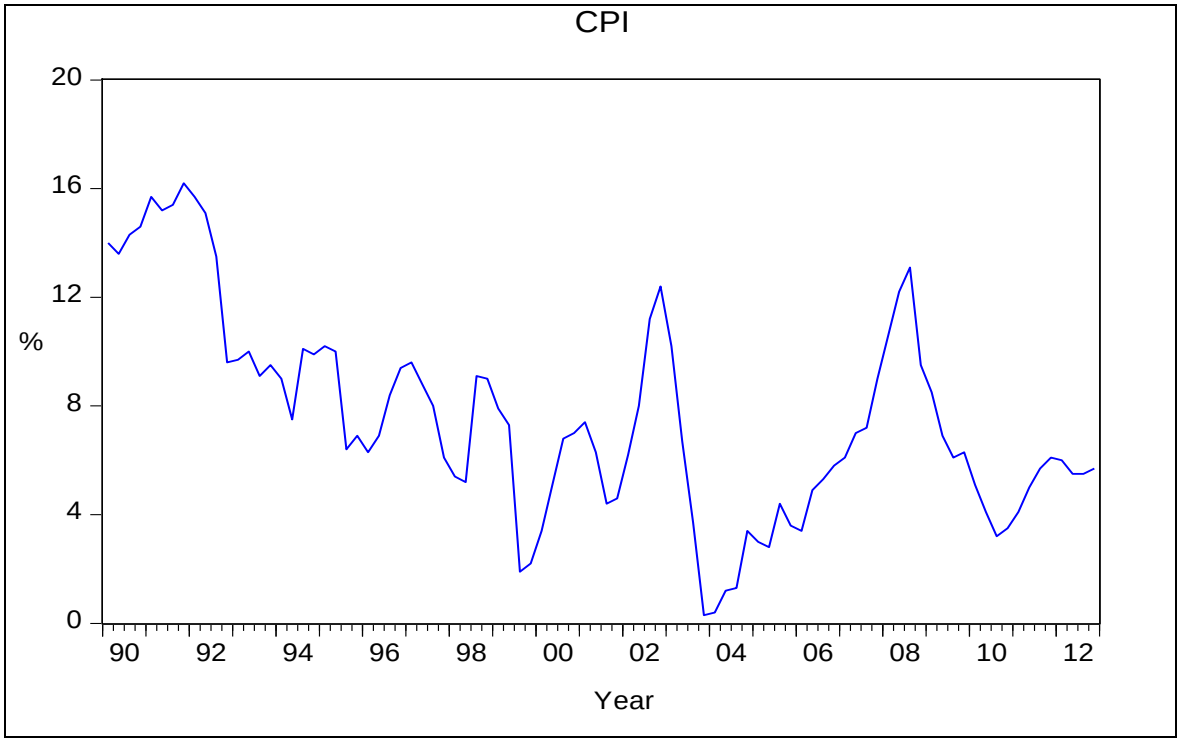

Figure 2.3: Inflation rate in %

Source: Stats Sa (2013)

For over decades now, annual inflation rates in different nations has been fluctuating and changing over time, however the reasons for these changes are still debatable however. Figure 2.3 illustrates the fluctuations in inflation rate from 1990 to 2012 in South Africa. Prior to liberalisation in 1994, the South African economy experienced a decline in growth due to political instability, sanctions from other nations and poor macroeconomic decisions that resulted in high inflation rates. From the first quarter of 1990, the inflation rate increased slowly from 14% to the last quarter of 1991 where it reached 16.2%. Graphically it can be noted that from the first quarter of 1990 up to the 2nd quarter of 1992, the inflation rate in South Africa has been recorded as very high and fluctuating around 15% (Padayachee, 2010).

Due to a global financial crisis from 2007, too much pressure was exerted on most central banks by increasing the inflation rate. The on-going global economic downfall, which started towards the end of year 2007 and sharply declined in 2008, resulted in a negative South African inflation rate. The South African economy experienced a recession from the 4th quarter of 2008 to the 2nd quarter of 2009, resulting in inflation breaching the outer limit of the target 3% to 6% (Padayachee, 2010). There was a sharp increase of 8.1% in the inflation rate from 2005 to 2008, where in 2005's annual inflation rate was 3.4% and 2008's was 11.5%. From 2009 up to 2012, the inflation rate has been dropping due to recovery after the financial crises. It is noted that

during that period the SARB managed to keep the inflation rate inside the set target band of 3% to 6%, where it has been fluctuating around 5%. This proved that the economy was in a more stable state, thus enhancing economic growth.

2.4 THE SOUTH AFRICAN INFLATION RATE COMPARED TO SOME OECD COUNTRIES THAT HAVE INFLATION TARGETING

Assessed against other nations that implemented inflation targeting, South Africa has proved to have a high inflation rate. Figure 2.4 shows that from 1990 to 2003, the country has been experiencing a high inflation rate compared to five other OECD contries. The top five OECD countries' inflation rate during same period has been fluctuating around the 5%. Whereas in South Africa has been way above other countries. In 2004 the rate dropped below other nations' rates and was at 1.3% the same as that of the UK. Noteworthy is that, whilst the inflation rate has been fluctuating in other OECD economies over the years, the fluctuation was somehow different for South Africa, which was intense from 2001 to 2009. Figure 2.4 shows a comparison of South Africa with other countries that have implemented inflation targeting.

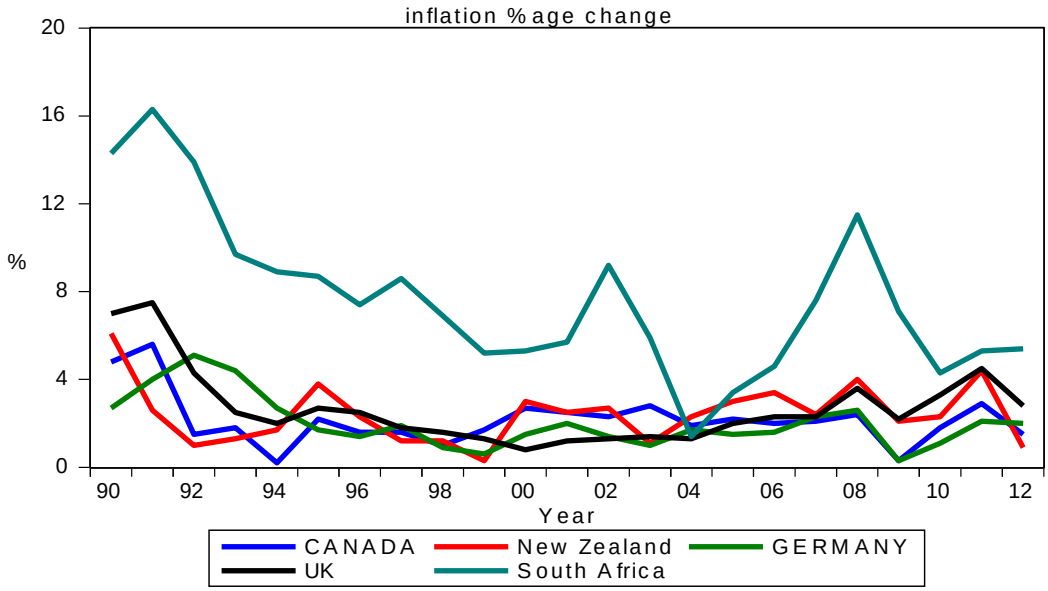

Figure 2.4: A comparison of South Africa with other countries

Source: World Bank (2015)

Most countries that have inflation targeting have their inflation rates hovering around 4%. However, this has not been the case for South Africa. The inflation rate was low in 2000 but rose to approximately 12% in 2008 and later went down in 2010. However, it was fluctuating around 6%, which was higher than the levels of other countries.

2.5 INFLATION AND FINANCIAL SECTOR DEVELOPMENT

Other than inflation rate, there are other factors like currency strength and government intervention which can affect financial sector performance. Wahid *et al.* (2011:151), however argued that high inflation rates degrade the efficiency of the financial sector and reduces economic performance. According to Boyd *et al.* (2000:1-2), growing theoretical literature defines ways whereby an anticipated increase in the inflation rate obstructs the ability of the financial sector to apportion resources efficiently. As the inflation rate increases, savings and investments in an economy are reduced and government increases tax to finance the budget deficit, thus depressing economic growth. A relationship between financial sector growth and inflation is shown in Figure 2.5 below.

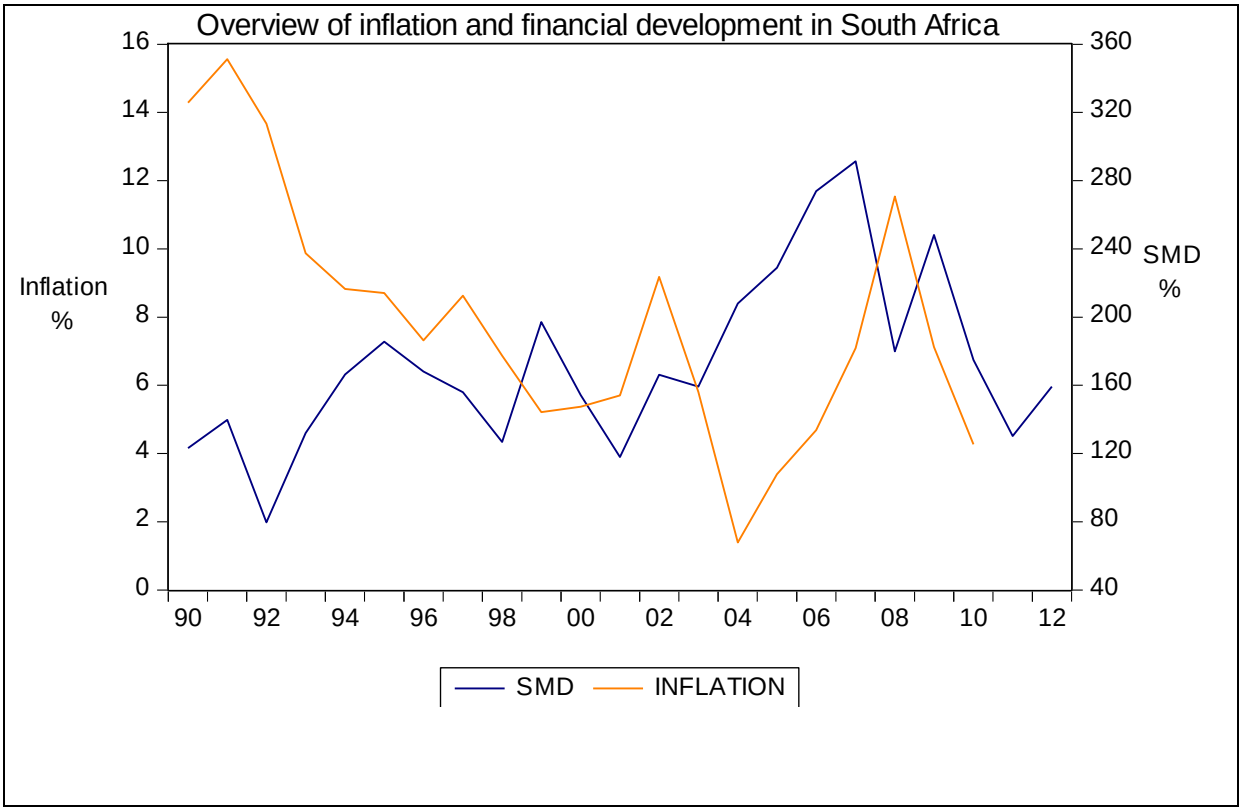

Figure 2.5: The Relationship of Inflation and Financial development in South Africa from 1990 – 2012

Source: World Bank (2015)

Figure 2.5 shows that the two variables, inflation and stock market capitalisation have not been moving together from 1990 to 1999. This may suggest that the two variables at that time had a negative relationship. When one variable is up, the other one is down. However, the two variables seemed to move together from 2006 and this may suggest that there might be an

association later on between them. The current state cannot fully predict future relationship between inflation and financial development.

2.6 CONCLUSION

The main objectives of this chapter were to analyse and evaluate the trends and causes of changes in inflation rate in South Africa from 1990 to 2012. It was significant to see the effect of the consumer price index on financial sector performance through a graphical presentation. This overview reviewed the effectiveness of money supply targeting and inflation targeting in promoting price stability in the economy. Last but not least, it was important to analyse these trends so as to understand how the implementation of inflation targeting, is affecting financial sector performance in both the short and long term

3
LITERATURE REVIEW

3.1 INTRODUCTION

The core objective of this chapter is to assess the theoretical and the empirical work concerning the relationship between inflation and financial development and draws on the findings of previous researchers. A theoretical literature review will be presented to give an in-depth understanding of the variables being used in the model of the study. This chapter consists of four sections. The first section covers the theoretical literature whilst the second section covers the empirical studies based on the impact of inflation on financial development. The third section provides the assessment of literature and lastly the fourth section gives conclusions of the chapter based on the findings.

3.2. THEORETICAL LITERATURE

3.2.1 Financial repression theory

Economists who focus on financial development believe that activities in the financial sector are crucial in bringing out development of other segments of the economy. Savings and investment levels are most crucial in determining the rate and level of economic growth. Inflation is believed to have an effect on financial deepening, thereby resulting in financial repression. High inflation discourages long-term financial contraction. It also increases the opportunity costs of holding money thus allowing financial intermediaries to maintain very liquid portfolios (Desalegne & Fereja, 2011:6). Most economies fail to meet the requirements for financial development due to financial repression.

Mckinnon (1993) and Shaw (1973) realised how most developing countries could not experience economic growth and development as a result of government intervention in capital allocation. The two writers introduced financial repression theory, which can also be defined as a set of government regulations, laws and non-market restrictions that hinder financial intermediaries to operate at their full potential (Hiro, 2005:3-9). In other words, economic growth is lowered as a result of inefficient allocation of capital by the government. Among many explanations, it is believed that, when an economy is financially repressed, savings and investments are discouraged resulting in low returns, and thus, poor or low economic growth. Kapur (1986) defined financial repression as a situation whereby an economy is less developed,

functioning with its monetary and banking system inhibited and distorted due to prolonged government policies. These sets of policies consider how the financial system can operate as well as how they may impact channels through which it can promote economic growth. Different measures such as liquidity ratios, interest rate ceilings, and bank reserve requirements, restrictions on market entry into the financial markets, and allocation of credit are used by the regime to enhance financial systems as well as to lower debt in the economy.

The financial sector is the most important sector in determining how other sectors of the economy can operate. Financial repression theory examines the impact of financial sector performance in mobilising activities of all sectors and developing the whole economy. Kui (1994:10-4) realized that a financial repressed economy is a nation that has artificially low deposits and loan rates and increases demands for loans and credit rationing. Since government manipulates credit flows and impose low interest rates, households will find it unprofitable to save and invest due to low returns on investment and loans granted. The theory basically suggests that financial deepening can be attained not only by government funds but by private funds as well.

Assuming that government controls financial sector performance through market intervention, revenue can be increased and generated through increasing the per capita real money demand. Government authorities then ensure that the domestic interest rate ceiling is kept below currency depression and the inflation rate to protect lenders from moderated interest rates (Giovannini & De Melo, 1993:955-9). McKinnon and Shaw (1973) advised that interest-rate ceilings suppress savings and reduces investment levels in an economy. Ultimately, higher interest rates boost savings and investment rates, thus contributing to economic growth and financial development. Considering previous studies, it has been argued that financially repressed economies will have higher inflation rates, lower real interest rates and lower growth per capita than financially developed economies (Martin & Roubini, 1991:2).

In financially repressed systems, monetary authorities intervene in freedom of financial markets and control capital and lower interest expenses. Mackinnon (1973) and Shaw (1973) suggested that returns on deposits are forced to be negative and low as banks will not charge high interest rates. Low returns on investment tend to affect potential savers depressingly. Potential savers will, however, prefer to invest in tangible assets than holding cash.

Inflation tends to rise in the boom and fall in recession where there is no identifiable real shock such as oil prices (Mankiw, 1989: 88-89). Since financial development is characterised by financial deepening in the long term and also short-term instability, bank crisis risk tends to be higher in inflation environments (Boyd &Champ, 2003:5). English (1999) argued that during periods of high inflation, households tend to substitute transaction services for money balances, which will increase financial services production and boost the development of the financial sector. It can therefore be concluded that inflation promotes financial development.

Based on imperfect credit markets, Kim *et al.* (2010) argued that theoretical models propose a severe endogenous information type. Credit friction and high inflation rates distort the flow of information, thus worsening credit market friction. They further argued that higher inflation represses financial intermediaries by lowering the worthiness of money assets and leading to policies that damage the financial structure. Hence, an unnecessary increase in inflation will hurt the development or functioning of the financial sector by reducing the allocation of resources, reducing accumulation of capital and thereby retarding economic growth. In 2012 and 2013 most pension funds and insurers were affected by financial repression when the government forced them to increase their government bonds and improve their capital buffers (Odhiambo, 2010:32). This action left the general public with no doubt that government officials forced investors into risky asset portfolios with the aim of maintaining economic growth.

Inflation has both a direct and indirect effect on the financial sector and economic growth in the long run (Rosseau & Watchel, 2000:1-2). The inflationary environment directly affects the transactional and informational cost, which will in turn inhibit economic development. For example, inflation may affect effective planning by economists due to uncertainties in its nominal values. This will then make firms and individuals reluctant to enter into contracts with uncertainty in terms of their cost and returns. As a result, their reluctance to enter into contracts will reduce investments and entrepreneurship, which will inhibit growth development of a nation and as well as its financial sector development.

Indirectly, the negative effect of inflation on economic growth is felt through the effects it has on financial sector development. Rosseau and Watchel (2000:4) further argued that in periods of high inflation rates, long-term financial tightening is discouraged and financial intermediaries will be willing to only hold liquid portfolios. Thus, financial intermediaries will be reluctant to provide capital for any long-term projects due to uncertainty on the returns to

their portfolios. Inflationary periods will, however, motivate the government to come with policies such as financial repression on a move to curb the effects of inflation but it will in turn hurt the performance of financial sector development. Interest rate ceilings and credit provisions are common in high inflation periods. Rosseau and Watchel (2000:6-7) suggested that repression and inflation has a bi-directional relationship in that the former can be used as a tool to lessen the effects of a rise in inflation in certain areas of the economy and can also be used by the government to finance its activities or its sectors.

