IMPLICATION OF FINANCIAL CRISES, FINANCIAL REGULATION AND BUSINESS CYCLE FOR BANK LENDING IN SOUTH AFRICA

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Declaration

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F.A. Akinsola **March 2016**

DEDICATION

I dedicate this work to God, my dear wife Motunrayo and daughters, Esther and Favour.

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ABSTRACT

This thesis examines the link between financial crisis, financial regulation and credit crunch in South Africa. This was done by assessing how periods of credit growth or crunch are associated with recession periods in South Africa, concentrating on both the demand-side and supply-side phenomenon of credit procyclicality. The data set for the study covers 21 years from 1990Q1 to 2013Q4. The financial variables and control variables were obtained from the South African Reserve Bank (SARB) and the IMF's International Financial Statistics (IFS). This study employed the Vector Autoregressive (VAR) based co-integration and vector error-correction models accompanied by impulse response and variance decomposition,

The first article examines the relationship between commercial bank lending and the business cycle from the demand side of credit procyclicality as occasioned by the activities of non-financial firms during a business cycle. The result shows that fluctuation in the business cycle can influence the credit growth. Disruptions in the flow of credit occasioned by a downturn in the economy can induce a crisis that affects the real sector of the economy.

The second article assesses the relationship between regulatory bank capital adequacy and the business cycle. The study asked questions on how an increase in bank regulation during a financial crisis amplifies the business cycle. The result shows that fluctuation in the business cycle can be amplified by the bank capital adequacy requirements.

The third essay examines the effect of bank regulation and how it might deepen the business cycle and accentuate the credit crunch. The study adopts the regulatory driven capital crunch hypothesis employing data from the SARB. The result shows a vivid relationship between prudential regulations and credit growth. The study concludes that tightening prudential regulations, especially during a business cycle, will likely constrain banks' balance sheet, retard credit growth and affect banks' lending.

The fourth essay investigates the relationship between lending to small and medium scale enterprises and the business cycle in South Africa after the global financial crisis of 2008. This paper employed monthly data from the SARB for the period 2008 to 2014. The result shows strong evidence of procyclicality in SME lending in South Africa.

The study further sheds some light on the role that the credit market plays in business cycles and reviews their implications for small and medium scale enterprises in South Africa. The findings of this thesis have pertinent policy implications for the government, regulatory bodies in the financial sector and banks. We suggest that the South African economy needs forward-looking policies that will mitigate the flow of credit to the real sector and at the same time ensure financial stability.

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LIST OF ABBREVIATIONS

2SLS	Two stage Least Square regression
ABS	Asset-backed security
ABSA	Amalgamated Bank of South Africa
AD	Aggregate Demand
ADF	Augmented Dickey-Fuller test
AIC	Akaike Information Criteria
A-IRB	advanced internal based rating approach
AMM	advanced measurement method
AR	Autoregressive
BASA	Banking Association South Africa
BCBS	Basel Committee on Banking Supervision
BEE	Black Economic Empowerment
BGG	Bernanke, Gertler and Gilchrist
BIM	basic indicator method
BIS	Bank for International Settlement
BRICS	Brazil, Russia, India, China, and South Africa
BSM	Business Segmentation Measure
CAMELS	Capital adequacy (C), Asset quality (A), Management soundness (M), Earnings (E), Liquidity (L) and Sensitivity to market risks (S)
CaR	Capital Asset Ratio
CAR	Capital Adequacy Ratio
CCSA	Competition Commission for South Africa
CDO	Collateralised Debt Obligation
CE	cointegrating equations
CIR	Cost to Income Ratio
COB	Cost of borrowing

CPI	Consumer Price Index
DEA	Data Envelopment Analysis
ECM	Error Component Model
EFP	external finance premium
ELA	Emergency Liquidity Assistance
EU	European Union
FAC	Financial Access Charter
FCI	Financial Condition Index
FEM	Fixed Effects Model
F-IRB	Foundational internal risk based
FNB	First National Bank
FPE	Final Prediction Error
FRB	FirstRand Bank
FSB	Financial Stability Board
FSI	Financial Soundness Indicators
GDP	Gross Domestic Product
GEM	General Equilibrium Model
GFC	Global Financial Crisis
GFSR	Global Financial Stability Report
GLS	Generalised Least Square
HQIC	Hannan-Quinn Information Criterion
IFA	International Financial Architecture
IFS	International Financial Standard
IMF	International Monetary Fund
IMH	Institutional Memory Hypothesis
IRB	internal based rating approach
JES	Johannesburg Stock Exchange
KPSS	Kwiatkowski–Phillips–Schmidt–Shin

LCR	liquidity coverage ratio
LGD	loss given default
LIBOR	London Interbank Offered Rate
LR	Likelihood Ratio test
LSDV	Least Square Dummy Variable
MBS	Mortgage- backed security
MENA	Middle-East and North Africa Region
NCR	National Credit regulator report
NIM	Net Interest Margin
NPLs	Non-performing loans
NPV	Net present value
NSFR	Net stable funding requirement
NW	Net worth
NYDA	National Youth Development Agency
OECD	Organisation for Economic Cooperation and Development
OLS	Ordinary Least Squares
OTC	Over the Counter Transaction
PD	Probability of default
PP	Philips-Perron
PwC	PricewaterhouseCoopers
RBC	Risk based capital standard
ROA	Return on Assets
ROE	Return on Equity
RWA	Risk-weighted asset
S&P	Standard and Poor
SA	South Africa
SARB	South African Reserve Bank
SEDA	Small Enterprise Development Agency

SIC	Schwarz Information Criterion
SIM	standard indicator method
SMEA	Small medium scale Gross credit exposure
SMME	Small Micro and Medium- sized Enterprise
SME	Small and Medium-sized Enterprise
SMEGCE	Small medium enterprise gross credit exposure
SMEGE	Small medium enterprise gross exposure
SPV	Special Purpose Vehicle
SSA	Sub-Saharan Africa
STATSSA	Statistics South Africa
UNCTAD	United Nations Conference on Trade and Development
UNIDO	United Nations Industrial Development Organisation
USAID	United States Agency for International Development
VAR	Vector Autoregressive
VEC	Vector Error Correction
VECM	Vector Error Correction Model
WHO	World Health Organisation

Chapter 1
INTRODUCTION

1.1 BACKGROUND INFORMATION

The exact nature of the relationship between financial crises and credit crunch has not been established in the literature. Financial crises often lead to greater financial regulation as exemplified in the introduction and implementation of the Basel Accords. Each Basel Accord came into being after an episode of financial crises (Cukierman, 2011; Barrel *et al.* 2010; Liu and Seeiso, 2011; Hanke, 2013a). An increase in regulatory tightening coupled with economic downturn is often associated with credit crunch. Credit crunch would further have an effect on economic growth and lending to Small and Medium Scale Enterprises (SMEs). This poses a great challenge to development finance (Beck *et al.*, 2009b; Gottschalk, 2010).

The primary roles of most banking regulations, such as the International Financial Standard (IFS), are to ameliorate the stability of the financial system, prevent systemic risk and reduce the effect of asymmetric information (Gottschalk, 2010). However, there is an emerging consensus in the literature that banking regulations could deepen financial crises, especially in developing countries (Giovanoli, 2009; Barth *et al.*, 2006; Reinhart and Rogoff, 2008a). Bank regulation constrains most banks' balance sheets, and cash flows usually retard banks' credit and affect their macroeconomic function of enhancing growth and development (Hanke, 2013a; Gottschalk, 2010; Kim, 2010; Seo, 2013). The literature has further established a procyclical pattern between banks' credit and business cycles. When the economy is unfavourable, banks tend to reduce their credit and lending since most banks are vulnerable to crises during recession. This is because banking is naturally a fragile venture which "lends short and borrows long". In addition, during recession most firms are unable to repay their loans due to a decrease in asset prices, hence there is a higher risk of default at this time. Most of the firms that banks lend to will have low value collateral due to decreases in the price of their assets. Sometimes banks are forced to sell these assets of the bankrupt firms at a lower price, consequently decreasing the price of assets for the banks, precipitating their bank balance sheet, net worth and cash flows. If the situation continues, it can engender a credit problem in lending, where the banks find it risky to lend given their devalued net worth. The implication of this for the banks is detrimental because deleveraging can cause "bank panic" and lending crash, ultimately affecting investment and growth of the economy (Liu and Seeiso, 2011; Gavin and Hausmann, 1998; Boissay *et al.*, 2013; Shin, 2008).

At the same time the behaviour of financial institutions and investors tends to be procyclical. During boom periods they take on more risk to get more returns and profits, but during recessions banks

retreat and reduce their risk by going for a “flight to safety” strategy (Cukierman, 2011; Liu and Seeiso, 2011; Global Risk Regulator, 2006). In an economic downturn, banks’ asset prices usually fall and this usually affects their asset value against the banks’ liabilities. That is why most banks are vulnerable during recession. Therefore, credit, leverage and net worth increase during economic booms and shrink during recessions. Furthermore, financial regulators can also play a crucial role to further repress credit during recession, especially when banks are mandated to raise bank capital requirements and liquidity in the middle of a recession. This has forced a number of banks to deleverage drastically.

Hanke (2013a) argued that tighter regulation can impede money supply and diminish economic growth in an economy. He further assessed that banks’ assets are made up of cash, loans and securities, while the source of funds called liabilities are mainly made up of approximately 90% deposits in most developing countries, hence most bank’s liabilities are money. Therefore, tighter regulation may force banks to reduce their level of risk by shuffling more risk-free weighted government securities at the expense of private credit. The cost of regulations to most banks in developing countries becomes higher and their net worth goes down drastically during recession periods. This is because pressures to meet the minimum capital requirement and leverage requirement for banks in most developing countries usually affect the banks’ asset portfolio in terms of their ability to get loans out to the private sector. Furthermore, most developing countries lack the financial expertise to cope with liquidity risk and credit risk during recession (Gottschalk, 2010; Giovanoli, 2009).

South Africa has one of the best regulated banking systems in Africa given its effective and unique method of conforming to the International Standard and Supervisory Framework. South African banks were among the earliest in Africa to adopt Basel II in 2008, and the only African country that has so far adopted Basel III (in January 2013). However, there are some major concerns with most South African banks in terms of their strict compliance to the Basel accords. For example, the implementation of Basel II has led banks in some emerging economies, such as India and Brazil, to give loans to lower risk and large borrowers at the expense of SMEs (Spratt, 2008; Gottschalk, 2010). Similarly, many researchers and policy makers have also raised an alarm that Basel III might be more onerous than Basel II to South African banks. The big four banks have acknowledged that Basel III will increase their operational costs from 20% to 40%.This might strengthen banks’ concentration and asset portfolio concentration (Gottschalk and Griffith-Jones, 2010). Consequently, this will affect lending and access to credit by SMEs with its negative implications for growth, employment, poverty reduction and equity in South Africa. In an economy where only 1 out of every 20 applicants for commercial bank loans is successful and where access to other banking services has barely nudged 60% (Schoombee, 2004; SARB, 2006; Genesis

Analytics, 2004), this could be a serious issue for consideration as the economy implements Basel III.

1.2 PROBLEM STATEMENT

A slump in the economy coupled with crises in the financial sector make it difficult for banks to lend. Banking regulations during the slump further reduces credit and exacerbates the inability of banks to lend to SMEs.

The recent Global Financial Crisis (GFC) has had an adverse effect on the financial system generally, causing banking crises, currency crises and sovereign debt crises. Banking crises dampen consumer and investor confidence, distort the flow of intermediation and reduce economic growth (IMF, 2009a; Buiter, 2009; Allen and Carletti, 2010; Brunnemeier *et al.*, 2009). Bernanke and Getler (1995) established how asymmetric information and an imperfectly competitive market can distort the whole macroeconomic system. The emerging economies have gone through some major financial crises since the Mexican crisis of 1994 to 1995, the Asian debt crisis of 1997, and the Argentinian crisis in 2001. The emergence of an interconnected financial system due to increasing globalisation has made many developing countries vulnerable to shocks and financial crises. Moreover, many developing countries still struggle with a weak institutional structure and macroeconomic imbalances which exacerbated these crises (Kim, 2010; Ikhide and Alawode, 2001; Obiechina, 2010; Barth *et al.*, 2004; Mishkin, 2009).

The “Financial Accelerator Model” of credit explains the link between the financial fundamental of borrowers and lenders and bankruptcy risk which later affects the cost and level of credit (Bernanke *et al.*, 1994). Lending is the predominant function of any bank, especially in developing countries. The loan portfolio is usually the largest asset and form of revenue for many banks. In other words, the ability of a commercial bank to increase the volume of loans enhances the bank’s profitability. The loan portfolio is usually the main source of income and profit for many banks but the asymmetric information literature has shown that the volume of loans and bank revenue is not stable since banks usually suffer from bank runs (Stiglitz and Weiss, 1981; Cukierman, 2011; Bernanke, 2007; Walsh, 2003).