Hauner *et al.* (2013) argued that in a closed economy, financial repression and low financial sector performance rejects potential competitor's free entry into the market. This results in only the executives benefitting in that market. However, a growing openness of the two will result in the undermining of this status quo. Hauner *et al.* (2013) further argued that the entry of the foreign investors in the domestic markets creates more investment needs as well as reducing rents. Furthermore, capital flow openness is believed to sponsor an increase in financial repression.

Smith (2003) argued that changes in inflation rate affects financial decisions. It increases fiction in the financial markets thus reducing the efficiency of the financial system. Financial sector development is significant to growth in such that a deeper financial sector development encourages savings and investments which will improve capital allocation through the efficiency and expansion of the financial sector. Once there is financial deepening in an economy, all other sectors become easy to develop.

3.2.2 Introduction of financial liberalisation

Low savings and investment rates that are experienced in a financially repressed economy hinder financial market development and hence, slows down economic sector growth. The view that financial repression has a negative effect on economic growth has been widely explored in the past, which also resulted in financial liberalisation being introduced. McKinnon and Shaw (1973) argued against financial repression and suggested an economy which is financially liberalised. Removing interest rate ceilings and other restrictions is believed to increase savings and investment rates, which ultimately lowers the inflation rate, hence improving economic growth (Jankee, 1999). An implicit policy arises from the McKinnon-Shaw hypothesis that focuses on exclusion of interest rate ceilings and other government regulations that avoid the competitive operations in the market because funds are beneficial to

developing countries. Widespread expansion of financial institutions and their activities leads to real economic growth.

As Mckinnon and Shaw (1973) introduced financial repression theory, many studies where carried out and proved a different perspective which supports financial activities in being liberalised. Advocates for financial liberalisation have based their arguments and opinions on Mckinnon and Shaw's argument on financial liberalisation. Eliminating controls on interest rates and allowing them to increase can result in high levels of saving. High interest rates are believed to increase saving rates, which ultimately improves the quality and quantity of investments in an economy.

Financial liberalisation can be characterised as the process of allowing markets to determine credit allocation and at what price it should be attained (Odhiambo, 2011). Financial openness can be noted through the abolition of credit controls, free entry into the banking service sector, deregulation of interest rates, and liberalisation of banks and international capital flows. Most authors have focused on the liberalisation of interest rates in bringing out financial development and economic growth. Interest rate ceilings deprive consumers of the right to choose what to do with their capital, whereas liberalising interest rates allow households to postpone consumption and increase savings.

Attempts to liberalise financial systems in developing countries have produced a mixture of success and crises. Graham (1996:9) realised that financial liberalisation relies on timing and structuring of liberalisation measures despite of the common macroeconomic factors that have an effect on financial development and economic growth. Higher interest rates, on the one hand, bring high savings and investments in the economy, and on the other hand, it brings scarcity of capital resulting in low and poor economic growth.

However, financial liberalisation has some limitations on the performance of the economy and there is need for stabilising the financial sector through a monetary policy framework. Lack of supervision in the financial system can lead to unnecessary fluctuations in interest rates, which will bring instability in savings and investment, thus affecting economic growth. The other argument put forward against financial liberalisation is that it may result in market segmentation. There are a couple of reasons why financial development results in economic growth in most nations for example, improvement in savings and investment levels. The link between economic and financial development has been of great concern to many nations in

modern economics. Pagano (1993) argued that although the impact of financial development on economic growth has been examined broadly, the degree of financial development is presumed to be an outcome of other economic factors. However, understanding what determines financial development is of great importance in assessing its effect on economic advancement.

The link between inflation, financial growth and economic evolution can be drawn because inflation or any form of financial consequences leading to inflationary pressures in an economy can adversely affect the productivity of the financial system and through this, the growth process. Following Montiel (2003:5-6), the relationship between economic growth, financial development and inflation can be captured through Pagano's AK model.

3.2.3 Pagano's AK theoretical model of endogenous growth

The financial system impacts the accumulation of capital by distressing the rate of savings and the restructuring of the savings as shown in the AK model of Pagano (Kuipou *et al*., 2012:13-4). Pagano's theory, being one of the simplest endogenous models, offers a concrete base to determine that a large, liquid and efficient financial system favours economic growth.

To comprehend the bond between economic growth and financial sector development, the simplified AK type growth model was posited by Pagano. This model states that there is a linear relationship between aggregate output and aggregate capital stock. The linear relationship can be expressed as follows:

$$Y_t = AK_t \quad \text{..... (1)}$$

where:

Y = output

A = a constant that reflects technology

K = human capital

To bring out relationship as well as the effects between financial and economic advancement, Pagano introduced equations for gross investment and capital, thus formulating a model in which the steady state growth in terms of coefficients is expressed as follows:

$$g = A\Phi s - \delta \quad \text{..... (2)}$$

where, A = a constant factor relating Y to K

Φ = the fraction of savings used for investment

S = the saving rate relating S and Y as $S_t = sY$

δ = depreciation rate.

The higher savings rate an economy can have, the more efficient its financial system becomes since it will have enough capital to cater for factors of production that lead to economic growth. This model assumes that a long-term positive relationship between financial sector growth and economic development is established. Kuipou *et al.* (2012:15), concluded that from equation 2, financial development can enhance economic growth positively through the savings rate, technological development and the share of savings allocated to the financing of the state. Hence, raising these three important factors will, in turn, enhance economic growth.

Since financial sector development has an effect on economic growth, it can therefore be concluded that all macroeconomic factors that affect financial development also have effects on economic growth. The relation between inflation, financial development and economic growth arises because any inflationary pressures in an economy can adversely affect the performance of the financial sector in consequence affecting economic progress. In order to see this effect, growth rate productivity capacity of the economy can be established following Montiel (2003:7) as follows:

$$\Delta Y/Y = Aes \quad \text{..... (3)}$$

where,

A = a measure of total factor of productivity

e = an indicator of efficiency of the financial system (being resources used by sector)

s = the saving (the ratio of savings to GDP)

In investigating the underlying correlation between the financial sector and real sector growth, the demand following and supply following are crucial fundamental hypotheses. Banergee and Ghosh (1998:2) used demand following in determining the causal relationship from real sector to financial sector growth. As the real sector develops, demand for financial services also increases, which will result in economic growth. High inflation rates will adversely influence the connection between financial sector performance and economic growth.

3.3 EMPIRICAL LITERATURE

3.3.1 Specific country studies on the impact of inflation on financial development

Bittencourt (2008:4-6) empirically examined inflation and financial development focusing on Brazil using panel time series and time series data. The period of study was from 1985–2002 from ten different major regions of Brazil. Ordinary least squares time series results show that economic growth, financial development and inflation have a negative effect. Uncertainty in expectations of the inflation rate lowers financial development, hence impeding economic growth.

Desalegne & Fereja (2011:1) investigated the impact of inflation on the Ethiopian economy and financial sector development. Taking into account annual data from 1992 to 2011, the main objective was to determine the inflation–growth–finance nexus. Desalegne & Fereja (2011:6-7) used ordinary least squares techniques as the econometric technique and the findings have two conflicting results. They concluded that at levels below threshold level, inflation has a positive effect on economy and finance, whereas at levels that is above threshold level, there in a nonlinear relationship.

Azim *et al.* (2011:145) studied the influence of inflation on financial development in the Bangladesh economy using annual time series data. Focusing on the long-term and short-term, the study covered the period from 1985–2005 using the autoregressive distribution lag (ARDL) model and the error correction method to run the regressions. Empirical findings of the study supported the notion by other economists like Boyd *et al*. (2000) who stated that high rates of inflation negatively affect financial sector performance, which in turn, lowers economic growth. The study substantiated that there is a negative association between inflation and financial development in long- and short-term. Azim *et al*. noted that although high rates of inflation impede financial sector development, other variables like GDP per capita sponsors development of the financial sector through contributing channels.

Abbey (2012:227) studied the influence of price increases on financial expansion in Ghana. The author used quarterly time series data from a period of 1990–2008 and the results show two conflicting outcomes in the short- and long run. Based on the pairwise correlation analyses, a negative relationship was established between the variables. Regression analysis was also implemented and resulted in different outcomes whereby, inflation and financial development proved to have a constructive relationship whereas in the long run there was no relationship.

Abbey (2012:234), however, concluded that inflation lowers financial sector development in Ghana and proposed that monetary policy framework must be taken serious and be implemented effectively in ensuring price stability of the economy.

Karagoz &Ozturk (2012:81) empirically examined the connection between inflation and financial development in Turkey. Their study used an annual data set stretching from 1971 up to 2009. Like many other researchers, Karagoz & Ozturk (2012:85) used ARDL bound testing in determining if there is a long- or short-term cointegration between inflation and financial development in Turkey. The analysis of the study by Boyd *et al.* (2000) proves that in the long- and short-term, an adverse relationship between inflation and financial development is experienced. Non-linear relationship is also expected to be the result in this study of South African case.

Odhiambo (2012:1497) investigated the impact of inflation on financial sector growth in Zambia in a period between 1980 and 2011. Using gross domestic credit as a measure of financial development, time series data was used. The main focus of the study was to examine if there is a long term affiliation between financial development and inflation. Due to weaknesses with the Engle Granger test and Johansen cointegration test, Odhiambo (2012:1499) used ARDL bounds testing technique to examine the impact between the two variables. It was thus settled that in Zambia there is a long-term negative relationship between inflation and financial development. These results showed that high rates of inflation obstruct and slow down the improvement and development of the financial sector in Zambia.

Due to a prolonged government budget deficit in Iran, the economy experienced high inflation rates. The country therefore became a great subject of interest to researchers analysing the effect high inflation rates had on the financial development of that economy. Aboutorabi (2012:8399) used a multilateral index and ARDL approach to observe the impact of inflation on financial sector development in Iran from 1973 to 2007. Although the same research had been carried out before in Iran, Aboutorabi (2012) focused on different indicators of financial development in the banking sector. The following indicators were used as a measure of financial development namely; liquid liabilities to GDP ratio, the credit allocated to private enterprises to GDP ratio.

The results of the study showed that high inflation rates have a nonlinear relationship with financial market performance, especially the banking sector of Iran. In a situation where

financial sector performance is being hampered, it has a great effect on the economy resulting in slow economic growth and a high unemployment rate. Aboutorabi (2012:8399), however, concluded that controlling the inflation rate and maintaining price stability will enhance and deepen the financial sector performance of Iran.

Using annual time series data from 1964–2012 in Ghana, Akosah (2013) studied the dynamic association between inflation and financial development, checking if causality between the two variables is the same in the long and short term Liquid liabilities to the GDP ratio and private credit scaled to GDP were the indicators used as a measure of financial development. Johansen cointegration tests, vector error correction (VECM) models, variance decomposition and impulse response are the econometric techniques that were used in the study and they differed from Abbey (2012) who used a pairwise correlation technique.

Akosah (2013:20) produced results which are in line with findings of Odhiambo (2012) and Boyd *et al*. (2001) who stated that, in the short and long term, negative relationship between inflation and financial development is established. Though the Granger causality results of Akosah (2013) proved that, financial development have a short-term relationship and feedback effect with inflation in Ghana, it however contradicted the findings of Abbey (2012) who argued that there was no feedback effect at all between the two variables.

3.3.2 Influence of inflation on financial sector development: Cross country studies

Boyd *et al*. (1996:5) investigated the cross-sectional empirical association between inflation and the functioning of the financial system. Having focused on two data sets, namely banking and stock market activity, the banking sector covered the period from 1960–1989 for 119 countries whereas the stock market activity was for 51 countries covering period from 1970–1993. Boyd *et al*. (1996:8) established a positive connection between financial sector performance and economic development from their findings; hence there are nonlinearities between inflation and financial growth resulting in the two variables in question not being correlated in the long run. It has been explored that once inflation exceeds the threshold level, banking and equity market activities will decline and negatively affect overall economic growth.

Boyd *et al.* (2000:1-2) empirically assessed how increases in inflation obstruct the capability of the financial sector to apportion resources efficiently. To determine the predictable impact of inflation on financial development, a panel study was carried over 100 countries from 1960

to 1995. In their study, GMM estimator was used and they concluded that there is a negative association between inflation and financial systems, especially in countries with low to moderate inflation rates. The findings are in conformity with the expected results in case of the South African economy.

The relationship between inflation and the financial sector has also been of concern to some researchers like Ghazouani (2004:49). In the study of identifying the short- and long-term relationship between the inflation rate and financial sector development, Ghazouani (2004:50) focused on 11 Middle East and North African (MENA) countries over a period of 1979–1999. GMM was used as an econometric technique since likelihood of analysis is extremely difficult in different regions. Ghazouani (2004:58) found a significant adverse relationship between the inflation rate and financial sector growth, which supports findings of Boyd *et al.* (2001) of non-linearity between the addressed variables.

Using unbalanced pooled mean data for 87 countries for the period 1960–2005, Kim *et al*. (2008:343-4) analysed the dynamic relationship between inflation and financial development by mean of ARDL. The lag order of the ARDL testing was selected using consistent information criteria on a country by country basis and gave a distinction between low-income and low-inflation countries to others. Results obtained showed a negative relationship between variables in the long run whereas in the short run, a positive relationship exists. Short-term results confirmed the findings of English (1999) who also concluded that a high inflation rate will cause households to substitute transaction services for money balances. This substitution will increase production of the financial services sector and boost financial development.

3.3.3 Empirical studies on inflation, financial development and growth

Rousseau and Watchel (2002:777) utilised panel data for 84 nations covering a period from 1960–1995 in examining cross-sectional evidence on the strength between financial development and economic growth in relation to variations in the annual inflation rate. The threshold level was set between 13% and 25%, any inflation rate above threshold level resulted in financial development impeding economic growth. Low inflation rates encourage savings and financial deepening, which have a positive influence on economic growth. Variables like real GDP, total credit to GDP and M3/GDP were used in this study to determine the degree in which inflationary environments affects financial development and economic growth. Looking at the results obtained in the study, it was noted that financial sector growth had a positive influence on economic growth only when the inflation rate was lower than the threshold level.

Alternatively, there was a negative relationship between financial sector performance and economic growth when the inflation rate was above the threshold level.

Lee &Wong (2005:46) examined two nations in realising inflationary effects on financial development and economic growth. The quarterly data set of Taiwan was from 1965 to 2002 while the data set for Japan was from 1970 to 2001. A threshold auto regression (TAR) analysis approach was implemented to investigate their relationship. Lee & Wong (2005:50) established that there was only one inflationary relationship in the case of Taiwan whereas in Japan there were two inflationary relationships. Therefore, inflation did not have to be left unattended due to its negative effect on economic growth and financial sector development. An increase in inflation rate reduces investment levels in an economy, thus hindering economic development.

Majid (2007:217) empirically examined the growth–finance nexus in Malaysia and Thailand using quarterly time series data of the period 1998 to 2006. Adopting the ARDL testing approach and VECM model, empirical results showed demand pull inflation in the Malaysian economy. This is the case where economic growth (increase in income levels) leads to an increase in inflation rate. Investigating the causal relationship of the variables, Majid (2007:228) found a long-term relationship between inflation, investments, financial development and economic growth. As inflation increased it lowered investment and savings rates in the economy, thus depressing and hindering economic growth. Based on the findings of the study one can conclude that financial intermediaries and monetary policy authorities were vital in progressing economic developments.

Rousseau & Yilmazkuday (2009:2) assessed the channels through which inflation affects the relationship between financial development and economic growth, which was built upon the theory of Rousseau & Watchel (2002). The study investigated the relationship using panel dataset of the period 1960 to 2004 of 87 countries. Using a trilateral graphical approach in determining the relationship among these variables, empirical results showed that financial deepening is important in enhancing long-term economic growth. Macroeconomic factors such as inflation are hindering the finance–growth relationship to a greater extent. Rousseau &Yilmazkuday (2009:26) concluded that high inflation rates have a negative impact on financial sector development, which also has a detrimental influence on economic growth. While accounting for financial and economic growth, any factors that has a direct effect on financial development also have an influence on economic growth since financial development is crucial for growth of the economy.

Kim *et al.* (2010:343) investigated the inflationary threshold levels on the relationship between economic growth and financial development. In the study, the generalised method of memories (GMM) was implemented to estimate this relationship in 71 countries for the period 1960 to 1995. In this cross-sectional study, private credit, commercial central bank, bank assets and liquidity were applied as financial development indicators. In this study, the empirical results argued that any inflation level above 8% is detrimental to the long term relationship between financial sector growth and economic development. Like most writers on the same topic, Kim *et al.* (2010:363) concluded that there is the presence of an inflationary threshold in the finance–growth relationship. A positive relationship is only evident if the inflation rate is kept below the threshold level.

Pradhan (2011:45-7) investigated the causal direction of inflation, financial development and economic growth. Pradhan (2011:50) used a monthly data series to examine finance–growth relationship, and the period of study was from 1994–2010. Cointegration and Granger causality techniques where both used in the trivariate analysis in determining the relationship between variables. Results of the study emphasised the causality and cointegration between inflation, economic growth, and financial development. Unmonitored inflation rates tend to have a negative effect on financial sector development and economic growth if they are way above the set inflation target. Pradhan's (2011:53) results also conformed to the notion that high inflation rates have negative effects on financial development and economic growth, whilst low inflation rates have a positive effect that enhances the financial growth nexus.

In Iran, Ahmadi *et al.* (2012:480) used nonlinear regressions and a logistic smooth transition model covering a period from 1975 to 2008 to investigate the relationship between economic growth and financial development. The results of the study indicated that inflation alters the link between financial development and economic growth. Ahmadi *et al.* (2012:483) argued that the effects financial development has on the economic growth are dependent on the monetary policy framework of a nation. A low inflation rate regime results in financial development positively influencing economic growth. Contradictorily, high inflation rates highlight that financial development has a negative effect on economic development.

3.3.4 Empirical literature on inflation and economic growth

Pollin & Zhu (2005:2) analysed the non-linearity of the relationship between inflation and economic growth for 80 nations from 1961 to 2000. In the study, countries were grouped into three groups which are low income, middle income and OECD countries. Using a panel model

that incorporates non-linearity of the variables, Pollin and Zhu (2005:4-5) excluded inflation rate observations that are above 40% and as an explanatory variable for inflation, included the squared term. Empirical results of the study showed that in OECD countries there is no inflation–growth relationship. In the middle-class countries, all signs of inflation coefficients were positive though inflation and economic growth were insignificant. Low-income countries also had positive signs on inflation coefficients, which were higher than the middle-class countries. Positive and high coefficients left the relationship between growth and inflation statistically significant in the low-income countries.

Bick (2006:127) examined the threshold effect of inflation on economic development in 40 developing countries during the period of 1960–2004. The study used the generalised panel threshold model by Hensen (1999) in determining the possible effects of inflation rate on economic growth on cross section of countries. Any slope coefficients were estimated using the OLS technique. Empirical results of the study suggested the presence of threshold effects of inflation on economic development. The regime intercept introduced in the study was in support of earlier studies that concluded that low rates of inflation significantly influence growth positively. In contrast, high inflation rates adversely influence economic growth.

Pypko (2009:1-2) empirically found that a threshold level exists in the relationship between inflation and growth. Pypko focused on six independent Commonwealth countries and the annual data used was from 2001 to 2008. He used conditional least squares and post estimation technique in estimating the threshold level of inflation, which was found to be 8% in six independent Commonwealth countries. This was different from other studies in the Commonwealth of Independent States (CIS) which discovered a positive relationship between inflation and economic growth. Pypko's (2009:28) results supported findings of other researchers in the sense that low levels of inflation enhanced economic growth and high levels of inflation above the threshold level negatively affected the performance of the economy.

Bittencourt (2010:1) conducted an empirical examination on the performance of inflation in establishing economic growth in Latin American Countries. Utilising panel time series data, the study covered a period stretching from 1980 to 2007. To determine static and dynamic models for pooled estimators, pooled ordinary least squares (POLS) was implemented. Bittencourt (2010:4) argued that though there were other variables introduced in the model to determine their consequence on economic growth, inflation is the only variable that had clear

results. Results suggested that inflation did have a negative effect on economic growth in Latin American nations.

Espinoza *et al.* (2010:3) used the panel data of 165 countries from 1960–2007 and estimated the link between inflation and economic growth. All the explanatory variables of the study were a logarithmic function of inflation leading to a smooth transition model being used to analyse to what extent the inflation rate above threshold level becomes harmful and detrimental to economic growth. With the threshold level set at 10%, Espinoza *et al.* (2010:4-5) proposed that any inflation above the threshold impedes economic growth. In oil exporting countries, the effect of inflation is stronger than other countries in the study.

Ayyoub *et al*. (2011:51) re-examined the prevalence of the relation between inflation and economic growth and empirically analysed the impact inflation had on growth for the period of 1972–2009 in Pakistan. The results of the study have been made basing on OLS econometric technique. It was implemented on annual time series data, to analyse the relationship between inflation and economic growth. Their findings indicated that inflation was destructive to the growth of Pakistan's economy. The inflation threshold level was found to be at 7% and any inflation rate above the threshold level seriously affected economic growth, yet levels below the threshold level promoted economic growth.

Dang & Jha (2011:1) analysed inflation variability and the relationship between inflation and economic growth in 182 developing countries and 31 developed countries. The study covered a period from 1961 to 2009 using the econometric technique of Hensen (1990:351) and Hensen (1999) in determining the inflation threshold level for these 213 countries. The results of the study indicated that in developing countries, when the inflation rate is above 10%, it is expected that inflation will have a negative effect on economic growth, whereas in developed countries, an inflation rate above the 10% level does not have a negative effect on economic growth.

Girma (2012:1-2) tested for short- and long-term relationships between economic growth and inflation for the period 1980–2011 in Ethiopia. Yearly time series data, the vector autoregressive model (VAR) and the Granger causality test are used in the study. Results suggested that, in the short term an increase in economic growth decreases inflation whereas inflation does not have negative influence on economic growth. The Johansen cointegration test, however, showed a long-term connection between economic growth and inflation in

Ethiopia. Girma (2012:41) suggested that non-inflationary sources must cover problems emanating from high the inflation rates in Ethiopia so as to keep enhancing economic growth.

Baro (2013:85) empirically assessed the effects inflation had on economic performance and the study covered over 100 countries using annual data from 1960–1990 was used. Baro (2013:107), however, noted a causal relationship between inflation investments and economic growth. It was concluded that there were adverse effects inflicted by inflation on economic growth because it reduced economic growth due to its negative effect on investments.

3.4 ASSESSMENT OF LITERATURE

Mckinnon and Shaw's (1973) theory of financial liberalisation allowed the interest rates and capital flows to fluctuate freely, thus to be volatile due to the elimination of restrictions on both the former and the latter. In their theory, they argued strongly against policies under which an economy is financially repressed where there will be interest rate ceilings and controls over trade and capital flows. They believed that only financially liberalised economies will enhance growth in the financial development of a country compared to a financially repressed economy. Financial liberalisation advocates further recommend governments to abolish interest rate ceilings.

Setting a threshold level in an economy has proven to have an impact on financial development. When the level of inflation was below the set level, it had a positive effect and when the rate of was above the threshold level, it had a negative effect on financial development (Bawa & Abdullahi, 2009:43). The existing theoretical literature postulated a negative connection between the inflation rate and financial sector development.

The empirical work on the inflation–financial development relationship is mixed and different. In assessing the inflation–financial development nexus, common variables have been used across studies like private credit, M3/GDP as a measure of financial development, and CPI as the measure for inflation. Although some researchers used real data and others logged data sets, results of the studies tended to have a non-linear relationship. Inflation did have a negative relationship with financial development except for English (1999) who concluded that inflation and financial development had a long-term, relationship. Although few studies have been carried out so far on the relationship between inflation and financial development, studies that support the finance–growth relationship also proved that any macroeconomic factor that affects financial sector advancement is unfavourable to economic development. Empirical results

highlights that although inflation has a negative impact on economic growth, financial development and economic growth have a positive relationship.

Cross-country studies took a broad view on the relationship inflation had with financial sector performance. To cater for the difference in likelihood of analysis across countries, GMM was used. The ARDL bound test technique was also used in most studies with the aim of examining the impact between the two variables in question. Although these econometric techniques were implemented in most studies to bring out best results, they give out different results based on the economy.

4
RESEARCH METHODOLOGY

4.1 INTRODUCTION

The main objective of the study was to evaluate the long-term association between financial development and inflation in the South African economy. The literature review proved the relation between inflation and financial sector development and also highlighted other variables that have an effect on financial development. This chapter will serve to specify determinants of financial development, to develop a model that identifies the relationship between financial developments and its determinants, and to discuss the research methods used for the estimation of the model.

The chapter is divided into the following sections: Section 4.2 discusses the model specification while Section 4.3 gives a thorough definition of variables used in the model and their expected results. Data sources and period of study are presented in Section 4.4. A review on the estimation techniques follows in Section 4.5 while Section 4.6 completes the chapter with conclusion.

4.2 MODEL SPECIFICATION

4.2.1 Theoretical framework

The notion that an increased inflation rate has a negative influence on financial development has been an issue that is rarely questioned. This study acts as a contribution to previous studies of inflation and financial development. It incorporates selected few measures of financial development like private credit and money supply. The choice of variables was influenced by economic literature on the effect money supply and private credit has on financial development.

To analyse the impact of inflation on financial development, this study used the model adopted from Perasan & Smith (2001:289), contributing to previous studies with some modifications. In addition, the model includes private credit (PC), measure of money supply (M3) and gross domestic product (GDP) since they also have an effect to financial development. The regression equation can be expressed as follows:

$$FD = f(INF, M3, GDP, PC, \varepsilon_t) \quad \ldots\ldots (4.1)$$

where FD is the endogenous variable, (INF= inflation, M3 = money supply, PC = private credit and GDP = gross domestic product) and ε_t is the stochastic error term.

4.2.2 Model specification

Expressed in linear form, equation (4.1) can be specified as follows:

$$LogFD = \beta_1 logINF_t + \beta_2 logM3_t + \beta_3 logGDP_t + \beta_4 logPC_t + \varepsilon_t \ldots\ldots \quad (4.2)$$

where:

β_0	= the intercept
$\beta_1, \beta_2, \beta_3$ *and* β_4	= coefficients of explanatory variables to be estimated
ε_t	= stochastic disturbance term with standard properties
FD	= financial development
INF	= inflation rate
M3	= measure of money supply
GDP	= gross domestic product
PC	= private credit

4.3 DEFINITION OF VARIABLES AND A PRIORI EXPECTATIONS

The variables specified in the model are defined in this section. As the main determinants of financial development in South Africa, expected results of these variables are also realised. The variables that determine the impact of inflation on financial development includes inflation rate, money supply, gross domestic product and private credit.

4.3.1 Financial development

Financial development is defined as improvement in the financial instruments, intermediaries and markets. It measures the activity of financial intermediaries in channelling savings and investments. Perasan & Smith (2001:291) used domestic credit to measure financial development, and stock market capitalisation to measure the value of listed shares. Domestic credit includes credit offered by the banking sector to different sectors excluding credit of central government (World Bank Report, 2012). Stock market capitalisation is expected to contribute positively on the financial sector; as the value of shares increases, the financial sector also develops.

4.3.2 Inflation rate

According to Hazlitt (1964:2), it is the general price increase in goods and services in an economy which is primarily caused by an increase in money supply and banks credit. When the supply of money increases more than the supply of demanded goods, prices of goods and services also rises. The best measure for inflation is the Consumer Price Index (CPI). A targeted inflation rate is the main determinant of economic performance and when the inflation rate is below the set target, it has a positive effect on the economy while a rate above the set target has a negative effect.

4.3.3 Money supply

Money supply (M3) measures the proportions of the financial sector in an economy, which includes M2 plus long-term deposits in banks. As the financial sector becomes more developed and reveals greater depth, there will be more activities by financial intermediaries, implying that an increase in M3 affects financial development positively since there will be greater access to money in the country.

4.3.4 Gross domestic product

GDP measures growth in an economy that happens each time people take resources and reorganise them in ways that are treasured. Economic growth is the increase in the capability of an economy to yield goods and services matched from one period to another, usually yearly (Mankiw, 2005:225). Robins (1952) argued that economic growth stresses certain types for financial arrangements and responses to financial systems.

4.3.5 Private credit

This is the credit given by money lenders, banking sectors and other financial intermediaries, excluding government.

Table 4.1 gives a breakdown of all the variables used in the study and their expected results.

Table 4.1: Expected Results

Variable	Description of variable	Expected results
FD	Financial development	+ (positive)
INF	Inflation rate	-(negative)
M3	Money supply	+ (positive)
GDP	Gross domestic product	+ (positive)
PC	Private credit	-/+ (positive/negative)

4.4 DATA SOURCES AND PERIOD OF STUDY

The data set of variables employed in this study comprises quarterly time series observations from 1990 to 2012. The period of the study was motivated by need to analyse the effect of

inflation rate on financial development before and after implementation of inflation targeting in South Africa. Data for private credit, measure of financial development and money supply were attained from SARB online statistical query. Data on the gross domestic product was acquired from the World Bank whilst the consumer price index data was obtained from Stats SA.

4.5 ESTIMATION TECHNIQUES

For the purpose of examining the relationship between the inflation rate and financial sector growth, the model was subjected to various econometric tests. These tests involved stationarity tests, which was performed to determine the order of integration around the variable. The stationarity tests were followed by co-integration analysis, and VECM techniques to determine the short- and long-term dynamics amongst the variables. Diagnostic tests, impulse response and variance decomposition were also conducted among other tests. To ascertain causality between inflation rate and financial development, the Granger causality test was applied.

4.5.1 Stationarity tests

Gujarati (2004) described time series data as a group of values that a variable can take at different timeframes. Data is required to be stationary when being incorporated in Ordinary Least Squares (OLS) and VECM estimation technique models. For time series data to be stationary, variance, mean and auto-covariance should be constant for each given time period or lag (Brooks, 2008). In other words, when the time series data is non-stationary, mean and variance will vary. Data was tested for being stationary in response to the problems that non-stationary time series data enforce on variables used in the study. Non-stationary data results in spurious regression where relationship is established on an unrelated time series. Supporting Yule (1926), Brooks (2008) argued that using non-stationary data for econometric analysis can have a negative effect on behaviour and properties of variables, thus resulting in the outcome of the test being unrealistic.

Asteriou & Hall (2007:233) highlighted that "a time series is covariance stationary when it has the following characteristics:

i. Displays mean reversion in that it alters around a constant long-run mean;
ii. Has a finite variance that is time-invariant; and
iii. Has a theoretical correlogram that reduces as the lag length increases".

A number of unit root tests can be used in determining how many times trending time series data should be differenced in order to render it stationary. This implies that non-stationary series should be differenced (d) times before it is stationary. When a series becomes stationary after being differenced (d) times, it is said to be integrated of order (d) and will be denoted as *I* (d). For example, a time series Y_t integrated of order d is denoted as$Y_t \sim I\ (d)$. An *I (0)* series denotes a stationary series at level form, while an *I (1)* series comprises one-unit root. Most economics time series data sets are differenced at *I* (1) whilst others require continuous application of the difference operator until results becomes stationary.

Unit root testing is, however, implied to inspect the stationarity of the time series data. Elder and Kennedy (2000:139) argued that unit root testing strategies do not derive benefit from previous information of growth status in the time series data. In such situations, they result in the outcome being realistic. Unit root tests have become widely used tests and the stationarity of a series can be assessed by either employing formal or informal unit root tests.

4.5.1.1 Informal unit root tests

Informal unit root tests display visual plots of series data through graphical presentations and correlograms. The use of graphical presentations allows for stationarity analysis by looking at trends of mean, variance and autocorrelation. Using only graphical presentations may give biased results since it allows for recognition of data capturing errors and also checks for structural breaks.

4.5.1.2 Formal unit root tests

Several formal techniques and methods were used in determining the stationarity of a data series. The formal unit root tests include Dickey-Fuller (DF), Augmented Dickey Fuller (ADF), Kwaitkowski-Phillips-Schmidt-Shin (KPSS) and Phillips-Perron (PP) tests.

This study employed both formal and informal unit root tests in analysing the stationarity of variables in the model. Formal unit root tests were used to determine the presence of unit roots in the data set.

i. DF test

Dickey and Fuller (1979) established a process to test whether there is a unit root for a variable or whether it followed a random walk. To allow for various possibilities, the Dickey-Fuller test was projected under three different null hypotheses which follows:

$$\Delta Y_t = \delta Y_{t-1} + \mu_t \quad \text{..... (4.3)}$$

$$\Delta Y_t = \beta_1 + \delta Y_{t-1} + \mu_t \text{..... (4.4)}$$

$$\Delta Y_t = \beta_1 + \beta_2 + \delta Y_{t-1} + \mu_t \text{..... (4.5)}$$

where *t* is the time trend of a variable, Δ is the difference operator and μ error term. The null hypothesis always highlights the existence of a unit root in data series. Dickey and Fuller highlighted that there are some differences in the null hypothesis where; Null hypothesis for equation (4.3) shows a random walk, the equation (4.4) is a random walk with a shift; and lastly equation (4.5) shows a random walk with drift around stochastic trends (Gujarati, 2004). In equations (4.3) and (4.4), the population value of δ is presumed to be zero under the null hypothesis whereas in equation (4.5), the time trend of regression is not included, thus the population of value δ is non-zero. The Dickey-Fuller (DF) test incorporated extra lagged terms of the dependent variable in order to eradicate auto-correlation, thus not giving the true size of the test. To address the shortfall of DF test, another test was formulated called the Augmented Dickey-Fuller or (ADF) test to correct high-order serial correlation.

ii. ADF test

In addition to the Dickey-Fuller test, ADF test was introduced for measuring the unit root in a time series data. This test removes all autocorrelation in the time series by adjusting the notion that all error terms are independently and identically distributed. The test involves regressing a particular variable on a time trend, intercept, the dependent lagged variable and lags of the differences series. To select a long lag length and model, t-statistics were used. The ADF test was conducted by adding the lagged values of the three equations in the Dickey-Fuller (DF), thus estimating the following ADF test equation:

$$\Delta Yt = \propto_0 + \propto_1 Y_{t-1+} \sum_{j=1}^{p} Yj\, \Delta Y_{t-j} + \varepsilon_t \text{.....(4.6)}$$

where Δ is the first difference operator, p is the lag length employed in the ADF test, Y_t, is all model variables at time t, $\propto_0$ and $\propto_1$ are being estimated, and ε_t denotes the pure white noise error term. Gujarati (2004) recommended that in the ADF test, the same critical values can be used as the DF test since both tests follow the same asymptotic distribution. The null and the alternative hypothesis of unit root in variable X_t is:

H_0: $\delta_1 = 0$, and $H_1 < 0$

The decision rule of the ADF test is based on the t-statistic and the critical values of a zero coefficient. When the t-statistic is greater than the critical value, the time series data is non-stationary and the unit root exists, as a result the null hypothesis is not rejected. If the t-statistic is less than the critical values, time series data is stationary and the unit root does not exist, hence we reject the null hypothesis. When time series data is non-stationary at level, we can test whether it is integrated at order one. However, the ADF test is the weak form of testing the time series for stationarity and this has necessitated the use of the more powerful stationarity test technique that was formulated by Phillips and Perron (1988).

iii. Phillips-Perron (PP) tests

To mitigate the weak form of testing imposed by the ADF test, Phillip and Perron (1988) suggested a non-parametric method of monitoring higher order auto-correlations in a time series data. The ADF and Phillip-Perron (PP) tests are alike and only differ in the sense that the Phillips-Perron test incorporates automatic correction of the ADF test to permit for auto-correlated residuals (Brooks; 2004). Although both tests are believed to give the same conclusions as well as limitations, the PP test is the most powerful test between the two tests.

Regression of the PP test follows the AR (1) process which states that:

$$\Delta y_{t-1} = \alpha_0 + \gamma y_{t-1} + \varepsilon_t \qquad (4.7)$$

If the variables under attention in this study are non-stationary at level but become stationary at first difference, co-integration tests can be carried out. ADF and PP tests will be carried out in this study to test for stationarity of variables. Different results for the same variables are expected from the two tests and in that case, the PP test results will be considered as it is rated as the most advantageous test between the two.

iv. Criticism of the ADF and PP test

The main critics of the PP and ADF tests are the power and size of the tests. An important issue when implementing the ADF test is choosing the lag length (p) of the test. If the lag length is too small, the residual serial correlation in errors will be biased. The same applies to a large lag length where the power of the test suffers. The size distortions can also be a result of the absence of the moving average (MA) component from the model (Gujarati, 2004). The low power of the ADF test is believed to be a result of:

- The power that hinge on the timeframe of the data greater than the size of the sample;

- If p≈ 1 and not equal to 1, the unit root may affirm non-stationarity of the time series; and
- the unit root tests may not catch the structural breaks if they are in the time series, them.

A variety of alternatives to solve these problems have been proposed, particularly the power problem. Despite the weaknesses that these tests may have, they continue to be the most widely used unit root tests.