The Bank of International Settlement through its ‘Basel Rules Accord’ believes that stiffening regulations on bank capital and liquidity will make banks safer and healthier. However, most rules and regulations restrict banks’ money (i.e. the deposit creation of most commercial banks, which is the largest component of the money supply). According to Hanke (2013), the enforcement of the 1988 Basel I capital requirement imploded and triggered the last 1990 USA recession. Banks constrained their capital ratio to adhere to the rules of Basel I. This caused bank money to reduce drastically, reducing total money supply and facilitating the recession in the economy. Mandating

banks to adhere to strict minimum capital requirements has altered banks' balance sheets by hindering their ability to take more risk by lending (creating private credit). To make matters worse, interest rates were very low in the USA and Europe; this further exacerbated the situation because interbank lending was crippled and a credit crunch was induced (see Figure 1.1 and figure 1.2)

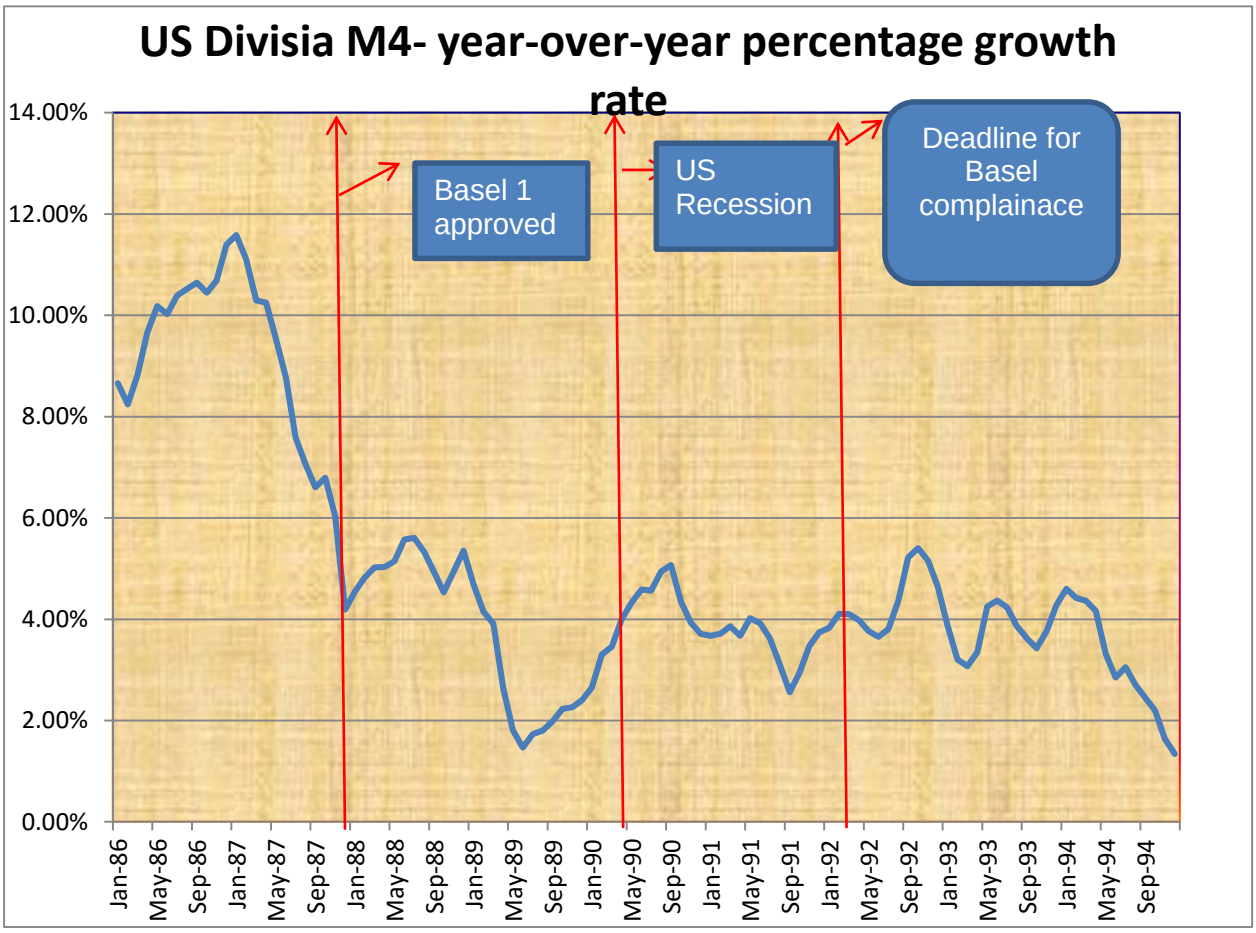

Figure 1.1: US Divisia M4 growth rate

Source: Centre for Financial Stability (2013), Hanke (2012) and Author's calculation

Following the global financial crises, credit in most developed countries such as the Euro zone has gone down drastically as banks are cutting back on their loans to private individuals and business. According to Hanke (2013a), the money supply growth increased by 3.1% in last quarter of 2012 but the growth of private credit in the Euro zone went down to negative, showing a drastic credit crunch in Europe (Figure 1.3).

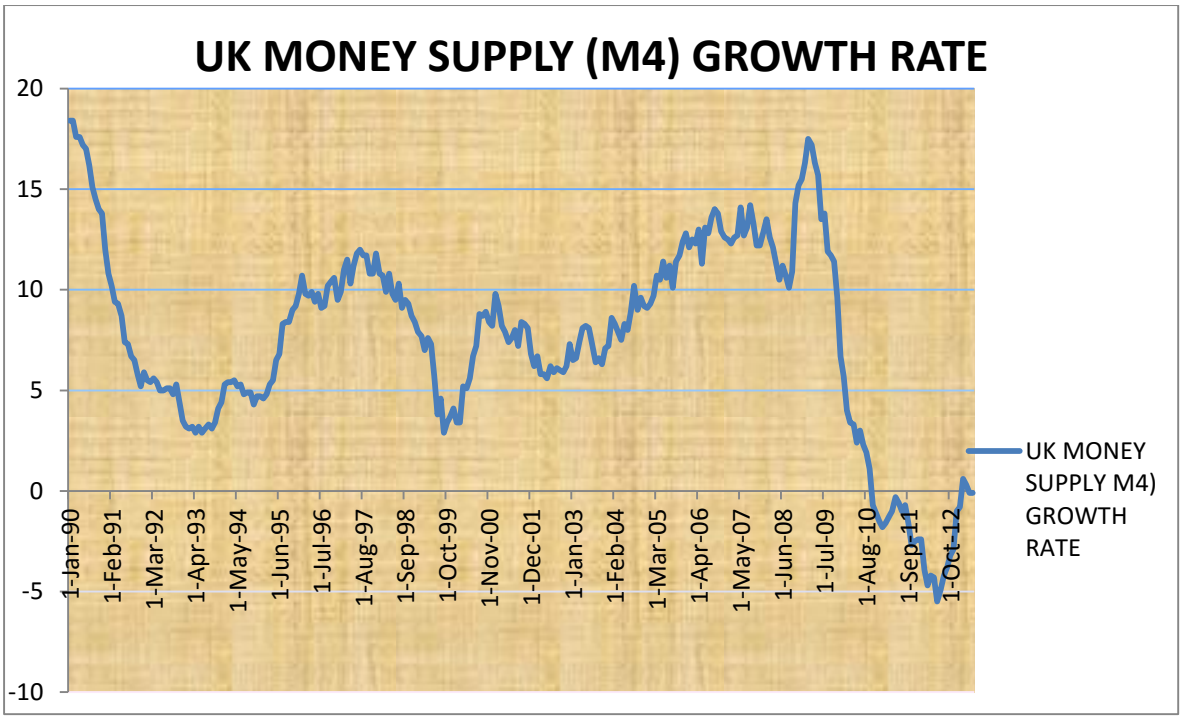

Figure 1.2: UK money supply (M4) growth rate

Source: Bank of England, 2013 and Author's calculation

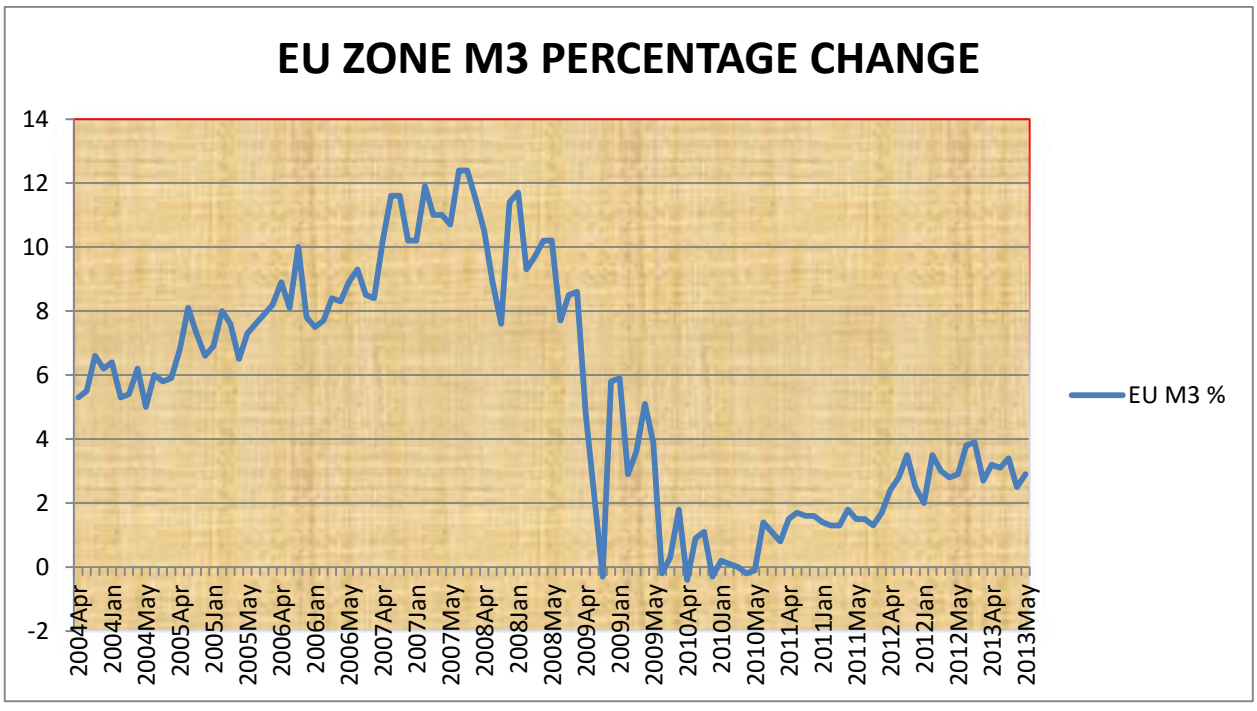

Figure 1.3: EU zone M3 percentage change

Source: European Central Bank, 2013 and Author's calculation

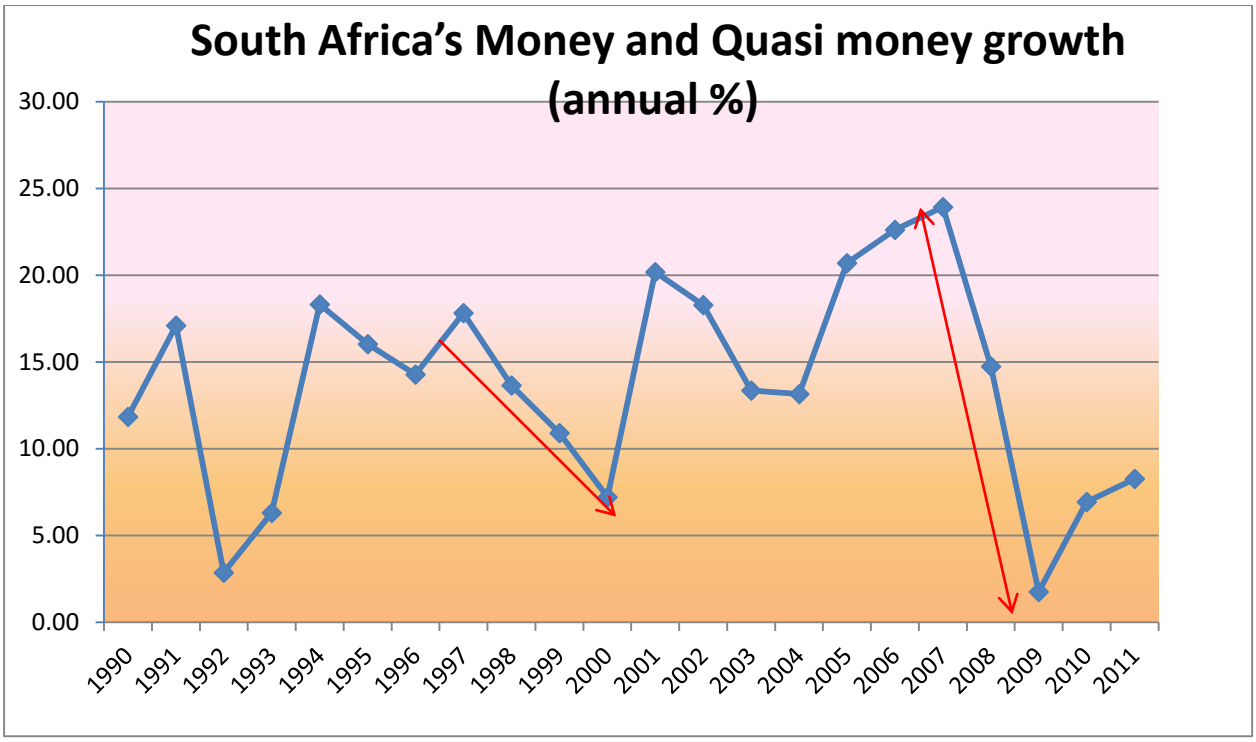

Figure 1.4: South Africa money growth

Source: World Development Indicators Database, 2012 and Author's calculation

Figure 1.4 shows the growth trend in broad money (M3) in South Africa during the global financial crises. Between 1994 and 2000, South Africa's money supply growth fell from 17% to about 4%. The major emerging market crises must have contributed significantly to the fall in South Africa's money growth (Mexico crises of 1994 to 1995, Asian crisis in 1997 to 1998 and Argentina crisis in 2001). Similarly, during 2007–2009, South Africa's money supply growth rate fell from 24% to about 1.76%. The decline in the growth rate of money supply affected domestic credit as a percentage of GDP during the crisis. The fall in domestic credit was accentuated by stricter regulatory requirements. Banks are usually not motivated to lend money at any interest rate due to high regulatory requirements and the likelihood of adverse selection which may lead to payments defaults and its consequences for regulatory failure, hence the growth rate of domestic credit will fall. The lending policy of a bank at a point in time is usually a good indicator of a recession (Hume *et al.*, 2009; Hanke, 2012). Studies have shown that banks tighten their lending policies before any recession commences. Moreover, asset and credit shocks are usually a pivotal component of a business cycle variation. Figure 1.5 further buttresses the decline in South Africa's domestic credit during period of crises. It is interesting to note that South Africa's credit to the private sector only responded to the crisis after some time. For example, Figure 1.5 shows that the Asian crisis petered out by 2000 but the fall in the domestic credit only started in 2000. Similarly, the credit impact of the global financial crisis of 2007 did not start till 2009. This shows that private credit only

responds to crisis after some time, that is why SA's credit to the private sector only decreases significantly after each crisis.

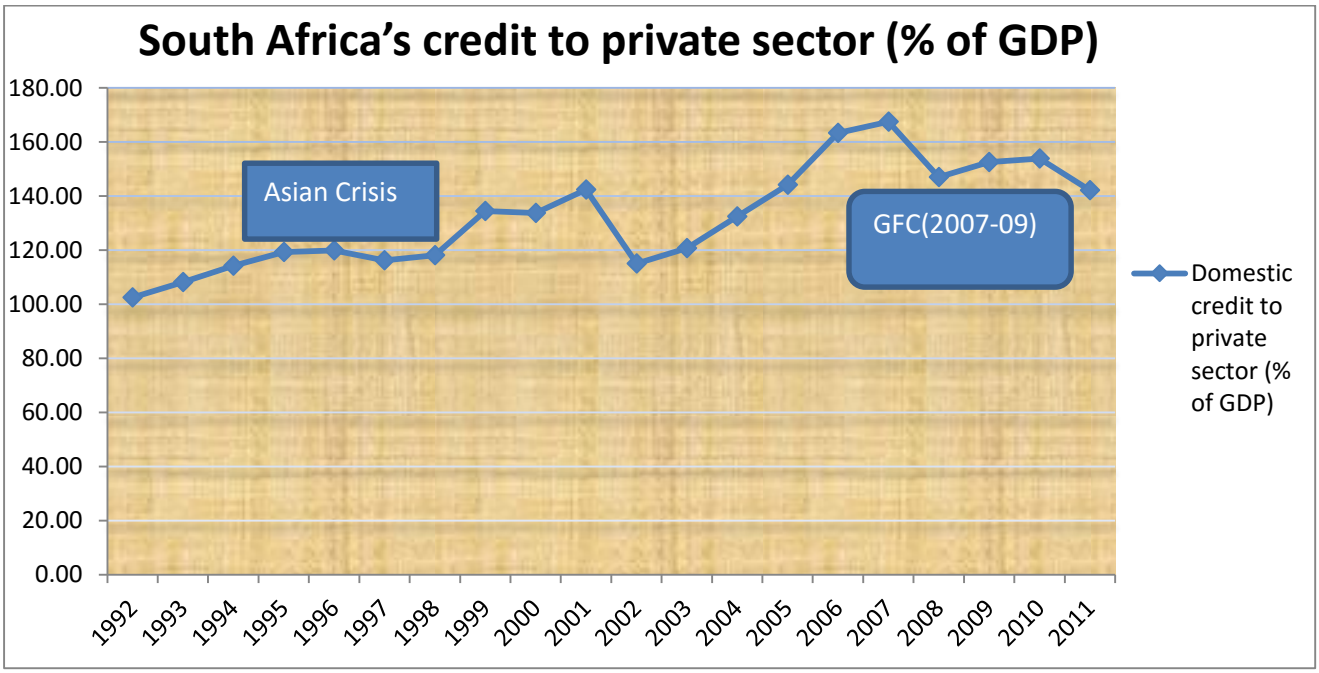

Figure 1.5: SA credit to private sector (% of GDP)
Source: World Development Indicator Database, 2012 and Author's calculation

The joint occurrence of increase in regulatory demands and banking fragility has received some attention in the recent past. Despite the strong regulatory tightening incentive of Basel II, why did we still experience the Global Financial Crises? The answer is simply because most regulatory tightening (Basel I and Basel II) designed to prevent systemic risk actually had some weaknesses that squeezed most financial intermediaries' capital and encouraged most banks to carry out riskier ventures that did not appear in the balance sheet. At the same time, restricted banks' credit flow impedes the efficient allocation of funds to productive investments and retards many banks' ability to lend efficiently. Barth *et al.* (2001, 2004, and 2006) were the first to compile a comprehensive database on banking sector regulations using different approaches. They observed that regulatory approaches restricted banks' operations and facilitated financial crises. Giovanoli (2009) believed that Basel I and Basel II induced many financial intermediaries to reduce credit from their balance sheet through shadow banking (securitisation) and these have contributed to the emergence of crises.

Some studies have also shown that banks' behaviour is mainly induced by financial regulations which may cause a procyclical pattern in the long run (Kashyap and Stein, 2004; Andersen, 2012; Borio *et al.*, 2001). Regulations are supposed to prevent crises and absorb shocks. However, what we observe is that during booms, credit lending in the banks tends to be higher, and in recessions it falls. Akinboade and Makina (2010), Liu and Seeiso (2011) and Bernstein *et al.* (2014) have

raised major concerns that Basel II has increased pro-cyclicality of credit provisions because bank capital usually fluctuates over the business cycle in South Africa. Similarly, Basel III has been criticised to entail a high cost of maintenance that will adversely affect return on equity which will further reduce asset yield and bank lending. This leaves no room for the banks to finance development issues or SMEs (Ruis *et al.*, 2009; Cukierman 2011; Bernanke, 2007; Gottschalk, 2010). The Economic Intelligence Unit (EIU) study in 2009 reported a restriction of finance to small and medium-sized enterprise (SME) sectors all over the world, where GDP growth rate came down sharply from negative 1.5 percent to negative 4 percent, and bank loans to SMEs decreased from negative 3 percent to negative 7.9 % (Ruis *et al.*, 2009). Moreover, liquidity tightening and capital reserves requirement of bank regulations engender bad loans which affect lending and dampen credits, and makes it more difficult to finance SMEs. This can ultimately aggravate the level of poverty and unemployment in South Africa.

Many studies have tried to establish the link between financial crises and regulatory reform (Cukierman, 2011; Jokivuolle and Peura, 2004; Bouvaiter *et al.*, 2012; Mishkin, 2009; Anderson, 2011; Hale, 2012). However, many of the empirical results were focused mainly on developed countries; there are few studies on credit crunch and financial stability in Africa. For example, Jacobsohn (2004), Cumming and Nel (2005), Makwiramiti (2008) and Liu and Seeiso (2011) attempted to establish the effect of Basel II on South African banking. Most of the studies were not able to explain the link between business cycle and credit crunch. Moreover, there are few studies in South Africa that have examined the development finance's implication of the Basel Accords. This study identifies as a major concern the impact of Basel Capital accord on development finance in developing countries.

Some of the questions addressed in this study include:

- Is there a relationship between financial regulation and credit downturn in South Africa (SA)?
- How did the banks in South Africa respond to the global financial crises (GFC)?
- What is the connection between business cycle and regulatory oversight?
- What is the implication of this for development financing in SA?

1.3 OBJECTIVES OF THE STUDY

The general objective of the study is to examine the link between financial crisis, financial regulation and credit crunch in South Africa.

The specific objectives are as follows:

1. To examine the link between financial regulation and financial instability;

2. To assess the link between financial regulation and credit crunch;
3. To determine whether credit growth exhibits a procyclical pattern in SA;
4. To estimate an econometric model that explains the link between financial crisis, regulation and credit crunch in the South African economy; and
5. To articulate the implication of these for bank lending to SMEs.

1.4 HYPOTHESIS

To achieve the stated specific objectives, the following set of hypotheses will guide the scope of this study with reference to South Africa:

HYPOTHESIS I

H_{0a}: Financial regulations induce financial crises

H_{1a}: Financial regulation does not induce financial crises

HYPOTHESIS II

H_{0b}: Financial regulation causes credit crunch

H_{1b}: Financial regulation does not cause credit crunch

HYPOTHESIS III

H_{0c}: Credit growth exhibits a procyclical pattern in South Africa

H_{1c}: Credit growth does not exhibit a procyclical pattern in South Africa

HYPOTHESIS IV

H_{0d}: Financial crisis and financial regulations negatively affect bank lending.

H_{1d}: Financial crisis and financial regulation do not affect bank lending.

1.5 JUSTIFICATION OF THE STUDY

Many studies have tried to establish the link between financial crises and regulatory reform but the empirical results were focused mainly on developed countries; there are few studies on credit crunch and financial stability in Africa. Most of the studies were not able to explain the link between business cycle and credit crunch. Some studies concluded, using a non-technical approach, that Basel II has the tendency to trigger procyclicality in the financial system of South Africa. Others argued that financial regulation actually reduces systemic risk. Thus the results from these analyses were inconclusive. None of these studies examined the likely effects of Basel III on the financial system of South Africa except the work of Liu and Seeiso (2011) which looked at the effect of Basel II's procyclicality in South Africa.

Moreover, there are few studies in South Africa that have examined the development finance's implication of the Basel Accords. This study identifies as a major concern the impact of Basel Capital accord on development finance in developing countries. According to Gottschalk (2010), there has been a lack of debate about the impact of Basel Capital accord in developing countries. Basel II has been criticised as being so complex that it takes up most of the resources of the banks

in developing countries, forcing them to increase the cost of transactions and leaving them little capacity for development-related issues (Gottschalk, 2010; Cukierman, 2011; Bernanke, 2007; Giovanoli, 2009).

First, this study make an important contribution to the discussion on credit crunch, financial regulations and their implication on development finance in South Africa. Second, the study will result in better understanding of the macroeconomic impact of Basel II and Basel III in sub-Saharan Africa. The study establishes the link between prudential regulatory and credit downturn in South Africa. The study further sheds some light on the role credit markets play in business cycles and review their implication for small and medium scale enterprises in Africa.

Furthermore, since investment is usually sensitive to any change in credit, net worth and cash flow in the financial system, this study will make a significant contribution in linking the relationship between credit, investment and economic growth in Africa. For instance, a number of studies have linked credit to growth and investment in Africa. Eyraud (2009) established a linkage between investments to growth in South Africa. Similarly, Mijiyawa (2013) found that investment, credit to the private sector, government effectiveness, exports and the share of agricultural value added in GDP are significant growth determinants in Africa. Fedderke *et al.* (2006) also found strong empirical evidence that investment in infrastructure is not only positively associated with economic growth, but that it actually leads growth. In sum, both the cross-country and country-level evidence indicates that investment is critical for accelerating growth in African economies. However, most of these studies have not looked at the role of credit in augmenting investment and growth in Africa.

1.6 OUTLINE OF THE STUDY

The study is divided into eight chapters. Chapter one contains the introductory chapter and lays the foundation of the research and identifies the goals of the study. Following the introductory chapter is chapter two which elucidates on the background of the South African banking Industry as well as the effect of the global financial crisis on the South African banking industry. Chapter three reviews the existing theoretical and empirical literature on credit, bank regulations and financial crisis. Chapter four considers the first article that examines the relationship between commercial bank lending and the business cycle from the demand side of credit procyclicality. Chapter five presents the second article that assesses the relationship between regulatory bank capital adequacy and the business cycle. Chapter six contains the third essay which examines the effect of bank regulation and how it might deepen the business cycle and accentuate the credit crunch. Chapter seven examines the fourth essay that investigates the relationship between lending to small and medium scale enterprises and the business cycle in South Africa after the global financial crisis of 2008. Chapter eight contains a summary of findings of the study, policy recommendations

Chapter 2

AN OVERVIEW OF THE BANKING INDUSTRY IN SOUTH AFRICA

2.1 OVERVIEW OF THE SOUTH AFRICAN BANKING INDUSTRY

Banking in many African countries has gone through different epochs, from the period of restrictions and regulations in terms of interest rate ceilings, credit quotas and government-owned banks in the seventies to the advent of financial liberalisation, globalisation, innovation and financial deepening (Beck and Cull, 2013: 1). Africa has become financially stronger although still having problems of high transaction costs and low competition. The South African financial sector has also gone through structural changes which affect banking, insurance and stock market (Stuart and Robert, 2010: 207; Gilbert *et al.* 2009: 44).

2.2 THE SOUTH AFRICAN BANKING INDUSTRY

The United Nations Conference on Trade and Development defined an efficient and stable financial market as a system that assures an efficient allocation of funds, and reduces transaction cost and systemic risk to the real sector for productive investment (Draghi, 1997:4). The South African banking industry will be assessed against this definition. The South African Reserve Bank (SARB) is given the major responsibility of ensuring price stability in the South African economy. Hawkins (2002: 4) described the South African financial sector as a fully regulated and sophisticated financial sector which includes the banking, insurance and securities industries.