4.5.2 Co-integration

Long-term relationships can be jeopardised due to loss of data through transformation into first difference when examining for stationarity. After finding that variables are stationary, it is essential to determine whether the modelling has an empirically meaningful relationship. This second step of testing for co-integration considers the possibility of double unit roots, which results in a loss of long-term relationship amongst variables. Co-integration exists when two or more variables have a long-term linear relationship despite them being individually non-stationary. Gujarati (2004) explained co-integration as a long-term, equilibrium linear relationship between variables. When the combination of such variables is stationary, then there is co-integration. In simpler terms, co-integration arises out of the concern about spurious regression in time series data.

Similar to unit root testing, the co-integration econometric technique offers different co-integration tests. In this study, the Engle Granger two-step method (1987) and Johansen-based technique (1991) were employed to determine the long-term association between variables. The Johansen-based technique is the central for testing co-integration as only one step is involved, unlike the Engle-Granger approach that involves two steps. These two tests are crucial in providing a formal background for estimating and testing both long- and short-term relationship among economic variables in the study.

4.5.2.1 The Engle-Granger Two-Step Method (EG)

The two-step Engle-Granger test is an econometric approach that assumes a single co-integrating equation. Engle and Granger (1987) discovered that in a case where there is more than one variable, there are possibilities of multiple co-integrating relationships. The critical values become more negative as the number of variables in the co-integrating regression increases, thus allowing the Engle-Granger test and the Johansen test to be the best methods to use (Brooks, 2002).

The initial step in the study examined the order of integration, which made sure that individual variables were integrated at order 1 and had a unit root. Once the order of integration was established, co-integration could then be estimated using an OLS approach. In order to ensure that there was stationarity among variables, the residuals were tested using ADF and PP stationarity tests. Testing residuals ensured that variables were stationary and if they were stationary and co-integrated in the same order, Engle-Granger could then be employed.

The second step involved using residuals from the initial step and estimating the long-term equilibrium relationship in the model. The two-step Engle-Granger co-integration method suffers a number of weaknesses when applied to multivariate models. According to Brooks (2002), the Engle-Granger technique has the following problems:

i. a shortage of power in co-integration and unit root tests
ii. if causality between two variables runs in both directions, this could result in the estimation equation being biased. The single equation approach will require the researcher to normalise on one variable as dependent variable and the other independent variable; and
iii. it is less likely to do any hypothesis testing about the co-integrating relationship projected at the initial stage.

In an attempt to improve Engle-Granger test, the Engle and Yoo approach was introduced. The Engle and Yoo approach also suffers the same limitations as the Engle-Granger test. Both tests have no possibility of performing hypothesis testing concerning the co-integration relationship (Brooks, 2002). Due to inconsistencies proved by the Engle-Granger test, the Johansen technique, based on VAR, was preferred in providing estimates of co-integrating relationships that were in the model.

4.5.2.2 Johansen technique

The Engle-Granger approach did not allow hypothesis testing on co-integrating relationships, allowing for the introduction of the Johansen test, which takes into account the hypothesis testing about the equilibrium relationships of the variables. Instead of relying on the OLS technique, the test uses maximum likelihood estimation (Ssekuma, 2011:12). The Johansen test is optimal for testing co-integration which identifies all co-integrating vectors within given set of variables.

Asteriou & Hall (2007:326) assumed that more than one co-integrating relationships can be experienced in models that have more than one variable. It simply means that more than one co-integration can be detected if present in the equation. The technique allows for an estimation of dynamic error correction specification in the short- and long-term relationships within the model. This study employs the Johansen (1988) method to determine the long-term equilibrium relationship in the financial development (FD) equation. It has proven to be more appropriate and significant for multivariate models like the one in equation 4.2. The test allows variables to be trended with the dependent variable while maintaining constant co-integration results. In conducting the test, the Johansen method followed the following procedures:

i. Testing for order of integration

The opening step in the Johansen co-integration technique is to determine the order of integration of variables just like in the Engle-Granger test above. Determining the order of integration between variables assists in detecting whether there is any co-integrating relationship. This is done in order to avoid spurious regressions in the model. In testing for order of integration, unit root tests will be conducted. Brooks (2002) debated that the Johansen test can be exaggerated by the lag length used in the Vector Error Correction Model. Although variables are expected to be co-integrated in the same order, in some instances it might not be the case. Co-integration can also exist when variables are not integrated in the same order. In situations where *I* (2) variables are encompassed in the model, there are high chances that the two *I* (2) variables can co-integrate down to an *I* (1) relationship. Variable relationships may further be co-integrated with one of the two *I* (1) variables to form another co-integrating vector

ii. Setting appropriate lag length of the model

Setting the proper lag length is important for standard normal error terms that do not agonise from non-normality, heteroscedasticity and autocorrelation. In order to set an appropriate lag length for the VAR order, the following tests were employed, which are: the modified likelihood ratio, Schwarz information criterion (SIC), AIC, Hannan-Quinn information criterion (HQ) and Final Prediction Error Criterion (FPE) (Brooks, 2002). These information criterions normally produce disagreeing order selections, and for that reason, it is important to use both information criterion approach and *a priori* knowledge from economic theory to select the proper order of integration. The procedure that provides white noise residual is selected for

setting lag length. This VAR model has to be estimated for a large number of lags and narrowing down by re-estimating the model.

iii. Choosing the right model for the deterministic components

The deterministic component requires variables of the study to be tested to evaluate the order of integration. Variables are expected to have the same order of integration as it makes it easier to notice possible trends. However, variables with a different order of integration create difficulties in setting co-integration relationship. The five alternative models in theory concerning deterministic trend assumptions are as follows:

- Model 1: No intercept or trend in CE or VAR ($\delta_1= \delta_2=\mu_1=\mu_2=0$).
- Model 2: Intercept (no trend) in CE, no intercept or trend in VAR ($\delta_1= \delta_2=\mu_2=0$).
- Model 3: Intercept in CE and VAR, no trends in CE and VAR ($\delta_1= \delta_2=0$).
- Model 4: Intercept in CE and VAR, linear trend in CE, no trend in VAR ($\delta_2=0$).
- Model 5: A quadratic deterministic trend in data, intercept and trend in CE and linear trend in VAR

Specification of the deterministic component is based on the Pantula principal in choosing the correct rank order and deterministic components. The Pantula principal is used to test the deterministic components and hypothesis of the rank order as suggested by Johansen (1992). Model 1 and 5 are not used in choosing the right model regarding deterministic components. Model 1 is not likely to occur in the real world, excluding that all financial series have a zero mean. Model 5 brings far-fetched sample forecasts and does not give a definite rate of change in variables. One cannot necessarily predict if the rate of change in variables is ever-increasing or ever-decreasing.

The best practical models to choose from are Models 2, 3 and 4. The process ends when the null hypothesis is rejected the first time. The major drawback of the Pantula principle is the assumption that it is biased towards choosing model 3 when the correct data generating process is given by model 4 (Hjelm and Johansson, 2005). If model 3 is selected, it is crucial to test for the presence of a linear trend in the co-integrating system. Model 4 is chosen if the null hypothesis of no trend is rejected, otherwise choose model 3.

iv. Rank of Π determination

The rank deterministic test can be verified after defining the lag length and the deterministic trend assumption. In establishing co-integration, the Johansen approach (1988) employs two test statistics for the reduced rank tests. This step involves two test statistics which are the λtrace statistic and the λmax statistic. These test statistics can be formulated as follows:

$$\lambda trace(r) = -\mathrm{T} + \sum_{i=r+1}^{g} \ln(1 - \lambda i) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4.8)$$

$$\lambda max(r, r + 1) = -T\ln(1 - \lambda r + 1) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4.9)$$

where r is the number of co-integrating vectors in the hypothesis and λ_i is the estimated value for the i^{th} ordered eigenvalue from the Π matrix. The larger λ_i is, the larger will be the test statistic. λtrace represents a joint test where the null hypothesis states that the number of co-integrating vectors is less than or equal to *r* against the alternative that there is more than *r* co-integrating vectors. λmax demonstrates separate tests on each eigenvalue. The null hypothesis states that the number of co-integrating vectors is *r* against the alternative of r+1 (Brooks, 2002). The critical values depend on the value of *g-r*, illustrating what happens if constants are included in the equations and lastly, the number of non-stationary components.

Having established the number of co-integrating relationships, a series of likelihood-ratio tests can be executed to test unlike hypotheses. For better results, the Johansen co-integrating test is implemented since it is considered to be the best compared to Engle-Granger test. Weak exogeneity and linear restrictions in the co-integrating vectors can also be tested. Testing for linear restrictions allows for the estimation of the coefficients of the matrices and possible restrictions on the matrices being used.

4.5.3 Vector Error Correction Model

The VECM is an advancement of Vector Autoregressive (VAR) Model and it is used to determine the long run and short run relationships among variables that are co-integrated. The difference between the VAR and VECM is that the VAR is used when some variables have units and are not co-integrated. In this case, the ones with unit roots are first differenced and the differenced variables are then used in the VAR model followed by causality tests. In the case of VECM, it is used with the differenced variables to determine long run and short run dynamics when the variables have unit roots and are co- integrated (Paul and Vamvoukas, 2002; Fadli et al, 2011).

4.5.3.1 Estimation of the VECM

According to (Panas and Vamvoukas, 2002) the VAR model is expressed as follows:

$$Y_t = \mu + \varphi_1 Y_{t-1} + \varphi_2 Y_{t-2} + \cdots \varphi_k Y_{t-k} + u_t \quad \text{..... (4.10)}$$

where Y_t represents the system variables. u_t is the random error over time. μ denotes the vector of parameters.

After determining the optimal lag length and number of cointegrating vectors, the VECM can be modelled as follows:

$$\Delta Y_t = \Gamma_1 \Delta Y_{t-1} + \Gamma_2 \Delta Y_{t-2} + \cdots + \Gamma_{k-1} \Delta Y_{t-k} + \prod Y_{t-k} + \mu + u_t \quad \text{..... (4.11)}$$

Where $\Gamma' s$ represents the estimable parameters and $\prod$ is the parameter matrix in the long run. (Panas and Vamvoukas, 2002: 76) stated that the matrix can be presented as $\prod$ab. Matrix a measures the strength of the cointegrating relationships while matrix b identifies the parameters in the cointegrating vectors. The estimation of VECM in this study will identify if inflation rate has a short or long run effect on financial development in South Africa. The long run impact on financial development will not only be focused on inflation rate but also on other variables like private credit, economic growth and supply for money. If there is a long run impact of inflation rate on financial development, policy recommendations should be made to ensure that the inflation rate is kept within the target range of 3-6%. If the other variables (private credit, supply for money and economic growth) prove to be significant in the long run, it will be recommended for further studies in determining if these variables have a long run impact to financial development compared to inflation rate.

4.5.4 Diagnostic checks

Diagnostic tests are crucial in determining the impact of inflation on financial development because they authenticate the parameter evaluation outcome accomplished by the estimated model. Diagnostic tests check the correct specifications of the model and the tests that that were employed, among others, included residual auto-correlation, heteroskedasticity and normality tests.

4.5.4.1 Heteroskedasticity

Heteroskedasticity refers to a process in which the variance/co-variance of the errors is constantly changing over time. Studenmund (1992) saw heteroskedasticity as a violation of the

classical linear regression model (CLRM) assumption, which states that the observations from the error terms are extracted from distribution of the constant variance over time. Changes in variance/co-variance often occur in data sets that have a wide disparity between the largest and smallest observed data values. "The huge the difference between the size of observations in a sample, the more likely the error term will have different variances and thus being heteroskedastic" (Studenmund, 1992).

Heteroskedasticity takes a number of different forms, thereby allowing econometricians to use different tests for heteroskedasticity like: Goldfeld-Quandt test, the White test and Breusch-Pagan test. In this study, the widely used White test (1980) was implemented which is being rated the best, does not have several assumptions on any form of heteroskedasticity but only assumes that the estimated regression model is standard linear. The test is run by obtaining squared residuals of the estimated equations and using these squared residuals as the dependent variable in a second equation, which states:

$$e_i = \alpha_0 + \alpha_1 X_{1i} + \ldots\ldots\ldots\ldots + \alpha_9 X_{2i} X_{3i} + \mu_i \ldots\ldots\ldots\ldots\ldots\ldots \quad (4.12)$$

Lastly, the overall significance of equation 4.12 is tested with a chi-squared test. The null hypothesis for White test states that there is homoskedasticity while the alternative hypothesis shows that there is heteroskedasticity. If the χ^2 value obtained exceeds the critical χ^2 value found in statistical tables, the null hypothesis is rejected and it can be concluded that heteroskedasticity exists. If chi-square does not exceed the critical χ^2 value, there is no heteroskedasticity and it can be concluded that there is homoskedasticity.

4.5.4.2 Normality test

Although there are many normality tests, the Jarque-Bera (JB) test is one of the commonly used tests for normality. The JB normality test statistic is a test for large samples and is based on OLS residuals in determining whether the system is normally distributed or not. The test measures the skewness and kurtosis of series and determines whether they match a normal distribution. In large samples, a Jarque-Bera test statistic is formulated under a null hypothesis, which states that there is normal distribution; skewness and excess kurtosis are zero. If the calculated test statistic is above the critical value from the chi-squared distribution, the null hypothesis is rejected. However, the chi-squared approximation is overly sensitive to small samples, thus rejecting the null hypothesis and giving unrealistic results.

4.5.4.3 Autocorrelation – LM tests

Autocorrelation is defined as correlation between variables over a period of time (Gujarati 2004). It occurs more often in time series studies in which an observed data set is ordered in time. Lagrange Multiplier (LM) tests for parameter consistency against the alternative hypothesis that a parameter follows a random walk. In this study, the LM was a multivariate test statistic for residual serial correlation up until the specified lag order. In a VAR model, the value of R^2 is used and considered important when having a higher order of auto-correlation. The value of R^2 for that equation will be relatively significant if one or more coefficients in an equation are statistically significant, while if none of the variables is significant, R^2 will be relatively low. The R^2 from the regression is multiplied by the number of observations and can be stated as follows:

$$TR^2 \approx X^2(m)$$

where (*m)* represents the number of regressors in the auxiliary regression (apart from the constant term) and T is the number of observations. Serial correlation is noted when the residuals show correlation with its values from the past.

4.5.5 Impulse response and variance decomposition

It is important to define how financial development reacts to shocks in itself as well as to shocks in any of its determinants or explanatory variables. Impulse response and variance decomposition analysis in understanding how much time it takes for financial development to go back to its original position after experiencing a shock. An investigation of the VAR's impulse responses and variance decompositions will provide the true response of variables, whether a negative or positive effect.

4.5.5.1 Impulse response

Impulse response investigates the receptiveness of dependent variable in the VAR system shocks to other variables in the system (Brooks, 2008). To note the VAR system results upon each variable, unit shock is applied to errors in the variables. Through the structure of VAR, a shock on one variable will also be spread to other variables. In this study, impulse response shows the sign, persistence and magnitude of the real and nominal shocks to financial development. The main aim was to trace the dynamic response of each element of the dependent variable to a shock of each of the error term. Brooks (2008) further showed that impulse response analysis can be applied on VECM, given that the system is stable; thus shocks gradually die away.

4.5.5.2 Variance decomposition

Impulse response and the variance decomposition are more or less the same in examining the effects that shocks have on dependent variable in the model. The percentage of movement in the dependent variables is provided by the variance decomposition. Shocks due to the variables will be compared to shocks of other variables in the model. This tool is simply used to determine error variance in the variables, which can be illuminated by shocks from other variables. Following dynamic structures of the VAR, a shock of the first variable will also be spread to other variables in the system (Brooks, 2008). One can conclude that the same technique applied in impulse response is also applied for variance decomposition.

4.5.6 Granger causality test

The presence of a co-integration relationship amongst the variables in the model proposes that there must be long-term Granger causality in at least one direction (Hatanaka, 1996). This implies that the existence of co-integration in variables in the regression model provides a proof of causality in the series, although it does not show the direction of the causal relationship. According to Studenmund (2011) this necessitated the need to test the direction of the causal relationship amongst the variables. In 1969 and 1980 Granger causality test was established with the aim of determining whether changes in one variable can help explain changes in other variables.

Given all the information required, variable *x* is said to Granger cause variable *y* if the historical figures of *x* effectively forecast the current level of *y*. The result of a significant relationship is taken to entail causality because the lagged value occurred before the current value and hence, must have caused the subsequent value of the other variable. In a case where there are two stationary variables $x_t and\ y_t$, Granger causality involves estimating the following VAR models (Asteriou and Hall, 2007):

$$y_t = \alpha_1 + \sum^{n}_{i=1} \beta_i x_{t-1} + \sum^{m}_{j=1} \gamma_j y_{t-j} + \varepsilon_{1t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4.13)$$

$$x_t = \alpha_2 + \sum^{n}_{i=1} \theta_i x_{t-1} + \sum^{m}_{j=1} \delta_j y_{t-j} + \varepsilon_{2t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4.14)$$

where *n* is the number of lags that sufficiently models the structure. The error terms in the study may either be correlated or uncorrelated across equations. Asteriou and Hall (2007) explained different cases in which both error terms are assumed to be correlated. The cases are as follows;

Case 1: The lagged *x* terms may be statistically different from zero as a group, and the lagged *y* terms not statistically different from zero as a group. Henceforth x_t causes y_t in this case.

Case 2: The lagged *y* terms may be statistically different from zero as a group, and the lagged *x* terms not statistically different from zero as a group. Therefore, in this instance y_t causes x_t.

Case 3: Both sets of *x* and *y* terms are statistically different, hence there is bi-directional causality.

Case 4: Both sets of *x* and *y* terms are not statistically different in both equations, so that x_t is independent of y_t.

The Granger Causality test is only limited to pairs of time series data and if the relationship between variables is not strong enough, spurious regressions can be noted in the model.

4.5.7 Econometric tools

This study utilised the Eviews 7 econometrics package in estimation as well as for graphical and tabular presentations. The software has a wide range of equation estimation techniques for time series, panel data analysis, cross-sectional and forecasting. Simple estimation of co-integration among variables is allowed and also runs diagnostic tests. In addition, Eviews7 examines variance decomposition and impulse response for the VECM. The advantage of using Eviews 7 is that it is easy to use and interprets test results.

4.6 CONCLUSION

This chapter gave an analytical framework on the econometric tools used in this study to help determine the impact inflation had on financial development in South Africa. The explanatory variables for financial development used were inflation rate, money supply, private credit and gross domestic product. However, stock market capitalisation was identified as a measure for financial development.

Theoretical and empirical literature from the previous chapter helped to formulate the model used in study. Since this study intends to use time series data, stationarity tests will be used and avoid spurious regression in the model. Informal and formal unit root tests were explained in detail. As for the formal unit root test, PP and ADF tests were employed. Although augmented Dickey-Fuller and PP tests were used in this study, the PP tests took precedence over the ADF as the (PP) test is believed to be the most advanced and efficient test. The Johansen (1991) test and Engle-Granger test were used to analyse the co-integrating relationship among variables.

The diagnostic checks discussed included heteroskedasticity, residual normality test, and the LM. Impulse response and variance decomposition analysis were also explained in the chapter. Lastly, the Granger causality, which tests for causality between variables, was also discussed.

5

PRESENTATION AND ANALYSIS OF EMPIRICAL FINDINGS

5.1 INTRODUCTION

Time series data from 1990–2012 was used to determine both short- and long–term association between inflation and financial development. The results of the tests explained in Chapter 4 are presented and analysed in this chapter.

5.2 UNIT ROOT TESTS

5.2.1 Informal unit root tests

Figure 5.1 displays the level series of all data used for the variables in the model. The variables are: stock market capitalisation (SMC), inflation rate (CPI), measure for money supply (M3), private credit (PC), and gross domestic product (GDP). From the graphs in Figure 5.1 it can be noted that variables LGDP, LM3 and LPC seem to be trending upwards whereas LMC and CPI do not display a clear trend as they fluctuate over time.

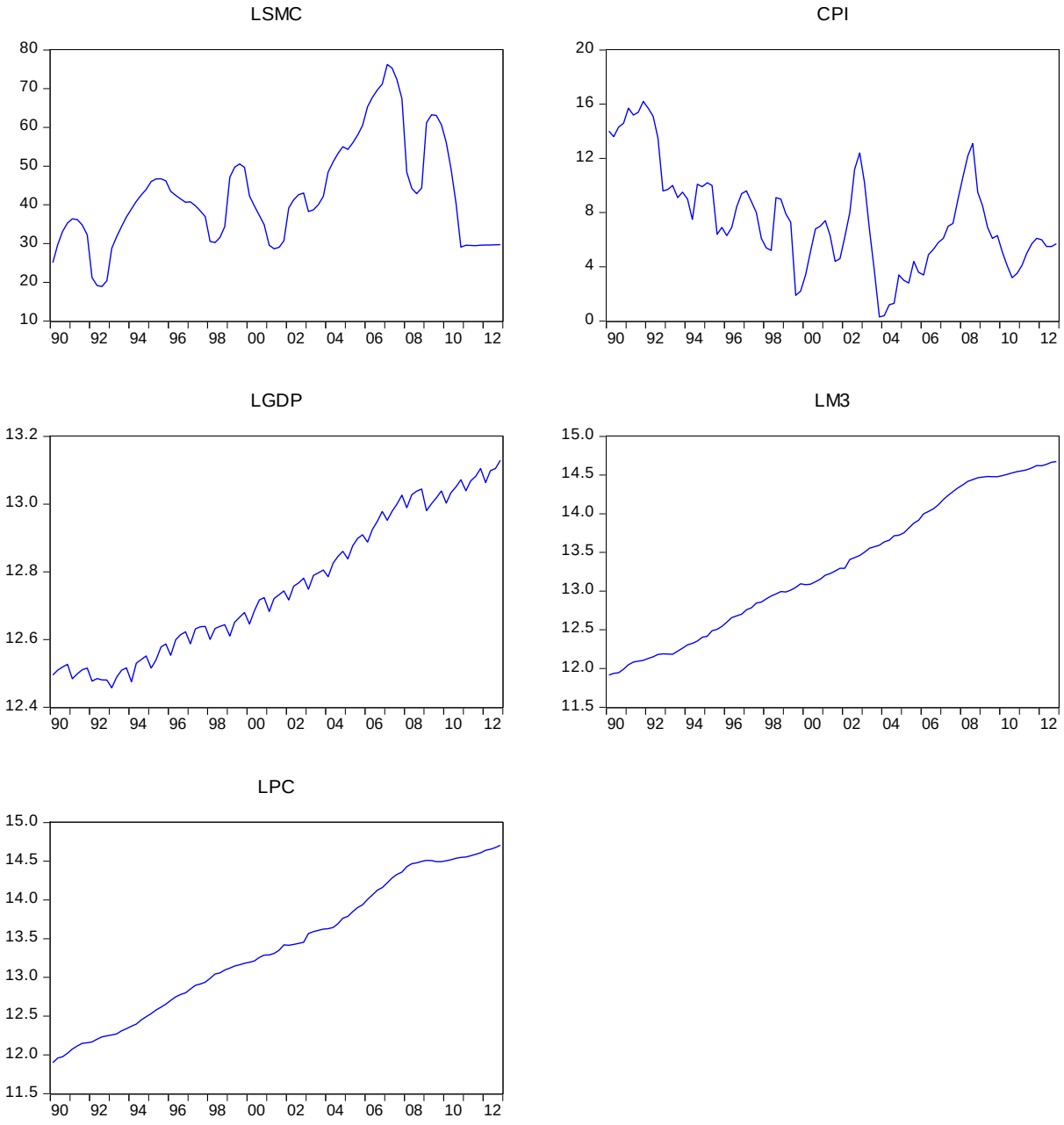

Figure 5.1: Graphical analysis of variables at levels

All variables appear to be non-stationary at level as they are all trending and this creates the need to first difference the data so as to attain stationarity. After being differenced, all variables in figure 5.2 seem to be stationary because of fluctuations around mean zero point.

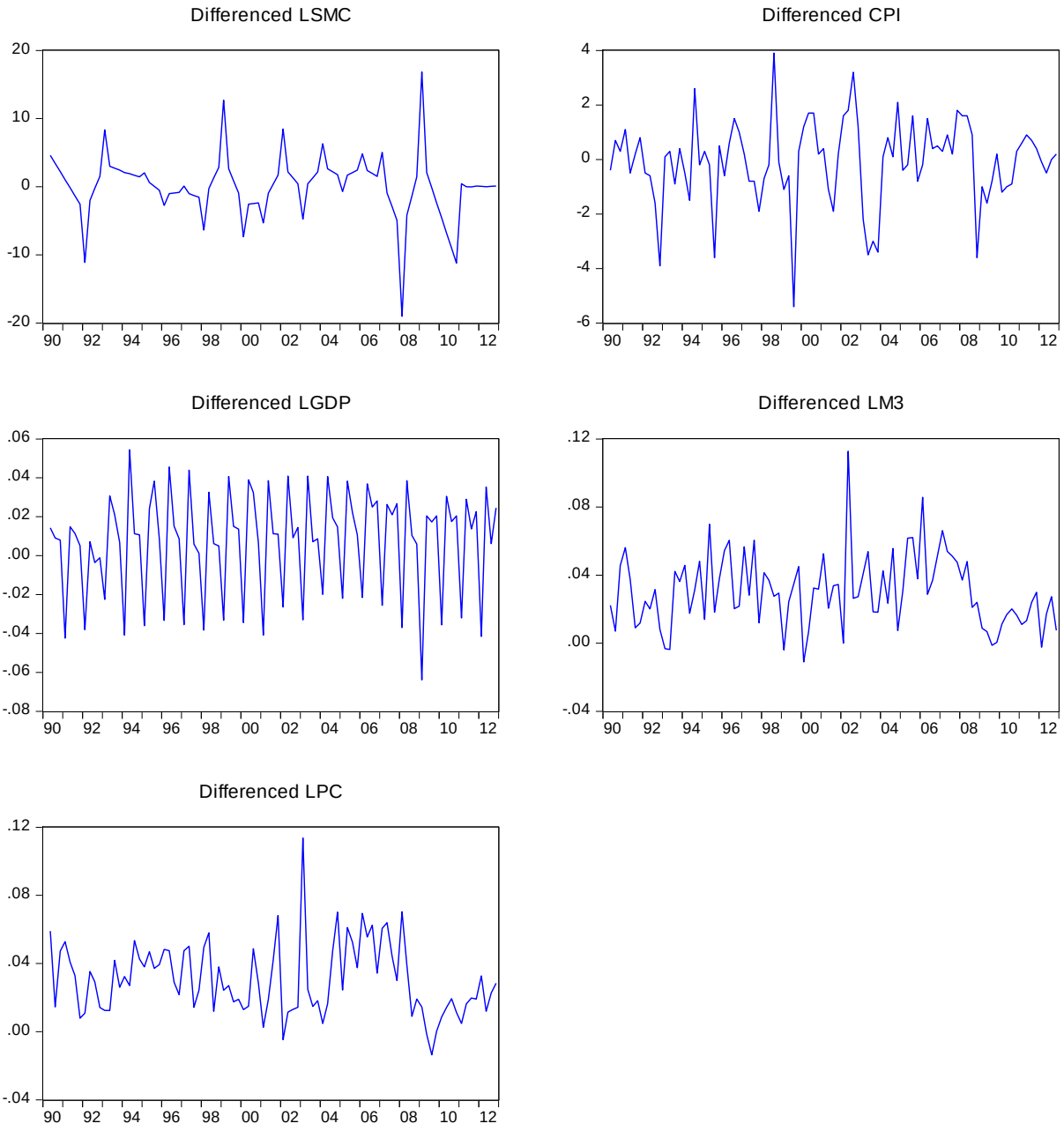

Figure 5.2: Graphical analysis at first difference, 1990Q1- 2012Q4

Informal tests alone are inadequate in making sound decisions concerning stationarity in a time series data set as they show unclear trends. Formal unit root test is, however, significant in determining stationarity of variables, which is discussed below.

5.2.2 Formal unit root tests

This study employed the ADF test and the PP test to examine stationarity properties of the series. The tests were piloted to support the findings of the graphical analysis in figure 5.1 and 5.2. The outcomes of the test are revealed below in Table 5.1. Both the ADF and PP test are

assumed to give similar results in testing for stationarity. ADF test and PP test follows a null hypothesis which states that:

$$H_0 = \text{Non stationarity.}$$

Rejecting the null hypothesis portrays non-existence of the unit root in the series and yet, a rejection of the alternative hypothesis implies the existence of a unit root in the data at test. The tests were carried out in three models that is, intercept, trend and intercept and none.

Table 5.1 shows that there is no stationarity at level with SMC when implementing the ADF test. Variable SMC becomes stationary at first difference under all three models at one percent significance level. If the PP test is used, the variable becomes stationary at one percent significance level after differenced once in all three models. Using the ADF test, the inflation rate is stationary at level series under none. It is, however, stationary in all three models at 1% significance level at first difference when using both ADF and PP tests. LM3 and LPC are stationary at none in level form at a 1% significance level in both ADF and PP test and truly become stationary in all three models at 1% significance level at first difference. LPC is stationary at 10% significance level of the two tests. The ADF test results indicates that series LGDP is non-stationary at level intercept but becomes stationary at level with 5% and 10% significance levels under trend and intercept, and none respectively. After being differenced once, LGDP is only stationary at intercept model at a 10% significance level. Following the PP test, LGDP at level series is only stationary in trend and intercept model and none model. In trend and intercept model, the variable is stationary at 10%, while in none model at 1%.

From the results in the table 5.1, it can be established that the variables become stationary at first difference. Thus, variables become integrated of order one, that is they are all I (1) and this means that the long-term relationship can now be determined using co-integrating techniques. The next step to be carried out is the co-integration analysis.

Table 5.1: Unit root tests at levels and first differences (Δ)

Variable	**(ADF)**			**(PP)**			**Order of Integration**
	Intercept	Trend and Intercept	None	Intercept	Trend and Intercept	None	
LSMC	-1.791639	-1.558590	-0.544268	-2.342915	-2.143827	-0.602527	I (1)
ΔLSMC	-4.577418***	-7.547557***	-4.605008***	-5.616615***	-5.837851***	-5.650792***	I(0)
CPI	-2.452747	-2.193607	-1.863922*	-2.533463	-2.965248	-1.528802	I (1)
ΔCPI	-8.388420***	-8.484043***	-8.334546***	-6.832646***	-6.809019***	-6.865357***	I(0)
LM3	-0.611121	-0.798941	13.29116***	-0.519051	-1.498559	9.467817***	I (1)
ΔLM3	-8.066578***	-8.051609***	-1.150064	-8.330521***	-8.313192***	-3.426590***	I(0)

LPC	-0.871490	-1.289459	5.416595***	-1.070449	-1.434247	9.037556***	I (1)
ΔLPC	-6.885328***	-6.907259***	-1.699777*	-6.934711***	-6.959525***	-3.214703***	I(0)
LGDP	-0.081567	-3.245621*	2.346826**	1.114956	-3.437165*	5.094968***	I (1)
ΔLGDP	-2.770632*	-2.703786	-1.471520	-15.59903***	-17.21930***	-11.90160***	I(0)
Critical value 1%	-3.507	-4.067	-2.592	-3.505	-4.063	-2.591	
Critical value 5%	-2.895	-3.462	-1.945	-2.894	-3.461	-1.944	
Critical value 10%	-2.585	-3.157	-1.614	-2.584	-3.156	-1.614	

Notes:
*** represents stationary at 1% level of significance
** represents stationary at 5% level of significance
* represents stationary at 10% level of significance

5.3 CO-INTEGRATION TESTS RESULTS

Table 5.2 presents the pair-wise correlation matrix. The financial development model is thus explained with the following variables; LCPI, LM3, LPC and LGDP. Before running the Johansen co-integration test, order of integration and optimal lag length selection criteria must be determined.

Table 5.2: Pair-wise correlation results

	LSMC	**LCPI**	**LM3**	**LPC**	**LGDP**
LSMC	1.000000	-0.363030	0.438928	0.442966	0.419215
CPI	-0.363030	1.000000	-0.554527	-0.564695	-0.498976
LM3	0.438928	-0.554527	1.000000	0.999105	0.989366
LPC	0.442966	-0.564695	0.999105	1.000000	0.985640
LGDP	0.419215	-0.498976	0.989366	0.985640	1.000000

From Table 5.2 we observed that LPC is highly correlated with LSMC followed by LM3. Both LPC and LM3 are positively correlated with the dependent variable. The next variable to be correlated with LSMC is LGDP, followed by LCPI. LGDP is positively correlated with the dependent variable whilst LCPI is negatively correlated. Results from the Table 5.2 prove that all variables are correlated to the LSMC and there are no variables that are specifically correlated to all variables; hence there is a lower probability of a multicollinearity problem.

5.3.1 Co-integration test results

5.3.1.1 Order of integration

It is crucial to establish the order of integration before conducting co-integrating tests. Unit root testing conducted showed that all variables became stationary when first differenced. It was settled that all variables in the model of the study became stationary when integrated of

order one, *I (1)*. When a long-term relationship is established between variables, it can be represented by a VAR with error correction through application of the Vector Error correction model (VECM). Establishing the VECM test allows for the determination of the optimal number of lags to be used in the model.

5.3.1.2 Optimal lag length selection criteria

Table 5.3 gives the optimal lag length selection for this study. The quarterly time series data from this study is drawn from a maximum of five lags to allow for modifications in the model. Although other methods use five lags, Schwarz Information Criterion (SC) chose to use only one lag. Based on the Johansen co-integration test, this study used only one lag for a vector autoregressive model (VAR).

Table 5.3: VAR lag order selection criteria

0	-266.8454	NA	0.000445	6.472510	6.617202	6.530675
1	244.6718	949.9606	4.15e-09	-5.111233	-4.243084*	-4.762245
2	278.1765	58.23430	3.41e-09	-5.313725	-3.722119	-4.673913
3	302.3939	39.20924	3.53e-09	-5.295094	-2.980030	-4.364458
4	387.2139	127.2299	8.77e-10	-6.719378	-3.680857	-5.497919
5	450.0363	86.75482*	3.75e-10*	-7.619913*	-3.857935	-6.107629*
6	464.5999	18.37784	5.20e-10	-7.371427	-2.885991	-5.568319
7	484.8341	23.12477	6.52e-10	-7.257955	-2.049062	-5.164024
8	514.3230	30.19104	6.86e-10	-7.364834	-1.432483	-4.980079

Notes
* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

5.3.1.3 Deterministic trend assumption (Pantula Principle test)

The Pantula Principal was applied to determine the appropriate model concerning the deterministic trend suitable for time series data in this study. The method entailed carrying out co-integration test for each of the models and comparing it to the trace statistic from the most restrictive options. Table 5.4 gives the final figures of the Pantula Principle test using trace statistic and model 3 was selected. The Johansen co-integration was, however, conducted under the hypotheses of intercept and trend.

Table 5.4: (Pantula Principle) – trend assumption

(R)	(n-r)	Model (2)		Model (3)		Model (4)	
		Trace Test statistic	Critical value	Trace Test statistic	Critical value	Trace Test statistic	Critical value
0	3	114.3549	76.9728	84.1420	69.8189	103.7440	88.8038
1	2	63.51251	54.0790	47.1465	47.8561	66.8761	63.8761

Note: * indicates the first time that the null cannot be rejected

5.3.1.4 Determination of the rank of Π

Tables 5.5 and 5.6 shows co-integration test results of the model based on trace and maximum eigenvalue statistics. Table 5.5 presents the Johansen co-integration test based on trace statistics whilst Table 5.6 shows the Johansen co-integration test founded on maximum eigenvalue statistics. "The trace statistic null hypothesis states that the number of co-integrating equations is more than the number of variables included in the model" (Hendry *et al.,* 2000). If the t-statistic value is less than the 5% critical value, the null hypothesis fails to be rejected. From Table 5.5, we reject the null hypothesis since the t-statistic of 84.1420 is above the 5% critical value of 69.8189. The null hypothesis that states that there are two co-integrating vectors cannot be rejected because the t-statistic of 26.7535 is less than the five percent critical value of 29.7971. The trace statistic indicates one co-integrating relationship at five percent significance level.

The hypothesis of *r* co-integrating equations assesses the number of the co-integrating equations using the maximum eigenvalue. When the test statistic is less than the critical value of maximum eigenvalue, we fail to reject the null hypothesis. The maximum eigenvalue test rejects the null hypothesis since the test statistic of 36.9955 is more than the five percent critical value of 33.8769. The test statistic of 20.3930, which is less than the critical value of 27.5843 at five percent, resulted in the null hypothesis at the most co-integrating vector being accepted. The results revealed the existence of only one co-integrating connection in the model of financial development.

The results from Tables 5.5 and 5.6 show similar results on the co-integrating vectors. However, Johansen and Juselius (1990) advises the examination of the co-integrating vectors in cases where there are conflicting results of co-integration relationship in the model based on trace and maximum eigenvalue tests.