Table 2.1: Total number of registered banks in South Africa

	Jan, 2013 No. of Institutions	Total Assets (in million Rand)	Jan, 2014 No. of Institutions	Total Assets (in million Rand)
Locally Controlled Banks	10	2 672	10	2 918
Foreign Controlled Banks	6	781	6	834
Mutual Bank	3	2	3	3
SA branches of foreign Banks	13	193	14	232
Total registered banks	32	3 648	33	3 986

Source: SARB, March, 2014

The data in Table 2.1 provide a general overview of the recent growth in the South African banking industry. The South African banking sector comprises 33 registered banks, with 10 domestic controlled banks, 14 branches of international banks in South Africa, and other mutual banks and co-operative banks. South Africa has a highly concentrated banking industry, where four banks own 84.1% of of the total banking sector by the balance sheet size. They are popularly known as the 'Big Four': The Amalgamated Bank of South Africa (ABSA), First National Bank, Nedbank and Standard Bank (SARB, 2014: 49). Concentration is defined as the extent to which most of the market's output is produced by a few firms in the industry. Several studies have raised alarm about the high level of concentration in the South African banking industry and suggested that these can adversely affect competition and transaction costs in the industry (Maredza and Ikhide, 2013: 2; Hawkins, 2002: 5; Mabwe and Webb, 2010; Mboweni, 2004; Mnyande, 2012; BASA, 2012; CCSA, 2008). Gottschalk (2010) believed that the implementation of the prudential regulation policy of Basel II has contributed to banking concentration and a steady decline in credit expansion in emerging markets over the years. This study is also interested in examining the relationship between credit growth and prudential regulation in South Africa. The high level of concentration in

the South African banking industry has great implication in terms of access of bank credit to small and medium enterprises (SMEs) and the poor.

Table 2.2: South African banking sector: overview of number of entities registered or licensed

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Banks	22	20	19	19	19	19	18	17	17	17
Mutual Banks	2	2	2	2	2	2	2	2	2	3
International Banks in SA	15	15	15	14	14	14	13	13	12	14
Representative Offices	44	43	47	43	46	43	42	41	43	41
Controlling companies	19	16	15	15	15	15	15	15	15	15

Source: SARB, 2012: 28

Table 2.2 shows the composition of the registered banks in South Africa. The table also gives an overview of the growth of the South African banking industry since 2003. The number of registered banks fell from 22 to 17 between 2003 and 2012 because some banks had their licence withdrawn by the Reserve Bank due to liquidation, mergers or acquisition.

In South Africa, foreign banks hold the largest share of the banking system assets. According to the SARB Annual Report 2012, foreign shareholders held 43% of the nominal value of the total banking sector's shares. For example, ABSA accounted for 26.5% of banking sector shares in nominal value at 31, December, 2012 (SARB, 2012: 29).

Figures 2.1 and 2.2 show the nominal value of South African banking shares in percentage between December 2011 and December 2012, where the foreign shareholders still have the largest shareholding.

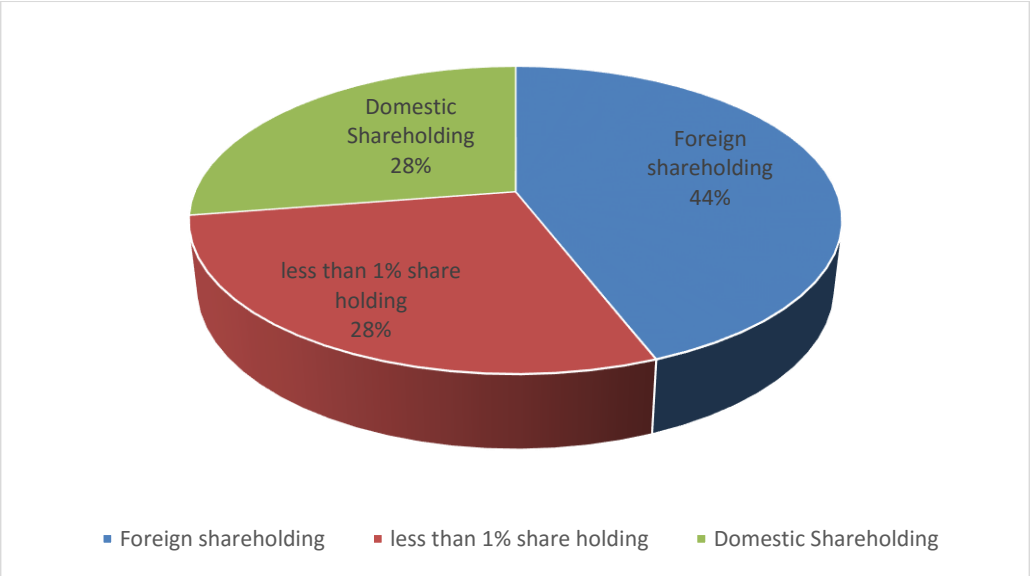

Figure 2.1: South Africa shareholding structure, 2011
Source: South African Reserve Bank, March, 2012

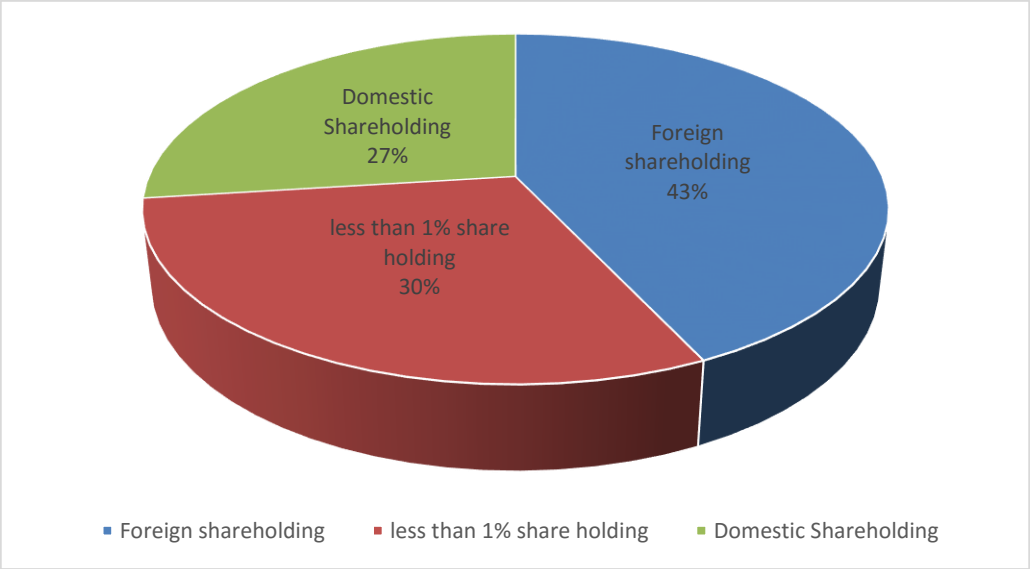

Figure 2.2: South African shareholding structure, 2012
Source: South African Reserve Bank, March, 2013

Table 2.3: Bank Concentration in South African (2014)

BANK	TOTAL ASSETS (R millions)	PERCENTAGE OF INDUSTRY TOTAL ASSETS
STANDARD BANK	1,099,503	26.3
ABSA	807118	19.3
FIRSTRAND	856911	20.5
NEDBANK	714408	17.1
OTHER BANKS	701060	16.8
TOTAL	**4179000**	**100**

Source: SARB, 2014: 42

Concentration is defined as the extent to which most of the market's output or assets is produced by a few firms in the industry. Table 2.3 reveals the dominance of the big-four within the banking market. As at 31 December, these four giant banks together represented 83.2 percent of the balance-sheet size of the total banking sector (SARB, 2014:42). The rest of the banks accounted for the remaining 16.8 percent indicating the high level of concentration in the banking market. The rest of the banks hold a very small portion of the market share. Hence, the South African banking industry exhibits a high level of concentration.

2.2.1 Economic contribution of the South African banking industry

The performance of the South African banking industry has attracted enormous attention since democracy in 1994 because of its role in risk management and prudent corporate governance over the years. PricewaterhouseCooperss' survey (PwC, 2013a) on South African banking rated South African banks as the top ranked banks in Africa and among the top 20 banks in the world. Its impressive performance is shown in its contribution to GDP in recent years. As indicated in Figure 2.3, finance, real estate and business services contributed 22% to South Africa GDP in 2013.

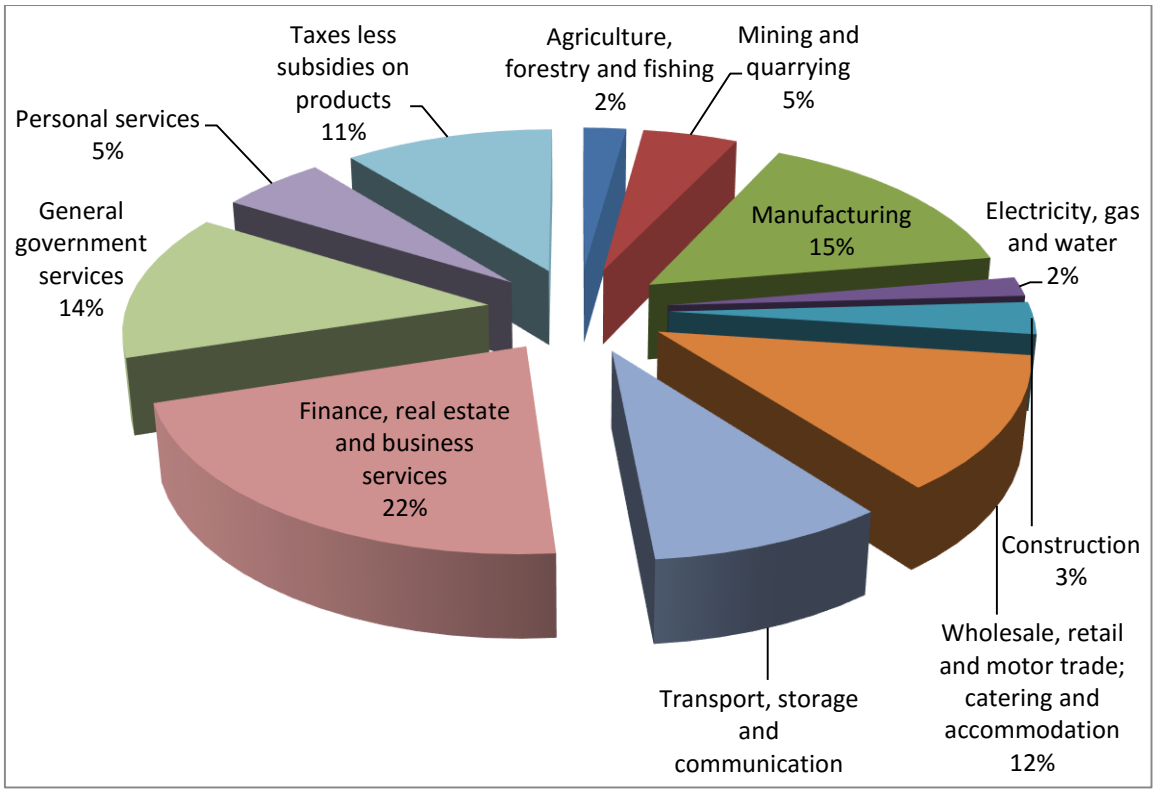

Figure 2.3: Contributions of different sectors to SA GDP Growth in 2013
Source: South African Reserve Bank, 2014

2.2.2 Private sector credit provided by the banking sector

Figure 2.4 shows the percentage change in the share of the private sector credit provided by the South Africa financial sector. The credit extension to the private sector was at its highest in 2007 and went down to its lowest of 3.5% in 2009 as a result of the global financial crises. Figure 2.4 also shows that during the Asian crisis, credit to the private sector was also low between 1999 and 2000. This depicts the contagion effect of crisis on South Africa as a result of capital outflow.

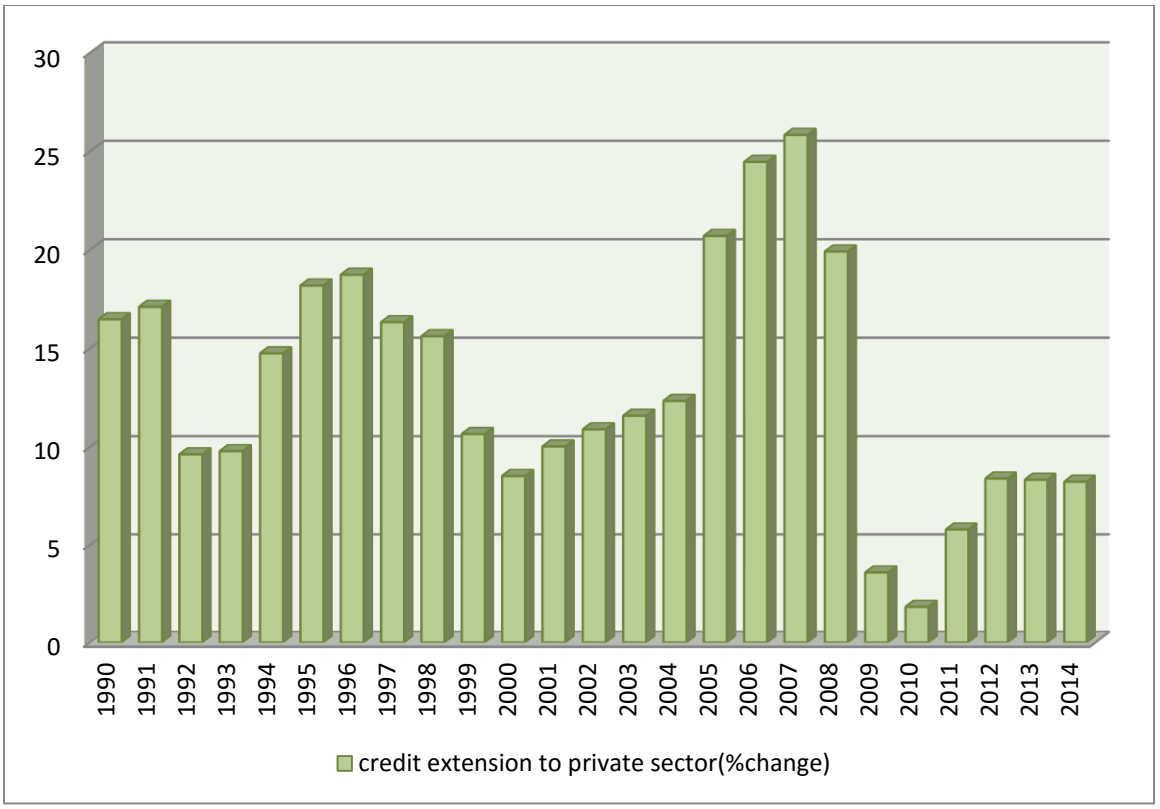

Figure 2.4: Percentage change in credit extension to the private sector
Source: South African Reserve Bank (2013)

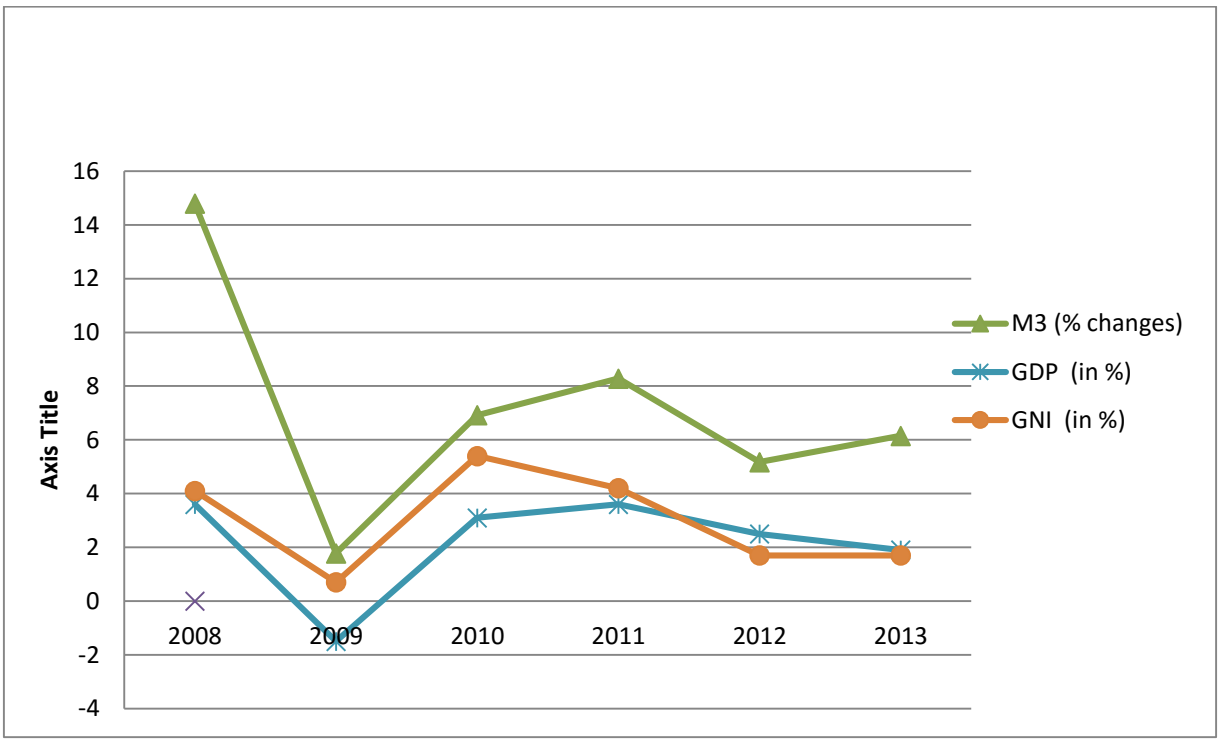

Figure 2.5: SA's key economic indicators after the global financial crisis of 2007
Source: South African Reserve Bank (2013)

Figure 2.5 shows the South African economic indicators for the period 2008 to 2013 after the global financial crises. The GDP growth rate fell sharply from 3.6% to 1.5% in 2009 but increased to 1.9% in 2013. Similarly, M3 growth fell sharply to 1.46 % from 14.79 %. However, despite the drastic fall in the major economic indicators, the South African banking industry still maintained a prudent and strong macro-fiscal policy which helped the industry through the turbulent period (SARB, 2009; Kumbirai and Webb, 2010: 31).

2.2.3 Business cycle and credit cycle in South Africa

Credit plays an important role in shaping the business cycle, especially during recessions and financial crises. The recent credit crunch, which started from the US mortgage market, has affected the proponent's view on the impact of credit on the business cycle and international shocks. Jorda *et al.* (2012) and Saayman (2010) noted that modern macroeconomic models have not done enough to be able to ascertain the influence of the financial sector on the real sector, hence researchers and policy makers still need to have a clearer picture of how credit boom can affect the real sector (Bernanke *et al.* (1999) and Kiyotaki and Moore (1997) have documented that a disruption in the financial and credit market (usually caused through "principle-agent" problem) will constrain most borrowers' balance sheets and affect the credit flow. Gertler and Kiyotaki (2011) also stated that credit market frictions can have a huge effect on economic activities, especially during financial crises.

A business cycle can be defined as an uninterrupted expansion and contraction of economic activities (SARB, 2005:61).The business cycle is usually measured using the real GDP. Most changes in business cycles are dependent on some fundamental elements such as changes in prices of assets, building construction, capital and consumer spending, inventories and interest payments. The economic system can become more vulnerable and fragile in an expansion, especially when these fundamentals are either overvalued or undervalued. For example, the excessive debt of consumers or firms can lead to bankruptcies or insolvencies in the financial sector when loans from banks cannot be repaid. Most banks usually change their behaviour by investing in riskier loans during booms and reduce their risky investment during recessions (Berneuer and Koubi, 2002: 2) Akinboade and Makina (2009) documented the connection between bank lending and the business cycle in South Africa, where they found that bank lending moves parallel to the business cycle at a macro-level but the growth of real credit was found to have no effect on the business cycle. The South African Reserve Bank has a mechanism to fine tune the repeated experiences of contraction and expansion in the economy through the use of inflation targeting policies, or the government might try to maintain low unemployment and high infrastructure investment policies over the years.

The South African Reserve Bank has a method for determining the business cycle in South Africa by computing the composite leading and coincident business cycle indicators. The turning points for the business cycle and the methodology employed are well documented in Pretorius *et al.* (1999), Venter and Pretorius (2001), Laubscher (2002) and Akinboade and Makina (2009). This method involves calculating the 'current diffusion index' for South Africa by calculating a 'comprehensive composite index' of various economic events and evolutions that can engender or change the economic activities in South Africa over the years (Akinboade and Makina, 2010: 3805). Table 2.4 presents the business cycle in South Africa since 1960.

Table 2.4: Business cycle phases in South Africa since 1960

Upward phases	Downward phases
January 1966 – May 1967	June 1967 – December 1967
January 1968 – December 1970	January 1971 – August 1972
September 1972 – August 1974	September 1974 – December 1977
January 1976 – August 1981	September 1981 – March 1983
April 1983 – June 1984	July 1984 – March 1986
April 1986 – February 1989	March 1989 – May 1993
June 1993 – November 1996	December 1996 – August 1999
September 1999 – November 2007	December 2007 – August, 2009

Source: SARB, 2014: S155

South Africa is currently in its 16th business cycle since the Second World War (SARB, 2014). Laubscher (2002) observed that South Africa has gone through different regimes of structural business cycle periods, from the first structural business cycle from 1946 to 1973 where there was an upward swing in growth, where the economy did not experience any negative growth. However, there was a change in the mid-1970s when there was a negative growth as a result of oil shocks. During the seventies, South Africa experienced a greater rate of economic instability.

Akinboade and Makina (2009) identified three factors responsible for the negative shocks which was as a result of the introduction of the floating exchange rate in 1979, the oil shocks of 1973/1974 and the Angola conflict, which had a spillover effect in South Africa. The literature has established that international shocks or events can spillover and affect South Africa in the long run. Similarly, the monetary authorities of South Africa used credit and interest rate ceiling policies to

create a direct control policy in the banking sector between 1970 and 1980 (Van Zyl *et al.*, 2003: 84-85). The last business cycle started from the late 1980s till date. The last stage is a period of consolidation, rationalisation, and financial liberalisation. This era marked a period of instability, takeovers and notable crises around the world. According to Akinboade and Makina (2009), South Africa's business cycle experienced the longest economic downturn of 51 months in length in 1999.

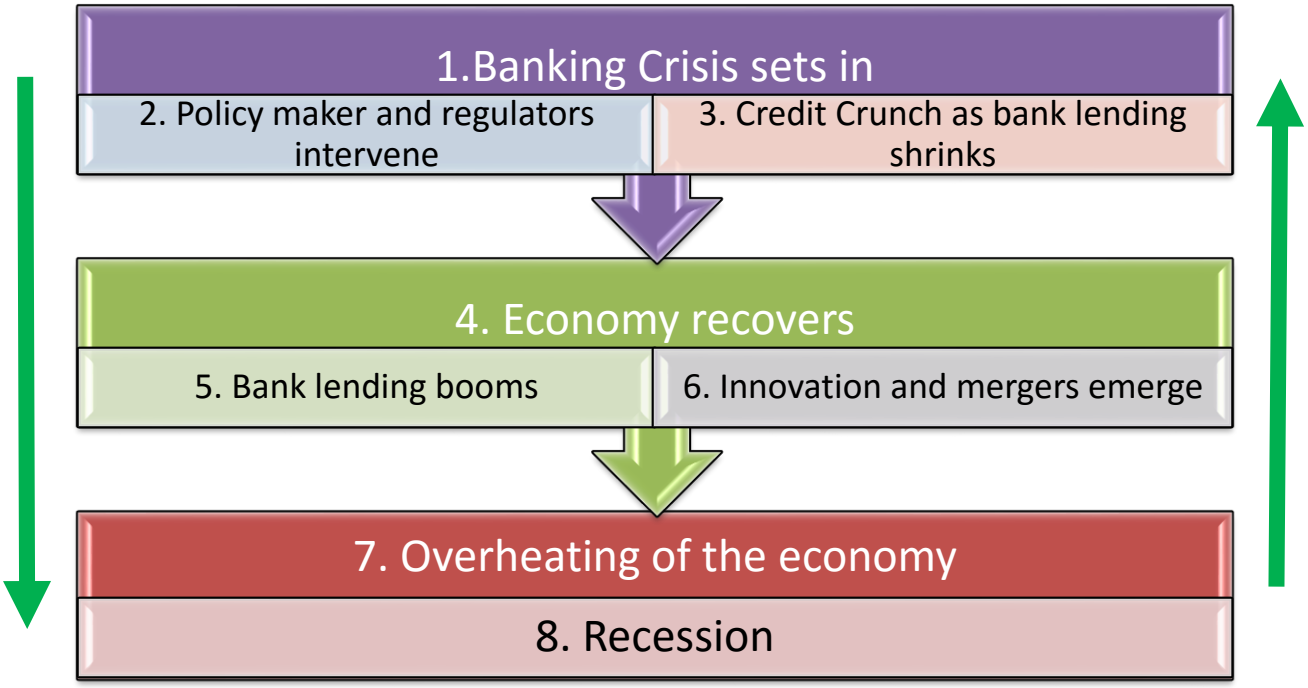

Figure 2.6: Stages of banking cycle in South Africa
Source: South African Reserve Bank (2013)

The South African Reserve Bank (SARB) outlines the eight stages of business cycle followed by the banking sector in South Africa. Figure 2.6 depicts these stages of business cycle. The first stage explains what happens to the economy during a banking crisis when the banks become very vulnerable and the balance sheet and assets of most banks shrink. At this stage, there will be a change in banks' willingness and ability to give out loans and this behaviour can further amplify the period of downturn. The Global Financial Stability Report for 2012 (IMF, 2013) holds that in most credit crises, the macroeconomic policies introduced in the economy usually cause an imbalance to the domestic economy and further amplify the business cycle since the policies might further reduce asset prices in the financial market during the crisis period. They found that shortage of excessive debt in the household, and shortage of collateral and capital in banks are usually the principal causes of credit crunch and reduction in credit demand in different countries. Credit crunch may further accentuate the period of recession and increase the business cycle. This

process is depicted vividly in stage three from Figure 2.6. Moreover, the study further highlighted the importance of having specific country studies since the constraints to the availability of credit differ from country to country (GFSR, 2013: 63). Stolz and Wedow (2011) examined the role of banks in transmitting shocks to the German local banks in period of 1993 and 2004. Their finding strongly suggests that prudential regulations of Basel II fluctuate along the business cycle during this period.