Table 5.5: Co-integration rank test (Trace)

The Trend assumption (Linear deterministic)

Series: LSMC CPI LGDP LM3 LPC

Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.33705	84.1420	69.8189	0.0024
At most 1	0.20275	47.1465	47.8561	0.0582
At most 2	0.15016	26.7535	29.7971	0.1078
At most 3	0.11779	12.1097	15.4947	0.1517
At most 4	0.00918	0.83032	3.84147	0.3622

Trace test indicates 1 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 5.6: Co-integration rank test (Maximum eigenvalue

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.33705	36.9955	33.8769	0.0205
At most 1	0.20275	20.3930	27.5843	0.3146
At most 2	0.15016	14.6437	21.1316	0.3146
At most 3	0.11779	11.2794	14.2646	0.1408
At most 4	0.00918	0.83032	3.84147	0.3622

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

It is essential to consider results from both tests because the co-integrating vector represents the deviations of the endogenous variables from the long-term equilibrium level. Results in Tables 5.5 and 5.6 can be presented graphically by plotting graphs of co-integrating variables as shown in Figure 5.3. One co-integrating vector in our VAR model realised from table 5.5 and 5.6, it is confirmed by the co-integrating graph in figure 5.3. The graph shows that between the periods of 1990 to 2012, the deviations of financial development from equilibrium were stationary. The error correction model can be specified from the results of the analysis.

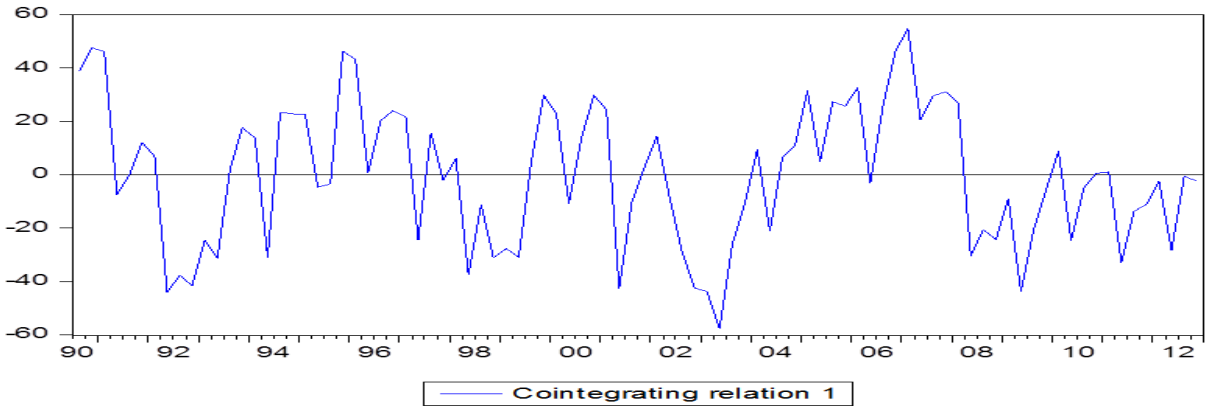

Figure 5.3: Co-integration graph

5.3.2 VECM modelling

5.3.2.1 Long-term relationship

A vector error correction model (VECM) was conducted after discovering the existence of co-integrating relationship in previous sections. A VECM permits us to differentiate long- and short-term effects of variables in a financial development model. To estimate the VECM outcomes for a number of co-integrating relationships, the number of lags and the deterministic trend assumption were used. According to Ali (2013) the coefficient signs are reversed when interpreting VECM results. The VECM long-term relationship outcomes are offered in Table 5.7;

Table 5.7: VECM- long-term relationships

Variable	Coefficient	Standard error	t-statistic
Constant	8231.264	-	-
CPI (-1)	4.2466	1.2305	-3.4511
LM3(-1)	478.4650	133.444	-3.5855
LPC (-1)	-261.6493	113.571	2.30384
LGDP (-1)	-869.8374	163.503	5.32000

In Table 5.7, the long-term effects of the variables explaining financial development are presented. The long term co-integration equation can be articulated as follows:

$$LSMC_t = 8231.264 + 4.247CPI_t + 478.465LM3_t - 261.649LPC_t - 869.837LGDP_t + \varepsilon_t \ldots\ldots (5.1)$$

Equation (5.1) is recommended considering respective signs of coefficients. From the results LCPI and LM3 are positively related to LSMC while LPC and LGDP are negatively related to financial development. Unit increase in inflation rate and money supply will result in financial development increasing by 4.247 and 478.465 respectively. The positive influence of LCPI is not in sync with priori expectation which states that, an increase in inflation rate results in lowering or declining of growth in financial sector.

The positive relationship between money supply and financial development conform to expected results of the study. The positive relationship found can be a result of more activity by financial intermediaries. It is argued that, as the financial sector develops and displays greater depth, there will be more involvement by financial intermediaries, suggesting that an increase in M3 does have a positive impact on financial development since there will be greater access to money in the country

Unit increases in private credit and gross domestic product result in financial development decreasing by 261.649 and 869.837 respectively. Theoretically, the impact of LPC on financial development is still questionable and debatable. Private credit, which is the credit given by money lenders, the banking sectors and other financial intermediaries excluding the government, is expected by the World Bank (2012) to have a positive influence on financial development. The negative influence LPC has on financial development is in sync with the expected results. Too much private undermine economic growth as investment is more on financial assets neglecting productive real assets.

From the empirical results there is evidence of a constructive and significant influence of gross domestic product on financial development. The coefficient of LGDP, which is statistically significant, implies that the gross domestic product improved financial development by about 869 units for every unit increase of LGDP. This is consistent with theory and *a priori*.

5.3.2.2 Short-term relationships

Analysis of this section examined the short-term effects of inflation, money supply, private credit and gross domestic product on the financial development sector in South Africa. The main aim was to determine whether the short-term dynamics are affected by the long-term equilibrium conditions. The nonconformities from the long-term association are highlighted by the coefficients of the variables in the co-integrating equation. The constants of the error terms point out the speed of alterations.

In Table 5.8, the constants of LPC and LGDP are related and lie between zero and one, demonstrating that these two variables revert back diverge to their long-term equilibrium. A positive coefficient specifies continued growth of any disequilibrium in the variables, which are noted from the study (CPI and LM3). Negative coefficients of LM3 and CPI in an error correction model represent an incomplete specification of the long-term connection between the variables. The coefficient of D (LSMC) of -0.037720, as indicated by Table 5.8, displays that the speed of adjustment is roughly 3.77%. This shows a non-conformity to equilibrium, only 3.77% is corrected as the variable changes towards returning to the equilibrium. The slow speed of adjustment of LSMC may suggest that there are other variables in the model that have an effect on financial development.

Table 5.8: VECM- short term relationships

Variable	Coefficient	Standard error	t-statistic
D(LSMC)	-0.0377	0.0195	-1.9331
D(CPI)	0.0220	0.0071	3.0940
D(LM3)	0.0003	0.0001	3.3843
D(LPC)	- 0.0002	9.8E-05	1.8979
D(LGDP)	-0.0003	0.0001	-2.2953

Impulse response and variance decomposition analysis can provide more information on the short term. Beforehand, bearing in mind variance decomposition and impulse response analysis, it is necessary to check that the results from the VECM reported originate from efficient models with well-mannered residuals. This is done by carrying out diagnostic tests on the residuals. Diagnostic checks were performed and results are shown in the following section.

5.4 DIAGNOSTIC CHECKS FOR THE VECMS

Diagnostic tests are important in validating the limit evaluation of the results attained by the model. The diagnostic checks indicate that the model is inefficient in the case where the estimated VAR model is subject to problems in residuals. The AR Roots test and serial

connection were conducted and the results are showed in Figure 5.4. The AR test assumes the stationarity of the estimated VAR if all roots fall within the sphere and their modules are less than one. From Figure 5.4 we can conclude that the VAR model is stable since all roots lay within the circle and were less than one. If the VAR model was not constant, impulse response standard error results would not be valid.

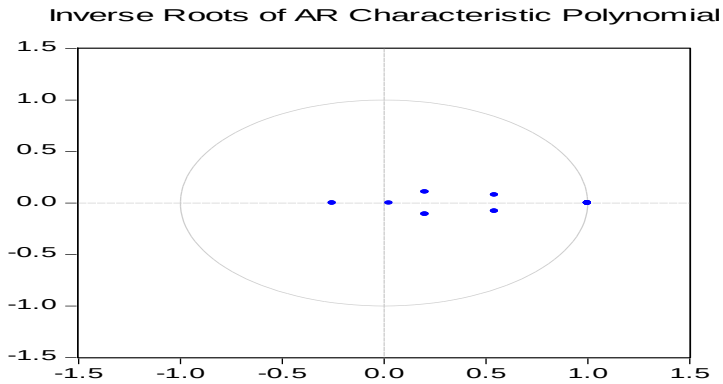

Figure 5.4: AR Roots Graph

Fitness of the model was conducted firstly by using the Lagrange Multiplier (LM) to tests for serial correlation. The subsequent step was to conduct the White test to examine the heteroskedasticity followed by Jarque-Bera for normality test. These diagnostic checks were founded on the null hypothesis, which specified the non-existence of serial association for the LM test. There was regularity for the Jarque-Bera test and there was no heteroskedasticity for the White heteroskedasticity test.

The presence of serial correlation was indicated when the probability was zero and when LM statistic was high. We did not reject the null hypothesis, which means that there is no serial relationship. Table 5.9 provides the LM statistic of 32.5977 and the probability of 0.1414. The LM results suggest that we accept the null hypothesis of no relationship and conclude that there is no serial correlation among the variables in this study.

Table 5.9: Lagrange multiplier test results

Lags	LM-Stat	Prob
1	32.5977	0.1414
2	46.8333	0.0051
3	39.6911	0.0314
4	149.9024	0.0000
5	32.5309	0.1432
6	34.7824	0.0922
7	24.4588	0.4930
8	102.5380	0.0000

9	34.2494	0.1027
10	29.6905	0.2361
11	27.2662	0.3427
12	80.6363	0.0000

Probs from chi-square with 25 df.

5.4.1 White heteroskedasticity test

The White heteroskedasticity was carried out in this study. The existence of heteroskedasticity meant that the model had no specifications; therefore, conclusive results could not be obtained from such a model. Table 5.10 presents the summarised results of heteroskedasticity using the White test. The test with no cross-terms provided a Chi-square of 183.2053 and probability of 0.4196. Based on the results in table 5.10, the null hypothesis, which assumed that there are no misspecifications, will be accepted.

Table 5.10: Heteroskedasticity test results

Joint test		
Chi-sq	Df	Prob
183.2053	180	0.4196

5.5 IMPULSE RESPONSE AND VARIANCE DECOMPOSITION

5.5.1 Impulse response analysis

This study concentrated on the impact of inflation on financial development. Impulse response investigates the sensitivity of the dependent variable to shocks of each explanatory variable in the study. Directional response of the dependent variable also indicates the lag structure in the economy. The impulse response function shows the dynamic response of financial development to changes on other variables in the study. It also indicates the direction and perseverance of the response to individual shocks over a 10 quarter period. Since the study focused on the effect of inflation on financial service sector development, the graphs in Figure 5.5 represent only the responses of financial development to other variables. Inflation and LGDP had a negative effect on financial development. A one-period standard deviation on LM3 and LPC had lasting positive influence on financial development. LPC shocks were not significantly away from zero and were temporary.

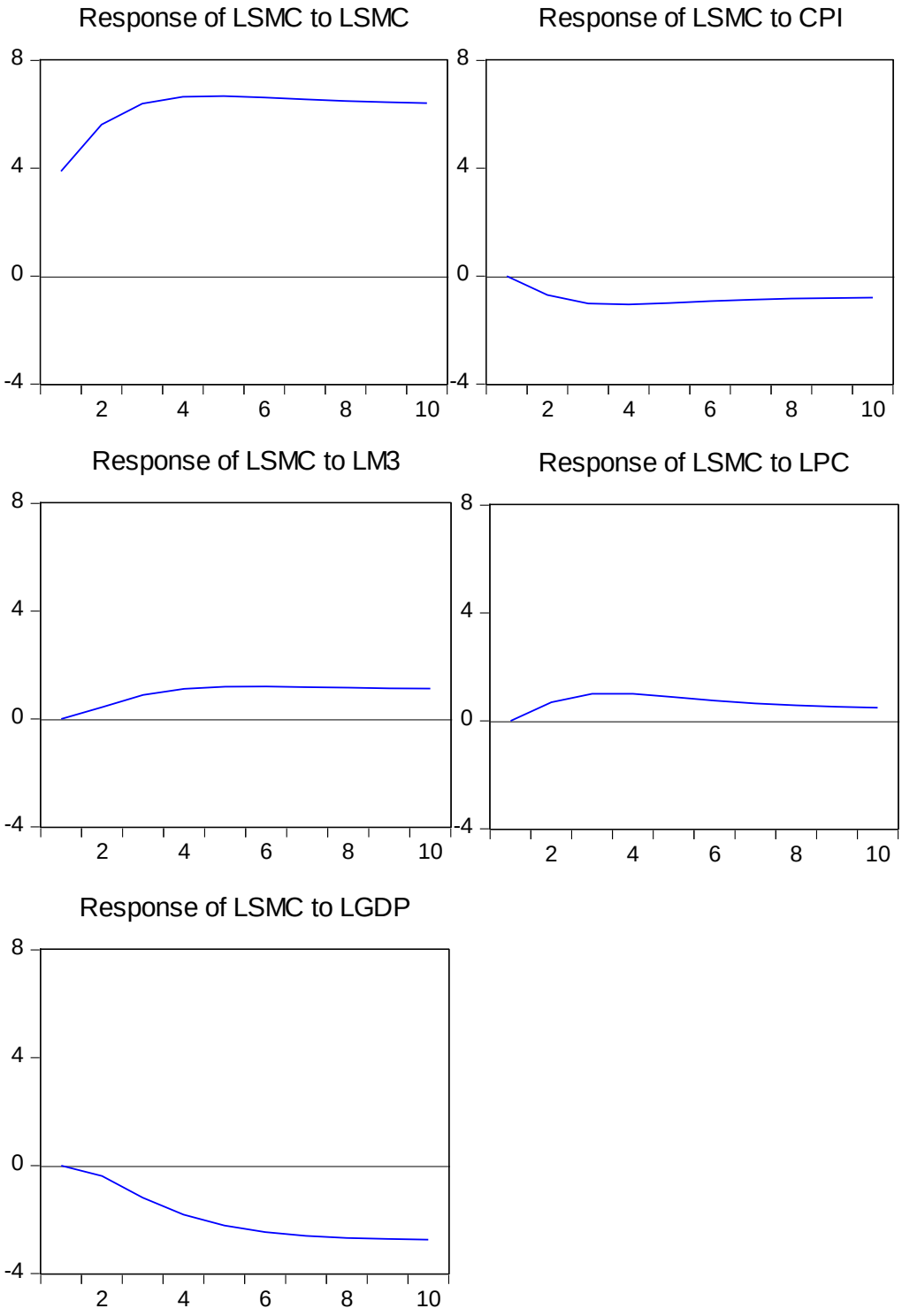

Figure 5.5: Impulse response

5.5.2 Variance decomposition

Variance decomposition examination offered a way of defining the significance of shocks in explaining variations of the variables in question. Movements in the sequence of the dependent variables' shocks were compared to shocks of other variables. This study therefore offered a

way of defining the importance of shocks to individual variables in explaining variations in financial development. Figure 5.6 presents the effects of the variance decomposition analysis.

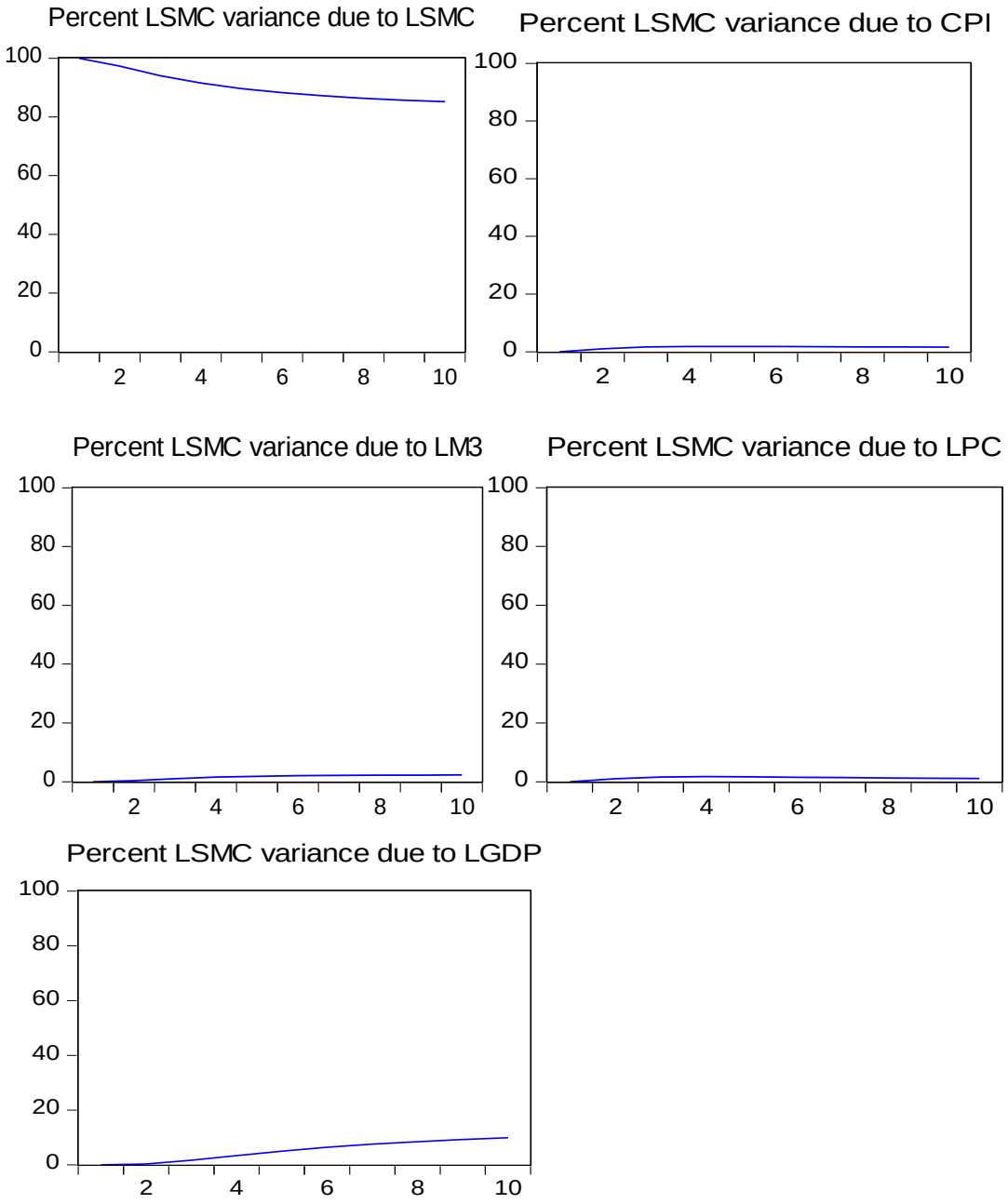

Figure 5.6: Variance decomposition analysis

The movement of financial development following its shocks and that of other variables were crucial in this study. The study permitted the variance decompositions for a period of 10 years with the aim of establishing the sound effects around variables when they were permitted to distress financial development for a relatively long time. Table 5.11 below presents variance decomposition of financial development for a period of 10 years in order to identify the most effective instrument to use.