2.2.4 Household debt and unsecured bank lending in South Africa

According to Van Den Heever (2007), the banking sector in South Africa was responsible for more than 90% of the total household debt in South Africa at the end of March 2006. When household debt rises excessively, there is a probability of greater default rate in loan repayment. The issue of uncollateralised loans can engender banking crises and credit crunch and distort the whole economy.

From the early 2000s household debt accumulation in South Africa has far exceeded the growth in household disposable income, and this is reflected in the deterioration of the ratio of household debt to disposable income, a benchmark indicator for debt (see Figure 2.7). This has led to concerns regarding the sustainability of household debt, and consequently the status of financial stability in South Africa because both the stability of the financial system and monetary stability are closely related to household financial fragility. The consequent impacts of household debts on consumption spending and financial stability have generated much debate and policy concerns, especially in the wake of the global financial crisis of 2007.

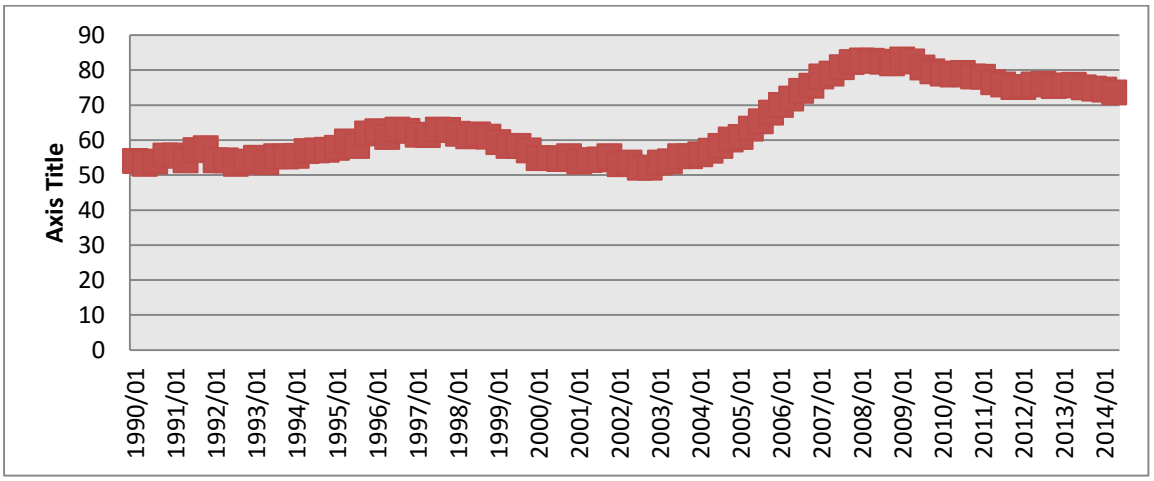

Figure 2.7: Household debt to disposable income of household
Source: South African Reserve Bank (2014)

The growth in the ratio of household debt to disposable income in South Africa perhaps refers to the importance of debt as a means for households to finance consumption. Fundamentally, the ratio of total household debt to disposable income can increase through two primary channels:

debt widening, whereby households acquire debt and the number of people with credit outstanding rises. The second channel is through debt deepening, where the household debt level increases when existing indebted household obtain more credit (Keen, 2009).

The inflation and interest rate scenario can further explain the performance of the ratio of household debt to disposable income. South Africa has pursued an inflation targeting monetary policy in an effort to stabilise prices. Lower inflation generally is associated with low interest rates. The effect on household debt has been twofold. Firstly, household borrowing has increased in response to the lower nominal interest rates; and secondly, it has resulted in lower nominal household income (SARB, 2006). Thus, from a South African perspective, the low interest rate environment brought about by the low inflation regime has enabled people to increase debt, and the higher debt to income ratio implies that households are more exposed to interest rate shocks (as are experienced during tight monetary policy).

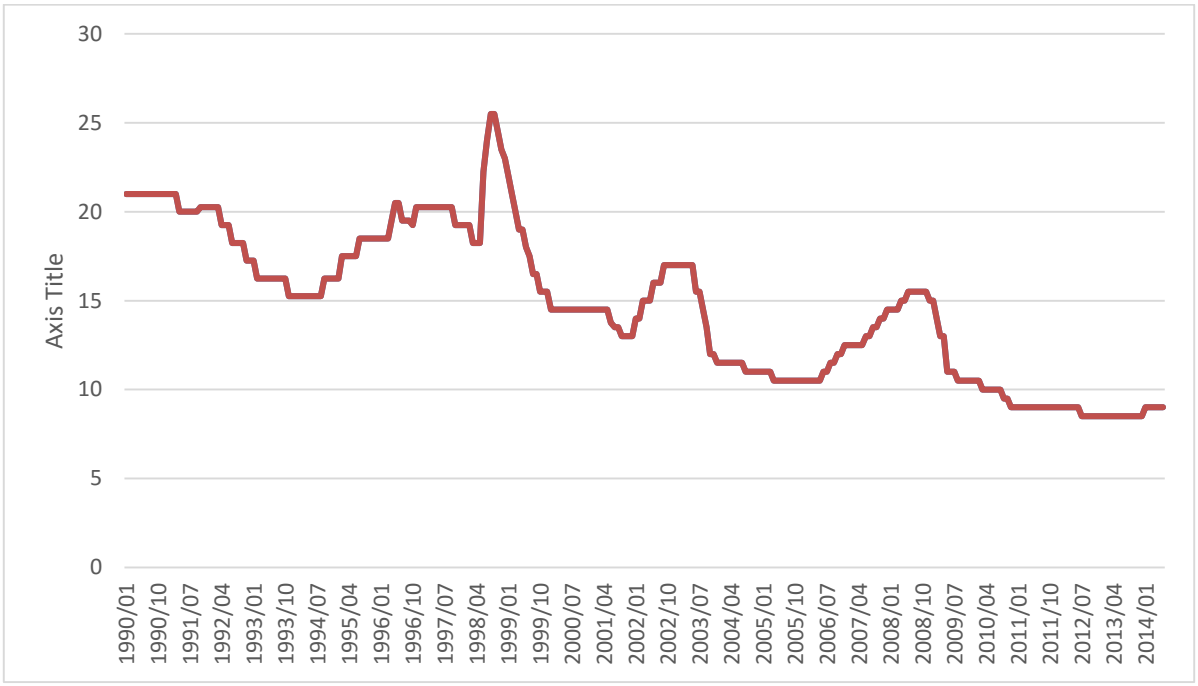

Figure 2.8: South Africa prime overdraft rate
Source: South African Reserve Bank (2014)

Figure 2.8 depicts the path of the prime overdraft rate or lending rate of banks. Between 1998 and 1999 the rate was maintained between 20% and 25%, and thereafter shows a downward trend, mainly because of the Asian crisis in 1998. The South African Reserve Bank recognises two major components of household sector debt: household/consumer credit and mortgage advances (Prinsloo, 2002). Household debt is in turn divided into open accounts, personal loans at bank, other personal loans, credit card facilities, instalment sale transactions and lease agreements.

Mortgage advances are agreements entered into when a household borrows funds to purchase fixed property and provide the same property as collateral for the loan. An instalment sale is a hire purchase agreement in which goods are provided to the buyer and the purchase price is paid in instalments over a period of time, and lease agreements are transactions in which goods are leased but there is no arrangement that the debtor will become the owner of the goods at any time after the agreement expires. Instalment and leasing finance in South Africa is used to finance mainly vehicle purchase and other durable goods. Credit cards provide households with a revolving credit facility, which defers the payment of a purchase price of a good to a later period.

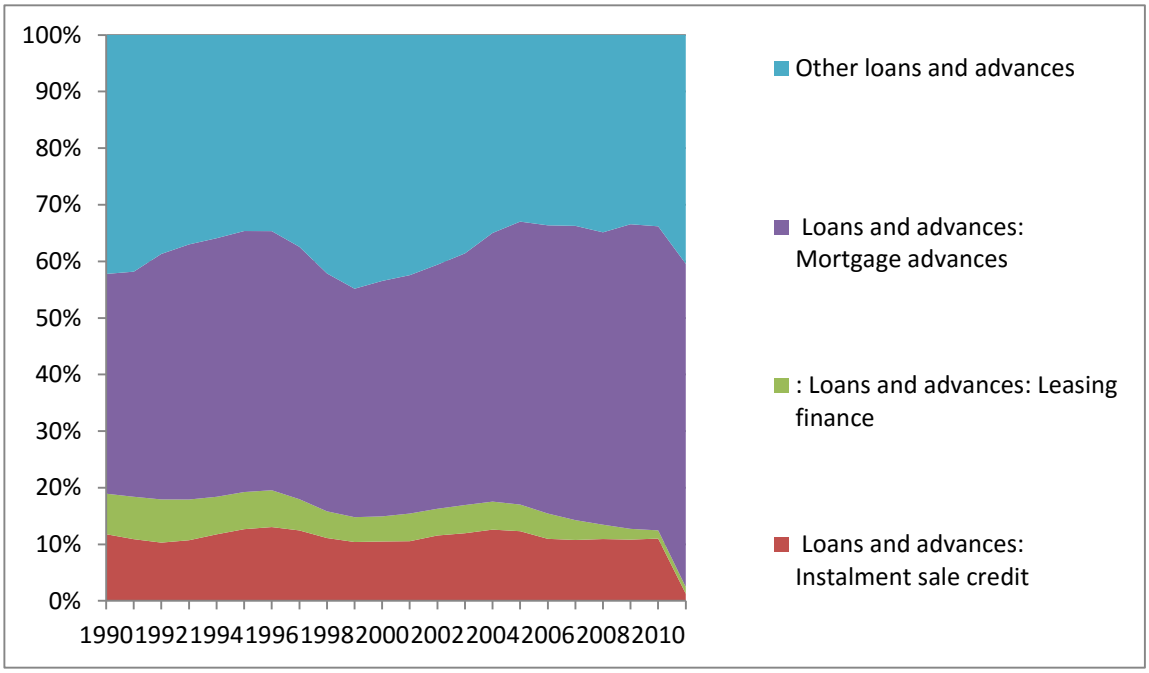

Figure 2.9: Loan and advances to household in South Africa
Source: South African Reserve Bank (2012)

The demand for mortgage advances since 1991 resulted in significant increase in the share of mortgage debt, with mortgage advances making up the single largest component of household debt in South Africa. This is compatible with international developments. The proportion of mortgage advances relative to total household debt has fluctuated between 40% and 55% from 1994, reaching a high level of about 46% in 2007. Between 2004 and 2007, mortgage loans issued to households by financial institutions trended upward, rising to over 50% of total household debt, followed by instalment sales at 11.7%, with leasing and credit card financing at 4.5% and 3% respectively. But at the advent of the global financial crisis of 2008, the proportion of mortgage loans relative to total household debt went down drastically.

2.3 FINANCIAL SECTOR REGULATION SYSTEM

South Africa has a well-developed financial market. Many studies have documented the impressive performance of the financial system (Kambirai and Webb, 2010: 31; Mboweni, 2004: 1). The monetary authority is the South African Reserve Bank (SARB) which is governed in terms of the South African Reserve Bank Act (Act No 90 of 1990). The South African banking industry has both foreign banks and domestic banks. Hence, regulation and supervision of the banks are conducted to strictly follow the principles set by the Basel Committee on Banking Supervision (BCBS). The South African banking industry was one of the first in Africa to adhere to Basel III in January 2013, and most of the financial regulation acts enacted locally are usually reviewed to accommodate the growing changes in risk management and to conform to the international standard. For example, the 1965 Bank Act was amended to the 1990 Bank Act in 1996 following the De Kock Commission recommendations and the De Swart Committee's recommendations to accommodate the Basel framework of ensuring stability and risk management practices in all banks in South Africa (Kambirai and Webb, 2010; Gilbert *et al.*, 2009: 48, 60).

2.3.1 Financial regulation and stability in the South African banking industry

The main goal of the financial regulation is to stabilise the financial sector by ensuring a healthy market and avoiding the drastic consequences of adverse selection and moral hazard. The role of financial sector regulation should not just be to stabilise the market against crises but also to ensure market imperfections are minimal. South Africa regulatory bodies recently added new objectives of facilitating the development of the financial market and combating money laundering in South Africa. Gilbert *et al.* (2009) explained the pivotal need to have financial regulations that will prevent negative externalities in terms of systemic risk, adverse selection and moral hazard and at the same time minimise the cost of regulation of increasing banks transaction cost, reducing innovation and restricting competition in the long run.

FinMark (2004) clearly defined the importance of financial regulation as a prudential system to ensure consumers' and investors' confidence. This can be done through enforcing various risk

management practices (capital and liquidity requirements, corporate governance requirements and auditing requirements). Similarly, it is also the role of the regulatory bodies to ensure the efficiency of the financial market. Efficiency means optimal distribution of resources and funds among the players. Many studies have highlighted that South Africa has a very low level of competition in the financial sector. This can clearly be seen in the case of the 'Big Four' banks having 89.4% of total assets. The oligopolistic nature of the banks stressed the need for a prudential regulatory body that will avoid market imperfections (KPMG, 2004: 13). Figure 2.10 shows the trade-offs and supportive policy objectives in the financial policy objectives. Most of the financial sector will have to concentrate of some of these objectives at the expense of others.

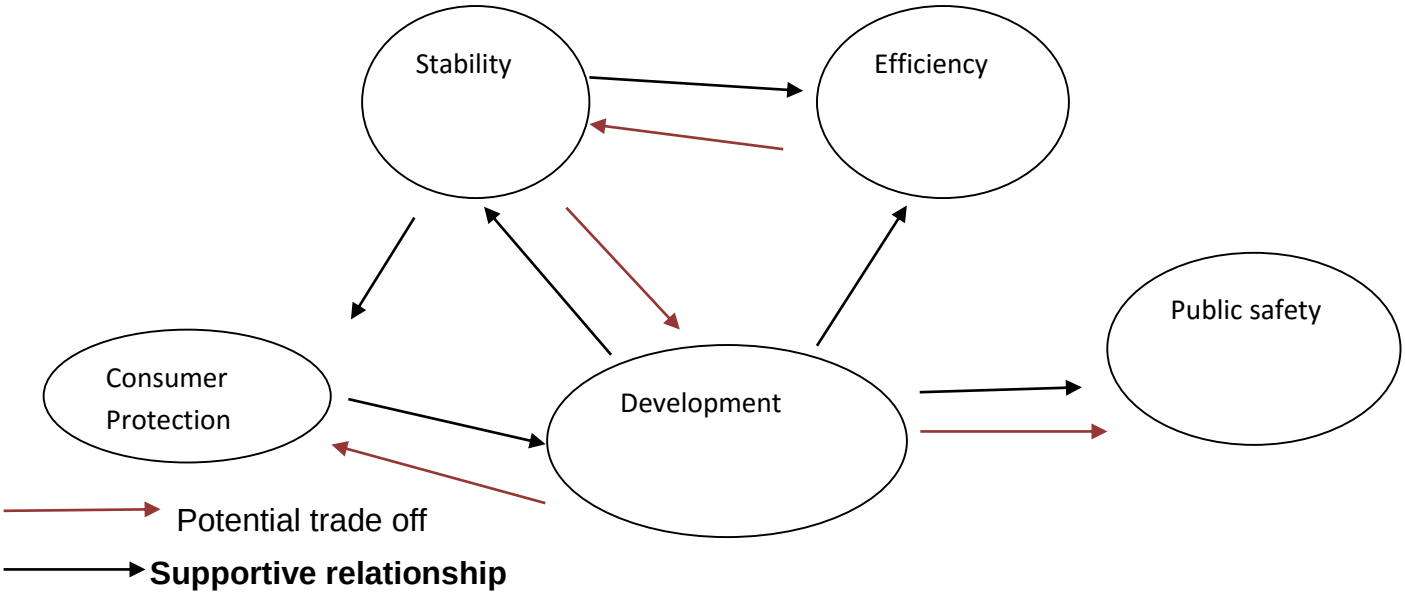

Figure 2.10: Relationship between financial policy objectives
Source: Genesis Analytics (2004)

Banks are considered to be the most important institutions within the financial system because they perform a special role in creating money by issuing deposits, providing a payments system and providing liquidity. They also play an important role in mobilising funds between lenders and borrowers as well as allocating resources more efficiently. The consequences on banking and financial systems, and ultimately the overall economy, brought about by bank failures poses serious challenges to policymakers.

The International Monetary Fund (IMF) identified various aggregate indicators which are used to monitor the health and identify risk to the financial system through what is dubbed the CAMELS framework: Capital adequacy (C), Asset quality (A), Management soundness (M), Earnings (E), Liquidity (L) and Sensitivity to market risks (S). These indicators are derived from aggregating the indicators of the financial health of the individual institutions in order to determine the current health of the financial system (IMF, 2000). Capital adequacy indicators focus on the strength of the financial institutions to withstand shocks to their balance sheet, and so indicators such as the capital-to-risk-adjusted assets are closely monitored to that effect. Closely linked to the capital adequacy indicators are the asset quality indicators, within which the solvency of financial institutions can be monitored. These indicators are on one side from the perspective of lending institutions, and on the other from the perspective of borrowing institutions. At the level of the former, sectoral credit concentration, non-performing loans (NPLs) and the risk profile of assets are just some of the indicators used in analysis; whilst for the latter debt-equity ratios, household indebtedness and corporate sector profitability look at the quality of the loan portfolio health of the institutions. More specifically, the rate of NPLs, return on assets, return on equity, interest margin

to gross and provisions are commonly used by international regulatory and supervisory bodies such as the IMF, World Bank and Bank for International Settlements (BIS) to assess the strength of the banking industry in each country. This is because they give an indication of the 'financial soundness' of the banks and state of the balance sheet of the financial institutions, as the risk relies heavily on the impairment of some of these off balance sheet items. It is also important to establish and document the failure of the prudential regulation (Basel Accord) in preventing international crises despite various versions of the Basel accords that have been established over the years. Many authors (Gilbert et al. 2009: 52; White, 2009 Goodhart, 2004 Gottschalk, 2010 have criticised prudential regulation for implementing outdated and backward-looking regulations that were not able to withstand modern credit management techniques. Moreover, Basel II has been criticised heavily to amplify procyclicality of credit provision. For instance, Gilbert *et al.* (2009), Akinboade and Makina (2009), Liu and Seeiso (2011) and Bernstein *et al.* (2014) have studied the relationship between Basel II and pro-cyclicality of credit in South Africa. However, most of these studies usually have mixed results concerning the link between the regulatory capital and the credit market. Most times, the feedback mechanisms are usually different.

2.3.2 Non-performing loans

Generally, NPLs are loans in arrears (bad loans, doubtful loans, bad debt, etc.). Under Basel II, NPLs are loans that are past due and unpaid for more than 90 days. Five categories of NPLs were proposed by the Institute of International Finance, and Bloem and Gorter (2001) analysed the specific treatment of NPLs in macroeconomic statistics. NPLs are loans whose interest rate and principal payments are longer than three months arrears of lending conditions. NPLs can also be defined as the full liquidation of outstanding debt (Bloem and Gorter, 2001).

NPLs are defined in different dimensions. The 'standard definition' refers to the situation in which repayment difficulties are not foreseen under current circumstances and full repayment is expected. Substandard, doubtful and loss each refer to situations in which the interest or principal or both are more than 90 days overdue, 180 days overdue and for more than one year, respectively.

In South Africa, NPLs represent credit in repayment delay for at least 90 days (three months). These are loans in the process of being judged unrecoverable and hence written off as a loss for the credit institution. For the purpose of this study, NPLs will help to ascertain the impact of financial regulations on bank lending. This study will focus on this indicator to assess the stability of the South African financial system during crisis periods. Figure 2.11 below shows the NPLs of South Africa during the global financial crisis of 2007. One can observe that the level of NPLs was at its highest in 2009 during the peak period of the crisis, buttressing the point that during crisis

periods, NPLs are usually consequences of increases in household debt, changes in interest rates and macroeconomic instability.

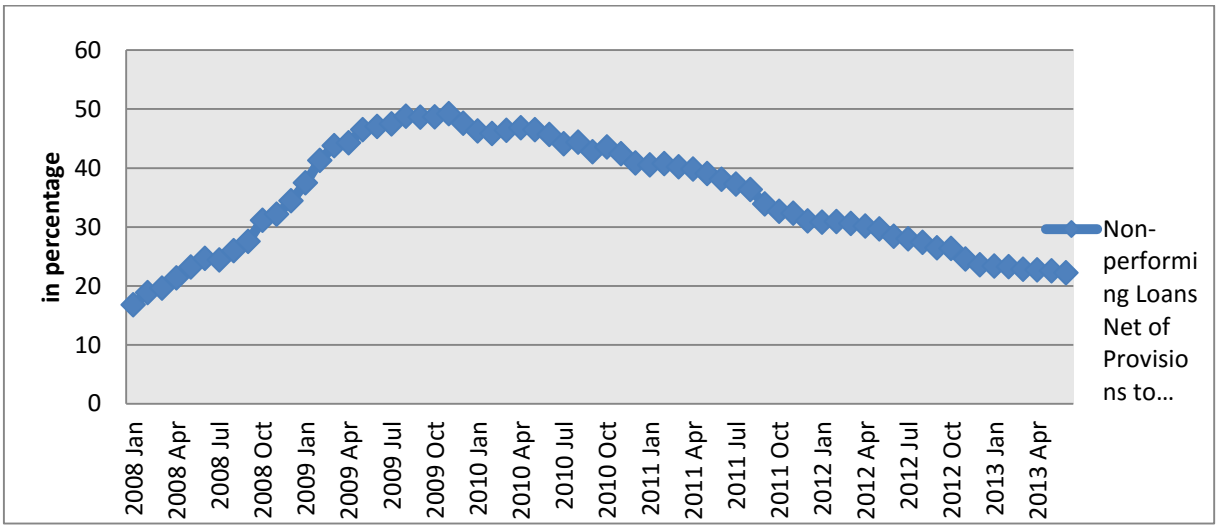

Figure 2.11: Non-performing loans to net provisions
Source: SARB (2013)

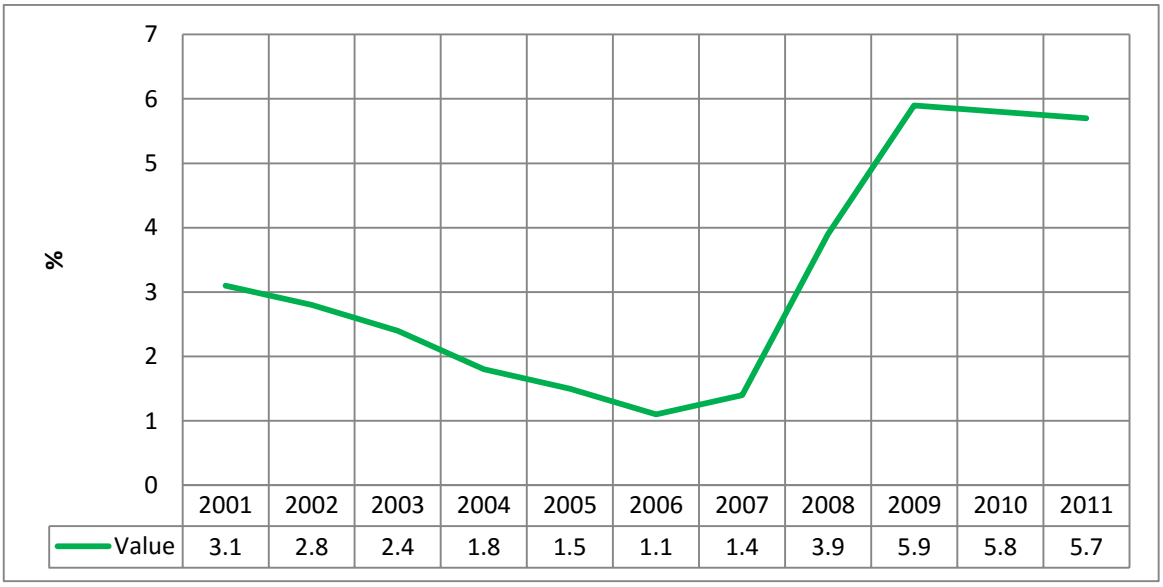

Figure 2.12: Bank non-performing to total gross loans
Source: Computed using data from Mundi Index

An increase in NPLs generally indicates inefficiency in lending. As the ratio of NPLs to gross loans increase, the provisions for loan losses also rise. NPLs will be discussed further in chapters seven.

The quality of bank loans, as indicated by the share of NPLs to gross loans, decreased significantly between 2001 and 2006 as shown in Figure 2.9. However the ratio began to go down after 2007, rising to 3.9 percent in 2008 and 5.9 percent in 2009. Banks' NPLs to total gross loans in South

Africa were 5.7 percent as at 2011. Its highest value over the past 10 years was 5.9 percent in 2009, while its lowest value was 1.1 percent in 2006. From a record low of 1.1 in 2006, the NPL ratio rose sharply, likely reflecting the onset of the global financial crisis. The record high in 2009 may have been due to the global recession that placed a huge financial strain on consumers resulting in a large volume of defaulted loan obligations.

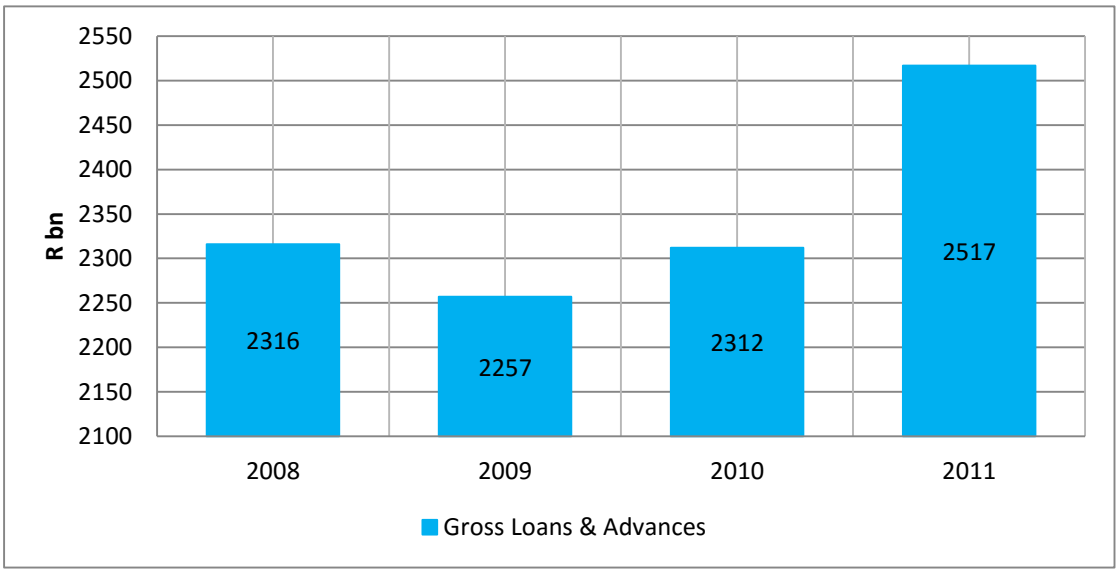

Figure 2.13: Gross loans and advances for the South African banking sector
Source: Computed using data from SARB

According to SARB (2011), bank loans and advances extended to the private sector first decelerated and then stagnated before progressing into a sustainable growth trend in the aftermath of South Africa's first recession in nearly two decades (see Figure 2.13). This improvement in the positive growth of gross loans and advances is attributed to the combined effect of improved interest rates, which improved growth in real income, and the progressive easing of lending criteria of banks.