Table 5.11: Variance decomposition

Period	S.E.	LSMC	CPI	LM3	LPC	LGDP
1	3.885795	100.0000	0.000000	0.000000	0.000000	0.000000
2	6.925218	97.27763	1.031243	0.390408	0.996320	0.304396
3	9.648377	94.04674	1.631052	1.045668	1.599697	1.676841
4	12.00059	91.52329	1.820055	1.547956	1.729933	3.378770
5	14.02718	89.64988	1.836650	1.860968	1.662474	4.990030
6	15.79718	88.25014	1.794435	2.045064	1.537821	6.372539
7	17.37276	87.18340	1.737301	2.152669	1.410191	7.516442
8	18.80120	86.35473	1.680982	2.216793	1.296387	8.451109
9	20.11650	85.69959	1.630486	2.256342	1.199499	9.214081
10	21.34276	85.17314	1.586814	2.281862	1.118174	9.840007

Brooks (2002) suggested that all the variances of LSMC are explained by its own shocks. 100% variation in LSMC was seen in the first period under the account of LSMC. In the fifth year ahead, 90% of the error variance was from financial development while the remaining 10% accounted for other variables used in the study (2% for inflation, 2% for LM3, 2% for LPC and remaining 6% for LGDP). After 10 periods, LSMC explained about 85% of its own variation, while 15% explained the other remaining variables. The influence of CPI, LM3, LPC and LGDP was 1.6%; 2.3%; 1.1% and 9.8% respectively. Shocks to variables continued to explain the proportion variation in financial development.

5.6 GRANGER CAUSALITY TEST

Investigating the impact of inflation on financial development was crucial to this study but defining the causal relationship between different determinants of financial growth and financial development was also important. To create the relationship between dependent and independent variables, the VAR Granger Causality tests was used and the results are presented in Table 5.12.

Table 5.12: Granger causality test

VEC Granger Causality Test

Date: 11/23/13Time: 13:39

Sample: 1990Q1 2012Q4

Included observations: 90

Dependent variable: D(LSMC)

Excluded	Chi-sq	Df	Prob.
D(LCPI)	4.213193	1	0.0401
D(LGDP)	0.821554	1	0.3647
D(LM3)	0.073758	1	0.7859
D(LPC)	4.053551	1	0.0441
All	8.900102	4	0.0636

The null hypothesis states that the endogenous variables which are the dependent variables, are not supposed to Granger cause. In a case where first series Granger cause second series or vice versa, the null hypothesis is rejected. *P*-values of LGDP and LM3 are above 0.05 which means, they do not Granger cause financial development in South Africa. In other words LGDP and LM3 do not have reverse causation from financial development since the F value is statistically insignificant. The values of LPC and LCPI allows the hypothesis to be accepted because the P-value is below 5% significance level hence we do not reject the null hypothesis. According to these results, these two variables have a causal relationship with financial development. The overall results have a p-value of 0.0636 which is above the 5% significance level therefore concluding that, all determinants in the study do not Granger cause financial development in South Africa.

5.7 CONCLUSION

This chapter investigated the impact of inflation on financial development and offered the results from the econometric analysis employing the different techniques as outlined in Chapter 4. It was divided into seven sections including the introduction. After the introduction in the first section, the second section presented both formal and informal unit root testing methods. Under informal unit root tests, graphical presentations were made to determine stationarity of variable whereas in formal unit root testing, the ADF and PP tests were utilised to check for stationarity. The results revealed that the data becomes non-stationary when first differenced.

The third section discussed co-integration whereby the Johansen maximum likelihood approach is used. Firstly, a pair-wise correlation matrix was presented to monitor the variable selection exercise. Secondly, the information criteria approach was used for optimal lag length selection and one lag was used for the VAR in the study. Thirdly, the Pantula Principle test was presented in choosing the correct model to use in the study and model three was chosen. Thus, the Johansen co-integration test was performed under the assumption of intercept and trend. Maximum eigenvalue and trace statics were used to determine the number of co-integrating vectors. Both tests revealed that at least two co-integrating equations existed at five percent significance level. One co-integrating equation was established and this allowed for the estimation of the VECM in the third section.

Diagnostic checks, impulsive response and variance decomposition analyses were presented in the fifth and sixth sections respectively. To assess the suitability of the model, autocorrelation, heteroskedasticity and normality tests were used. They all pointed out that the model was suitable. Variance decomposition and impulse response analyses were used to determine how financial development reacts to shocks in itself as well as to shocks in any of the determinants, which shock is comparatively most significant, and the average period it takes for financial development to restore its equilibrium following such a shock. Results from this research can be trusted since most shocks were not persistent.

The Granger causality test was used in the sixth section to examine the existence of causation between the variables and it was concluded that all the variables in the study do not cause financial development in South African economy. Lastly, the seventh section was a summary and conclusion of the econometric tests performed in this chapter and chapter 4. These results compel conclusions on the impact of inflation on financial development and also leave room for policy recommendations concerning this study.

6

CONCLUSIONS, POLICY RECOMMENDATIONS AND LIMITATIONS

6.1 SUMMARY OF THE STUDY AND CONCLUSIONS

The main objective of the study was to analyse the long-term relationship between financial development and inflation in South Africa. Chapter 1 introduced the study's focus area and its background. The chapter also presented the study's objectives, aim, hypotheses, rationale and the research problem. Furthermore, Chapter 1 showed that the study had other objectives such as to provide an overview of inflationary and financial sector developments in South Africa and to empirically examine the impact of inflation on financial development. It was also revealed that the study was triggered by results from empirical studies carried out so far showing that in Sub-Saharan countries very few studies have been conducted. Lack of consent on the association between inflation and financial growth has been evident by the few studies that have been carried so far. Empirical results showed that most of these studies relied on cross-sectional or panel data, not focusing on specific countries. Thus, there was a shortage in available empirical literature on inflation and financial development in Africa, and specifically in South Africa. This, therefore, created the need to conduct the study.

In order to provide an overview of inflationary and financial sector developments in South Africa, Chapter 2 presented the inflation financial sector trends. The main aim of Chapter 2 was to evaluate and analyse the trends and causes of changes in the inflation rate in South Africa from 1990–2012. A significant outcome was the effect CPI had on financial sector performance and was presented through a graphical presentation. This overview reviewed the effectiveness of money supply targeting and inflation targeting in promoting price stability in the economy. It was important to analyse these trends so as to understand how the implementation of inflation targeting and an increase and a decrease in inflation rate affected financial sector performance in both the short- and long-term.

Chapter 3, which gave an overview of the empirical and theoretical literature. The theoretical literature framework showed that the theory of financial liberalisation allows the interest rates and capital flow to fluctuate freely, thus to be volatile due to the elimination of restrictions on both the former and the latter. The theory also argued strongly against policies under which an

economy is financially repressed, where there will be interest rate ceilings and controls over trade and capital flows. The study concluded from the results of different empirical studies carried out that inflation did have both negative and positive influence on economic growth and financial development, which could only be established empirically.

The methodology of the study was explained in Chapter 4, giving an analytical framework on the econometric tools that were used in this study to help determine the impact inflation had on financial development in the South African economy. The inflation rate, money supply, private credit and gross domestic product were used as the explanatory variables of financial development. However, stock market capitalisation was identified as a measure for financial sector development. Theoretical and empirical literature from chapter 3 formulated the model used in study. This chapter showed that the study used time series data and saw the need to test for stationarity and avoid spurious regression in the model. Informal and formal unit root tests were explained in detail; where informal tests results were presented by means of graphical presentations. As for the formal unit root test, ADF and PP test were employed in the study. The Johansen (1991) test and Engle-Granger test were used to analyse co-integrating relationship among variables. The diagnostic checks discussed included heteroskedasticity, the residual normality test, and the autocorrelation Lagrange multiplier. Variance decomposition and impulse response analysis were also explained in the chapter. Lastly, the Granger causality, which tests for causality between variables, was also expanded upon.

Chapter 5 analysed and presented the study's findings. Under informal unit root tests, graphical presentations were used to determine stationarity of variable whereas in formal unit root testing, the ADF and PP tests were utilised to test for stationarity. These tests identified that the data series are stationary when first differenced.

In the third section, co-integration was discussed where the Johansen maximum likelihood approach was used. Firstly, a pair-wise correlation matrix was presented to monitor the variable selection exercise. Secondly, the information criteria approach was used for optimal lag length selection and one lag was used for the VAR in the study. Thirdly, the Pantula Principle test was presented in choosing the correct model to use in the study and model three was chosen. Thus, the Johansen co-integration test was performed under the assumption of intercept and trend. The co-integration test followed whereby the trace and maximum Eigen-value co-integration tests were used. Both tests revealed that at least two co-integrating equations existed

at 5% significance level. One co-integrating equation was established and this allowed for the estimation of the VECM in the third section.

Diagnostic checks, variance decomposition and impulsive response analyses were presented in the fifth and sixth sections respectively. To assess the suitability of the model, autocorrelation, heteroskedasticity and normality tests were used. They all pointed out that the model was suitable. Impulse response and variance decomposition analysis were conducted to determine how financial development reacted to shocks in itself as well as to shocks in any of the determinants as well as to determine which shock is comparatively most significant and the average period it takes for financial development to restore its equilibrium following such a shock. Findings from this research can be trusted since most shocks where not persistent.

The Granger causality test examined the existence of causality between the variables. It was, however, established that all the variables used in the study did not granger cause financial development in the South African economy. The F value of 0.0636 is less than 5 % significance level therefore we do not reject the null hypothesis which means there is no causal relationship from financial development to independent variables in the study. Lastly, the seventh section was a summary and conclusion of the econometric tests performed. The results shows that there is a negative relationship between inflation and financial sector. This notion supports the results that were expected from the study. The use of different variables to determine relationship between inflation and financial development, leaves room for policy recommendations concerning this study.

6.2 POLICY IMPLICATIONS AND RECOMMENDATIONS

The negative relationship between inflation and financial development is as result of the inflation rate being above 6%. If the inflation rate falls within the target range, there will be a positive relationship between inflation and financial development. We recommend that the SARB should keep inflation within its target range (3–6%). It should ensure that inflation does not go beyond 6%. This would ensure price stability and restore investor confidence in the financial sector, which then improves financial sector development. The main goal of the monetary policy framework in South Africa is to maintain and achieve price stability, balanced economic growth and development. Uncertainty is reduced in the economy and, hence, provides a positive environment for employment creation and growth. Additionally, a low inflation rate protects the buying power of all South Africans, which is quite favourable to those who save in the financial sector.

The negative relationship between money supply and financial sector development might be indirect, in the sense that it comes from inflation. An increase in supply of money results in an increase in the level of the general prices. This concept was validated by the classicalists and the monetarists. For instance, the monetarists are under the impression that anywhere in the world, inflation is always a painful phenomenon. The SARB is therefore, advised to use money supply with caution. They must make sure that whenever the money supply is increased, the target range of inflation is maintained. This will ensure that inflation will be kept under control regardless of the changes in money supply. If inflation is not kept under control, an increase in money supply would cause inflation to rise and this will have a negative impact on the financial sector.

The positive relationship between private credit and financial sector development should allow government to create a conducive environment for private credit institutions. In other words, the government must remove all obstacles that hinder the flow of private credit. This would make it easy and possible for private credit institutions to conduct their transactions and then improve financial sector development. Many firms in the financial sector rely on credit, and if there are obstacles in the processing of credit, they face difficulties in developing. The results illustrate a progressive relationship between GDP and financial sector development. The study recommends that the government comes up with measures to improve economic growth. They can do this by attracting foreign investment to increase economic growth. This will lead to financial sector growth and development.

6.3 ETHICAL CONSIDERATIONS

The researcher was aware of ethical issues arising from the use of data and information, and also of the need to apply to the Ethical Body of Institution for ethical clearance. However, the study involved the use of secondary data and desktop analysis, which required no ethical considerations. Acknowledgement was made in the text to data sources and works of others that were cited.

6.4 DELIMITATIONS OF THE STUDY AND AREAS FOR FURTHER RESEARCH

This study examined the impact of inflation on financial development covering only the South African market. This was done in order to have a detailed analysis in one of the top developing countries in Africa. To highlight the impact of monetary policy framework in the economy, the study was conducted for a period that covered before and after the introduction of inflation targeting. This gave different result expectations as some studies argued that there is no

relationship between inflation and financial development, while others support the notion that there is a long-term relationship between the two variables. The methodology of the study is limited to a few dependent variables that are different from other variables that were used in the past.

Empirical results shows that a few studies have been done to determine the relationship between inflation and financial development in South Africa. This could be as a results of the changing monetary policy framework between 1970 and 2000. The studies that have been carried so far have used different variables to test and determine the relationship between inflation and financial sector performance. Due to changes in the monetary framework regime in the South African economy and use of different variables, I recommend more research on the impact inflation has on financial development.

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APPENDICES

Appendix 1: Data

PERIOD	SMC	PC	M3	GDP	CPI
1990Q1	25.06953	11.90019	11.91628	12.49521	14.0
1990Q2	29.68672	11.95926	11.93859	12.50948	13.6
1990Q3	33.10859	11.97384	11.94566	12.51861	14.3
1990Q4	35.33516	12.02116	11.99126	12.52660	14.6
1991Q1	36.36641	12.07399	12.04738	12.48421	15.7
1991Q2	36.20234	12.11468	12.08478	12.49900	15.2
1991Q3	34.84297	12.14755	12.09375	12.51033	15.4
1991Q4	32.28828	12.15543	12.10557	12.51543	16.2
1992Q1	21.16719	12.16630	12.13011	12.47737	15.7
1992Q2	19.17031	12.20162	12.15027	12.48455	15.1
1992Q3	18.92656	12.23091	12.18175	12.48097	13.5
1992Q4	20.43594	12.24512	12.18976	12.47994	9.6
1993Q1	28.77266	12.25753	12.18652	12.45744	9.7
1993Q2	31.75859	12.26995	12.18282	12.48815	10.0
1993Q3	34.46797	12.31186	12.22504	12.50921	9.1
1993Q4	36.90078	12.33791	12.26131	12.51604	9.5
1994Q1	38.96328	12.37024	12.30706	12.47520	9.0
1994Q2	40.88047	12.39728	12.32462	12.52968	7.5
1994Q3	42.55859	12.45078	12.35587	12.54093	10.1
1994Q4	43.99766	12.49336	12.40398	12.55166	9.9
1995Q1	46.03359	12.53142	12.41798	12.51567	10.2
1995Q2	46.66016	12.57838	12.48789	12.53979	10.0
1995Q3	46.71328	12.61549	12.50606	12.57814	6.4
1995Q4	46.19297	12.65481	12.54389	12.58667	6.9
1996Q1	43.45859	12.70306	12.59835	12.55339	6.3
1996Q2	42.44766	12.75056	12.65878	12.59892	6.9
1996Q3	41.51953	12.77959	12.67909	12.61407	8.4
1996Q4	40.67422	12.80130	12.70088	12.62278	9.4
1997Q1	40.77891	12.84879	12.75751	12.58733	9.6
1997Q2	39.75234	12.89895	12.78565	12.63122	8.8
1997Q3	38.46172	12.91328	12.84605	12.63723	8.0
1997Q4	36.90703	12.93753	12.85803	12.63841	6.1
1998Q1	30.54531	12.98698	12.89940	12.60007	5.4

1998Q2	30.27969	13.04507	12.93636	12.63260	5.2
1998Q3	31.56719	13.05699	12.96389	12.63873	9.1
1998Q4	34.40781	13.09505	12.99331	12.64374	9.0
1999Q1	47.10625	13.11939	12.98931	12.61048	7.9
1999Q2	49.73125	13.14642	13.01370	12.65114	7.3
1999Q3	50.58750	13.16392	13.04850	12.66615	1.9
1999Q4	49.67500	13.18298	13.09349	12.67983	2.2
2000Q1	42.31016	13.19597	13.08250	12.64538	3.4
2000Q2	39.73359	13.21083	13.08915	12.68437	5.1
2000Q3	37.26172	13.25942	13.12158	12.71686	6.8
2000Q4	34.89453	13.28786	13.15338	12.72326	7.0
2001Q1	29.59688	13.29036	13.20599	12.68239	7.4
2001Q2	28.65313	13.30926	13.22648	12.72092	6.3
2001Q3	29.02813	13.35112	13.26030	12.73219	4.4
2001Q4	30.72188	13.41932	13.29476	12.74319	4.6
2002Q1	39.18750	13.41464	13.29476	12.71682	6.2
2002Q2	41.33750	13.42605	13.40749	12.75767	8.0
2002Q3	42.62500	13.43909	13.43382	12.76682	11.2
2002Q4	43.05000	13.45345	13.46117	12.78136	12.4
2003Q1	38.28047	13.56704	13.50198	12.74838	10.2
2003Q2	38.71328	13.59181	13.55582	12.78925	6.7
2003Q3	40.01641	13.60665	13.57419	12.79642	3.7
2003Q4	42.18984	13.62484	13.59241	12.80507	0.3
2004Q1	48.49141	13.62958	13.63492	12.78517	0.4
2004Q2	51.10234	13.64600	13.65848	12.82588	1.2
2004Q3	53.28047	13.69327	13.71416	12.84541	1.3
2004Q4	55.02578	13.76337	13.72162	12.86018	3.4
2005Q1	54.31875	13.78782	13.75231	12.83821	3.0
2005Q2	56.00625	13.84890	13.81402	12.87647	2.8
2005Q3	58.06875	13.90142	13.87611	12.89852	4.4
2005Q4	60.50625	13.93891	13.91391	12.90925	3.6
2006Q1	65.33438	14.00831	13.99960	12.88778	3.4
2006Q2	67.71562	14.06388	14.02835	12.92464	4.9
2006Q3	69.66562	14.12632	14.06518	12.94966	5.3
2006Q4	71.18437	14.16061	14.11635	12.97775	5.8
2007Q1	76.22539	14.22120	14.18257	12.95225	6.1
2007Q2	75.30023	14.28514	14.23642	12.97853	7.0
2007Q3	72.36242	14.32935	14.28754	12.99951	7.2
2007Q4	67.41195	14.35932	14.33496	13.02623	9.0
2008Q1	48.39688	14.42974	14.37204	12.98924	10.6

2008Q2	44.24188	14.46869	14.41999	13.02780	12.2
2008Q3	42.89500	14.47765	14.44100	13.03822	13.1
2008Q4	44.35625	14.49680	14.46501	13.04414	9.5
2009Q1	61.17758	14.51123	14.47383	12.98033	8.5
2009Q2	63.23430	14.50960	14.48063	13.00081	6.9
2009Q3	63.07836	14.49593	14.47945	13.01813	6.1
2009Q4	60.70977	14.49612	14.47988	13.03859	6.3
2010Q1	56.12852	14.50478	14.49109	13.00296	5.1
2010Q2	49.33461	14.51894	14.50785	13.03351	4.1
2010Q3	40.32805	14.53835	14.52797	13.05107	3.2
2010Q4	29.10883	14.54965	14.54443	13.07158	3.5
2011Q1	29.54582	14.55446	14.55540	13.03956	4.1
2011Q2	29.53120	14.57074	14.56866	13.06851	5.0
2011Q3	29.48490	14.59042	14.59263	13.08229	5.7
2011Q4	29.56377	14.60949	14.62253	13.10486	6.1
2012Q1	29.61350	14.64220	14.62017	13.06330	6.0
2012Q2	29.62628	14.65411	14.63740	13.09858	5.5
2012Q3	29.67699	14.67680	14.66473	13.10474	5.5
2012Q4	29.75733	14.70523	14.67231	13.12927	5.7

Appendix 2: VAR Lag Order Selection Criteria

VAR Lag Order Selection Criteria

Endogenous variables: LSMC CPI LM3 LPC LGDP

Exogenous variables: C

Date: 11/29/13 Time: 09:41

Sample: 1990Q1 2012Q4

Included observations: 84

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-266.8454	NA	0.000445	6.472510	6.617202	6.530675
1	244.6718	949.9606	4.15e-09	-5.111233	-4.243084*	-4.762245
2	278.1765	58.23430	3.41e-09	-5.313725	-3.722119	-4.673913
3	302.3939	39.20924	3.53e-09	-5.295094	-2.980030	-4.364458
4	387.2139	127.2299	8.77e-10	-6.719378	-3.680857	-5.497919
5	450.0363	86.75482*	3.75e-10*	-7.619913*	-3.857935	-6.107629*
6	464.5999	18.37784	5.20e-10	-7.371427	-2.885991	-5.568319
7	484.8341	23.12477	6.52e-10	-7.257955	-2.049062	-5.164024
8	514.3230	30.19104	6.86e-10	-7.364834	-1.432483	-4.980079

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Appendix 3: Vector Error Correction Model- Long run relationship

Vector Error Correction Estimates
Date: 06/06/16 Time: 17:30
Sample (adjusted): 1990Q4 2012Q4
Included observations: 89 after adjustments
Standard errors in ( )& t-statistics in [ ]

CointegratingEq:	CointEq1
LSMC(-1)	1.000000
LCPI(-1)	-4.246595
	(1.23052)
	[-3.45106]
LM3(-1)	-478.4650
	(133.444)
	[-3.58551]
LPC(-1)	261.6493
	(113.571)
	[2.30384]
LGDP(-1)	869.8374
	(163.503)
	[5.32000]
C	-8231.264

Error Correction:	D(LSMC)	D(LCPI)	D(LM3)	D(LPC)	D(LGDP)
CointEq1	-0.037720	0.022048	0.000338	- 0.000187	-0.000287
	(0.01951)	(0.00713)	(0.00010)	(9.8E-05)	(0.00012)
	[-1.93306]	[3.09402]	[3.38427]	[1.89788]	[-2.29532]
D(LSMC(-1))	0.511530	0.012514	9.17E-05	0.000203	-0.000137
	(0.11069)	(0.03742)	(0.00053)	(0.00052)	(0.00071)
	[4.62146]	[0.33440]	[0.17377]	[0.39022]	[-0.19348]
D(LSMC(-2))	0.044128	-0.098143	0.000181	-8.58E-05	0.000588
	(0.11186)	(0.03782)	(0.00053)	(0.00053)	(0.00071)

	[0.39449]	[-2.59514]	[0.33873]	[-0.16306]	[0.82445]
D(LCPI(-1))	-0.760268	0.315658	0.000875	0.001070	0.001743
	(0.29106)	(0.09840)	(0.00139)	(0.00137)	(0.00186)
	[-2.61205]	[3.20777]	[0.63082]	[0.78144]	[0.93855]
D(LCPI(-2))	0.505428	0.080588	0.004223	0.004546	-0.000802
	(0.30894)	(0.10445)	(0.00147)	(0.00145)	(0.00197)
	[1.63603]	[0.77157]	[2.86897]	[3.12727]	[-0.40688]
D(LM3(-1))	-4.347170	7.752374	-0.058001	0.164047	0.050885
	(22.8251)	(7.71685)	(0.10876)	(0.10739)	(0.14563)
	[-0.19046]	[1.00460]	[-0.53329]	[1.52759]	[0.34941]
D(LM3(-2))	-7.698788	9.445785	-0.000765	0.065655	-0.016611
	(22.9058)	(7.74413)	(0.10914)	(0.10777)	(0.14615)
	[-0.33611]	[1.21973]	[-0.00701]	[0.60922]	[-0.11366]
D(LPC(-1))	37.27046	-7.437428	0.097438	0.107154	0.126579
	(24.7205)	(8.35767)	(0.11779)	(0.11631)	(0.15772)
	[1.50767]	[-0.88989]	[0.82721]	[0.92130]	[0.80254]
D(LPC(-2))	3.161859	-15.09796	0.214220	-0.080836	0.082930
	(24.0969)	(8.14683)	(0.11482)	(0.11337)	(0.15375)
	[0.13121]	[-1.85323]	[1.86571]	[-0.71301]	[0.53940]
D(GDP(-1))	15.46872	-14.14519	-0.219846	-0.159164	-0.420348
	(21.6070)	(7.30503)	(0.10296)	(0.10166)	(0.13786)
	[0.71591]	[-1.93636]	[-2.13535]	[-1.56567]	[-3.04912]
D(LGDP(-2))	12.08400	-12.68098	-0.076863	-0.056886	-0.275827
	(19.0975)	(6.45660)	(0.09100)	(0.08985)	(0.12185)
	[0.63275]	[-1.96403]	[-0.84466]	[-0.63312]	[-2.26371]
C	-1.113479	0.293410	0.025298	0.024873	0.004113
	(1.08003)	(0.36514)	(0.00515)	(0.00508)	(0.00689)
	[-1.03097]	[0.80355]	[4.91582]	[4.89494]	[0.59684]
R-squared	0.334363	0.344052	0.325449	0.318217	0.223352
Adj. R-squared	0.239272	0.250345	0.229085	0.220819	0.112402

Sum sq. resids	1206.903	137.9518	0.027402	0.026716	0.049131
S.E. equation	3.959049	1.338500	0.018865	0.018627	0.025260
F-statistic	3.516240	3.671573	3.377278	3.267192	2.013093
Log likelihood	-242.3049	-145.7885	233.5313	234.6600	207.5494
Akaike AIC	5.714717	3.545808	-4.978232	-5.003594	-4.394369
Schwarz SC	6.050263	3.881355	-4.642686	-4.668048	-4.058822
Mean dependent	-0.037655	-0.096629	0.030637	0.030690	0.006861
S.D. dependent	4.539166	1.545922	0.021485	0.021102	0.026812

Determinant resid covariance (dof adj.)	1.82E-09
Determinant resid covariance	8.82E-10
Log likelihood	296.3599
Akaike information criterion	-5.199099
Schwarz criterion	-3.381555

Appendix 4: Cointegration Rank Test

Date: 11/29/13 Time: 09:55

Sample (adjusted): 1990Q3 2012Q4

Included observations: 90 after adjustments

Trend assumption: Linear deterministic trend

Series: LSMC CPI LM3 LPC LGDP

Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.337054	84.14203	69.81889	0.0024
At most 1	0.202752	47.14650	47.85613	0.0582
At most 2	0.150161	26.75346	29.79707	0.1078
At most 3	0.117791	12.10973	15.49471	0.1517
At most 4	0.009183	0.830316	3.841466	0.3622

Trace test indicates 1 cointegratingeqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.337054	36.99553	33.87687	0.0205
At most 1	0.202752	20.39304	27.58434	0.3146

At most 2	0.150161	14.64373	21.13162	0.3146
At most 3	0.117791	11.27941	14.26460	0.1408
At most 4	0.009183	0.830316	3.841466	0.3622

Max-eigenvalue test indicates 1 cointegratingeqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

LSMC	CPI	LM3	LPC	LGDP
0.047640	-0.202308	-22.79406	12.46497	41.43903
0.042469	-0.176668	26.76256	-22.44096	-23.54365
0.072333	0.261250	-1.455473	4.799334	-13.59395
-0.009458	-0.067915	-21.50647	23.33543	-4.168732
-0.004281	-0.026120	-2.784659	3.922017	-9.337144

Unrestricted Adjustment Coefficients (alpha):

D(LSMC)	-0.791777	-0.503843	-1.012544	0.120215	0.203049
D(CPI)	0.462796	0.211871	-0.368382	0.100647	-0.045415
D(LM3)	0.007100	0.000769	0.002482	0.002966	0.001164
D(LPC)	0.003920	0.004423	0.001082	-0.003458	0.001041
D(LGDP)	-0.006022	0.007978	0.001053	0.004586	-2.83E-05

1 Cointegrating Equation(s): Log likelihood 276.2749

Normalized cointegrating coefficients (standard error in parentheses)

LSMC	CPI	LM3	LPC	LGDP
1.000000	-4.246595	-478.4650	261.6493	869.8374

	(1.23052)	(133.444)	(113.571)	(163.503)
Adjustment coefficients (standard error in parentheses)				
D(LSMC)	-0.037720			
	(0.01951)			
D(CPI)	0.022048			
	(0.00713)			
D(LM3)	0.000338			
	(0.00010)			
D(LPC)	0.000187			
	(9.8E-05)			
D(LGDP)	-0.000287			
	(0.00012)			

2 Cointegrating Equation(s):	Log likelihood	286.4715		
Normalized cointegrating coefficients (standard error in parentheses)				
LSMC	CPI	LM3	LPC	LGDP
1.000000	0.000000	53862.38	-38463.92	-68939.34
		(12169.3)	(10344.1)	(13837.0)
0.000000	1.000000	12796.33	-9119.206	-16438.86
		(2882.25)	(2449.97)	(3277.26)
Adjustment coefficients (standard error in parentheses)				
D(LSMC)	-0.059118	0.249196		
	(0.02590)	(0.10901)		
D(CPI)	0.031045	-0.131058		
	(0.00943)	(0.03969)		

D(LM3)	0.000371	-0.001572		
	(0.00013)	(0.00056)		
D(LPC)	0.000375	-0.001575		
	(0.00013)	(0.00054)		
D(LGDP)	5.19E-05	-0.000191		
	(0.00016)	(0.00066)		

3 Cointegrating Equation(s):	Log likelihood	293.7933

Normalized cointegrating coefficients (standard error in parentheses)

LSMC	CPI	LM3	LPC	LGDP
1.000000	0.000000	0.000000	-8.654952	2.834041
			(18.4556)	(76.8884)
0.000000	1.000000	0.000000	16.78941	-59.94991
			(4.58556)	(19.1041)
0.000000	0.000000	1.000000	-0.713954	-1.279969
			(0.04272)	(0.17800)

Adjustment coefficients (standard error in parentheses)

D(LSMC)	-0.132358	-0.015331	6.037425
	(0.03765)	(0.14625)	(13.7335)
D(CPI)	0.004399	-0.227298	-4.342632
	(0.01371)	(0.05325)	(5.00030)
D(LM3)	0.000550	-0.000924	-0.144891
	(0.00020)	(0.00078)	(0.07313)
D(LPC)	0.000453	-0.001292	0.027442
	(0.00019)	(0.00075)	(0.07052)

D(LGDP)	0.000128	8.37E-05	0.349244	
	(0.00024)	(0.00093)	(0.08692)	

4 Cointegrating Equation(s):	Log likelihood	299.4330

Normalized cointegrating coefficients (standard error in parentheses)

LSMC	CPI	LM3	LPC	LGDP
1.000000	0.000000	0.000000	0.000000	-31.38772
				(12.2865)
0.000000	1.000000	0.000000	0.000000	6.435562
				(4.07914)
0.000000	0.000000	1.000000	0.000000	-4.102950
				(0.14172)
0.000000	0.000000	0.000000	1.000000	-3.954009
				(0.18155)

Adjustment coefficients (standard error in parentheses)

D(LSMC)	-0.133495	-0.023496	3.452027	-0.617031
	(0.03781)	(0.14855)	(16.0868)	(13.6625)
D(CPI)	0.003447	-0.234133	-6.507200	1.594816
	(0.01373)	(0.05395)	(5.84273)	(4.96222)
D(LM3)	0.000522	-0.001125	-0.208684	0.152390
	(0.00020)	(0.00078)	(0.08466)	(0.07190)
D(LPC)	0.000486	-0.001057	0.101818	-0.125903
	(0.00019)	(0.00075)	(0.08116)	(0.06893)
D(LGDP)	8.47E-05	-0.000228	0.250617	-0.142033
	(0.00023)	(0.00092)	(0.09973)	(0.08470)

Appendix 5: Variance decomposition

Variance Decomposition of LSMC:						
Period	S.E.	LSMC	CPI	LM3	LPC	LGDP
1	3.885795	100.0000	0.000000	0.000000	0.000000	0.000000
2	6.925218	97.27763	1.031243	0.390408	0.996320	0.304396
3	9.648377	94.04674	1.631052	1.045668	1.599697	1.676841
4	12.00059	91.52329	1.820055	1.547956	1.729933	3.378770
5	14.02718	89.64988	1.836650	1.860968	1.662474	4.990030
6	15.79718	88.25014	1.794435	2.045064	1.537821	6.372539
7	17.37276	87.18340	1.737301	2.152669	1.410191	7.516442
8	18.80120	86.35473	1.680982	2.216793	1.296387	8.451109
9	20.11650	85.69959	1.630486	2.256342	1.199499	9.214081
10	21.34276	85.17314	1.586814	2.281862	1.118174	9.840007

Variance Decomposition of CPI:						
Period	S.E.	LSMC	CPI	LM3	LPC	LGDP
1	1.419017	0.434933	99.56507	0.000000	0.000000	0.000000
2	2.263118	0.261701	97.48879	0.000338	0.010835	2.238332
3	2.942897	0.264145	92.71180	0.033100	0.080583	6.910370
4	3.530315	0.410109	87.26889	0.047518	0.402614	11.87087
5	4.056063	0.674468	82.30968	0.043117	0.912919	16.05982
6	4.535696	0.999321	78.14583	0.034941	1.484522	19.33539
7	4.978073	1.332831	74.76646	0.029441	2.033221	21.83805
8	5.389301	1.643865	72.05369	0.027230	2.521149	23.75406
9	5.774089	1.919247	69.87447	0.027253	2.939077	25.23995
10	6.136267	2.156600	68.11143	0.028456	3.291200	26.41232

Variance Decomposition of LM3:

Period	S.E.	LSMC	CPI	LM3	LPC	LGDP
1	0.019904	0.017375	0.605573	99.37705	0.000000	0.000000
2	0.028425	0.078399	0.448492	96.74514	1.655312	1.072658
3	0.036251	0.274903	0.540279	89.29125	3.537085	6.356481
4	0.043980	0.711320	0.800735	81.51142	5.713833	11.26270
5	0.051593	1.253284	1.101078	75.07615	7.616512	14.95298
6	0.058901	1.794934	1.374564	70.23246	9.154055	17.44398
7	0.065815	2.276970	1.600748	66.66175	10.34717	19.11336
8	0.072310	2.683147	1.781247	64.01618	11.26640	20.25302
9	0.078403	3.016888	1.923942	62.02383	11.97825	21.05708
10	0.084130	3.288859	2.037151	60.49289	12.53615	21.64495

Variance Decomposition of LPC:

Period	S.E.	LSMC	CPI	LM3	LPC	LGDP
1	0.019597	0.486534	0.917718	13.41112	85.18463	0.000000
2	0.031247	0.331698	0.390011	18.39720	80.43936	0.441735
3	0.041241	0.206449	0.232446	18.56111	78.56844	2.431556
4	0.050711	0.145466	0.194546	17.69184	76.87516	5.092995
5	0.059821	0.172220	0.226421	16.80201	75.41605	7.383307
6	0.068491	0.260302	0.289063	16.11298	74.24654	9.091114
7	0.076662	0.374011	0.357450	15.61465	73.34623	10.30766
8	0.084325	0.489239	0.420278	15.25708	72.65890	11.17450
9	0.091510	0.594354	0.474082	14.99651	72.13115	11.80391
10	0.098259	0.685517	0.518840	14.80199	71.72064	12.27301

Variance Decomposition of LGDP:

Period	S.E.	LSMC	CPI	LM3	LPC	LGDP
1	0.024889	2.287981	2.053243	3.056491	0.522602	92.07968
2	0.029446	1.872127	4.236716	7.429768	0.670236	85.79115
3	0.033854	1.782620	6.324809	10.40330	0.515751	80.97352
4	0.037626	1.815160	7.964282	12.05397	0.418437	77.74815
5	0.041126	1.891767	9.140723	13.03000	0.350692	75.58682

6	0.044365	1.966291	10.00003	13.67197	0.302131	74.05957
7	0.047399	2.028563	10.64303	14.13055	0.265506	72.93235
8	0.050256	2.077902	11.13968	14.47923	0.236832	72.06635
9	0.052963	2.116786	11.53387	14.75564	0.213763	71.37994
10	0.055540	2.147782	11.85429	14.98130	0.194807	70.82182