2.4 THE EFFECT OF THE GLOBAL FINANCIAL CRISIS' ON THE SOUTH AFRICAN BANKING INDUSTRY

It is well-established in the literature that financial development stimulates economic activities through efficient allocation of resources, reduction of transaction costs and diversification of risks (Knoop, 2013: 6). However, despite the numerous advantages of financial development, there is usually a trade-off between the establishment of a highly developed financial market and the stability of financial systems because of its fragility and interconnectedness with the real sector. Most emerging economies are apprehensive of the risk factor embedded in the expansion of credit

without effective implementation of micro and macroprudential regulation after encountering a series of financial crises.

A financial crisis can be generally defined as a great disruption to the financial market's asset prices and balance sheet engendered via an increase in asymmetric information (Mishkin, 2010: 199). Financial crises usually cause a disruption to the flow of credit to the real sector especially households and firms, retarding productive investment and consumption and generally resulting in a general economic meltdown (Demirgüç-Kunt and Detragiache, 1998a: 81). There are a host of factors, both direct and indirect, that have contributed to the eruption of the financial crises over the years. Mishkin and Eakins, 2013 (2013) summarised the various stimulants of financial crises both in developed and emerging economies, as the mismanagement of financial innovation and liberalisation, increase in asymmetric information in the financial market, increase in uncertainty and interest rate, and fiscal imbalances in emerging markets. The banking crisis episodes have shown how eruptions in the financial sector can affect the global economy and expose the fragility and instability of the banking system around the world.

According to the South African Reserve Bank (SARB, 2011), South Africa was directly affected by the 2008 global financial crisis due to inflationary pressures engendered by the commodity boom and importation of goods stimulated by the reduction of interest rate in 2009, reducing demand for credit in South Africa. However, South Africa was also shielded from the 2008 global financial crisis due to foreign exchange restrictions and fairly conservative prudential regulations, risk management practices and sound macroeconomic policies (Saayman, 2010: 5).

2.4.1 Asian crisis of 1998

Several articles have demystified the causes of the Asian crisis of July 1997. These include Corsetti *et al.* (1999), Mishkin (1999), Goldstein (1998), World Bank (1998) and Krugman (1998). The big lesson to be learnt from the Asian crisis is that financial liberalisation with limited contract monitoring enforcement and weak prudential regulation can expose the fragility of the financial system.

Although the Asian countries had a sound fiscal and budget surplus before the crisis (for instance, the Philippines had a budget surplus of 0.3 percent of GDP and in Indonesia it was 1.3 percent). Similarly most of the Asian countries had single digit inflation rates between 1990 and 1996 (Hussain and Wilborg.,1999). Mishkin (1999) shows that what really triggered the crises was the maintenance of fixed exchange rates and high interest rates, and these encouraged investors all over the world to take advantage of the excess liquidity and cash flow. This sudden change in the composition of capital flows later encouraged the appreciation of exchange rates, affecting the current account and trade balance of most Asian countries.

According to Mishkin (1999), the Asian crisis started when the financial liberalisation policy was enforced in the East Asian countries without corresponding prudential policies to curtail the risks associated with it. For instance, when the interest rate restriction was removed in 1997, it attracted many foreign investors who injected much foreign capital inflows into the Asian countries. The rapid increase in foreign capital flow lead to a dramatic increase in credit and lending in the banking sectors, which later endangered the Asian countries' financial system to asymmetric and systemic risk in the long run. According to the BIS, US$184 billion of net private capital flows moved into the Asian economies between 1994 and 1996. But in the middle of the Asian crisis about US$102 billion went out in the second half of 1997 (Word bank, 1998: 2).

These huge losses and deterioration of banks' balance sheet attracted a currency crisis because it was apparent that the central banks of the various Asian countries could not defend their currencies against speculative attack. For instance, the Thai government exhausted US$20 billion of foreign reserves to defend the Thai baht against speculative attacks (World Bank, 1998; Corsetti, 1998: 41).

Mishkin (1999) also noted that during the Asian crisis, credit extension in the Asian crisis countries grew faster than GDP and lending exploded such that it encouraged excessive risk-taking which resulted in the loss of loans. Similarly, the share of NPLs to total loans rose from 15% to 35% in some Asian countries (Malaysia, Thailand and Korea).

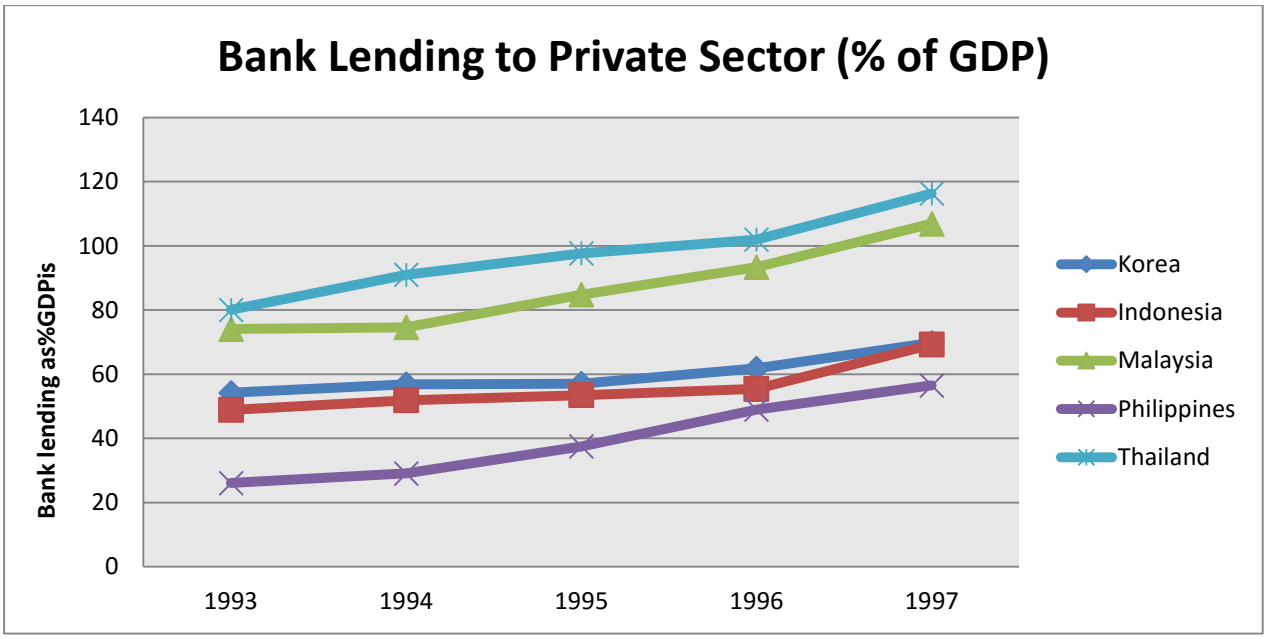

Figure 2.14: Bank lending to private sector for Asian Countries
(Source: Adapted from Corsetti, 1998: 62)

Figure 2.14 depicts the lending boom among the Asian countries. Thailand's bank lending to the private sector increased from 80% to 116% in 1997, while Malaysia's bank lending increased to

106% from 74%. This gives an indication of the magnitude of the bank lending boom during this period.

Corsetti (1998) also concluded that fundamental imbalances and speculative attack as a result of the precipitation of exchange rates, asset prices and economic activities caused the currency and financial crisis of 1997 to 1998. He pointed out that the unprecedented pressure to ensure a high growth rate in the Asian countries also exacerbated the crisis.

The Asian crisis ended up as twin crises of both financial and currency crises. These were stimulated by a sharp depreciation of currencies in Indonesia, South Korea and Thailand, in addition to the reduction in foreign reserves. For example, Indonesia's currency devalued by 75%. Devaluation of the domestic currency against a backdrop of debt contract denominated in foreign currencies further precipitated the balance sheet of the Asian countries since most of their assets are denominated in domestic currenciesy. This caused a great disruption to their banks' net worth and cash flow which further exacerbated the crisis.

How did the Asian crisis affect South Africa? Stals (1999: 2) stated that South Africa was affected by the Asian crisis because of financial globalisation. South Africa adopted economic policies that would ensure inflow of funds and foreign investment capital into the country to augment low savings and create more employment in the country. For example, the exchange control policy was reduced while the Johannesburg Stock Exchange (JSE) was remodelled to accommodate other specialised trading to attract foreign investment. Globalisation policies initially increased foreign investment funds by R200 billion from 1994 to 1998 and increased official foreign reserves by R30 billion. However, the contagion effect of the Asian crisis spilled over to South Africa economy in May 1998 when foreign portfolio investment plummeted by R26 billion in 1998. The large outflow of funds adversely affected the rand, causing a drastic depreciation of the rand by 20 percent, while the inflation rate increased from 5 percent in April 1998 to 9.3 percent in November of the same year (Stals, 1998: 4).

This section highlighted the major causes and consequences of the Asian crisis from various literature and how it spread to South Africa. Proponents have also established that the Asian crisis was caused by number of reasons, including the uncontrollable increase in foreign liabilities and the unregulated financial sector. We have learnt that a bank lending boom left uncurbed for a long period when the interest rate was artificially down can stimulate moral hazard and adverse selection problems that can later escalate to cause a huge crisis and spill over to affect other countries.

2.4.2 South African banking crisis

The South African banking sector has ensured a stable and well refined banking system for the last two decades, however, the South African banking sector also experienced a crisis in 2002, when small and medium banks experienced some turbulence due to liquidity crises caused by a “negative market perception” and the Saambou Bank crisis (Mboweni, 2004: 3). The Saambou banking crisis caused loss of consumer confidence in the SME banking system and many depositors withdrew their funds from banks. The crisis later spilled over to the larger banks in South Africa, for instance, BOE Bank and Islamic Bank were adversely impacted hence they had to be consolidated by desegregating with Nedbank. Mboweni (2004: 1) stated that 22 banks exited the South African banking system between 1997 and March 2003. Consequently, SMEs comprise only 3.1 percent of the total banking sector in 2009 as compared to 21.7 percent in 1994. There have been dramatic changes in the number of banks operating in South African banking system over the years. Gilbert et al. (2009) observed that the number of banks went down from 61 in 1970 to about 44 in 1996 before drastically reducing to 19 in 2007. He further stated that between 1996 and 2004 more than half of the banks (especially the small banks) were either liquidated, placed under curatorship or denied access to funds from the Reserve bank as “lender of last resort”. This was a result of rationalisation and consolidation of banks (Gilbert et al. 2009: 72-73).

2.4.3 Global financial crisis of 2007–2009

The global financial crisis of 2007, which started in the US sub-prime mortgage market, was one of the most serious financial crises since the great depression of the 1930s. The global financial crisis led to a collapse of stock markets around the world and the dilapidation of some huge financial institutions such as Lehman Brothers. It is important to ascertain the major causes of this crisis given the fundamental roles played by most financial systems in channelling funds for productive investment. An economy without an efficient functioning financial market is like a vehicle without fuel. Moreover, the global financial crisis of 2007 has challenged various schools of thoughts on the principal role played by financial regulation and financial innovation towards the stability of financial systems around the world (Angeloni and Faia, 2013; Borio and Zhu, 2012). According to Galati and Moessuer (2012), the global financial crisis (2007-2009) has shown the lapses of the supervisory framework in preventing financial instability and engendering an upsurge in the macroeconomic fundamentals (Galati and Moessuer, 2012: 4).

2.4.4 Major causes of the 2007-2009 sub-prime financial crisis

According to Mishkin and Eakins (2013), the sub-prime global financial crisis started when new types of loans or financial products known as financial innovation (securitisation) were mismanaged due to improvements in technology and data mining techniques. This led to the birth of a new class of risky residential mortgage in the United States. These developments in computer

technology facilitated a process known as securitisation in which small loans are built into standard debt securities. Sub-prime mortgages are loans that are given to borrowers who are regarded to be a high credit risk and may have difficulty with their repayment schedule. These individuals often have poor quality collateral and usually lack a strong credit history. As a result of securitisation and financial liberalisation, many sub-prime borrowers were able to access mortgage loans and buy houses. Between 1997 and 2006, the Standard and Poor (S&P) home price index reported that American house prices had risen by 124% (see Figure 2.15).

Figure 2.15 shows diminishing returns of the US home price index reaching a peak in 2006, which eventually burst resulting in many sub-prime borrowers becoming delinquent in their repayment obligations since their assets were now lower than their mortgages.

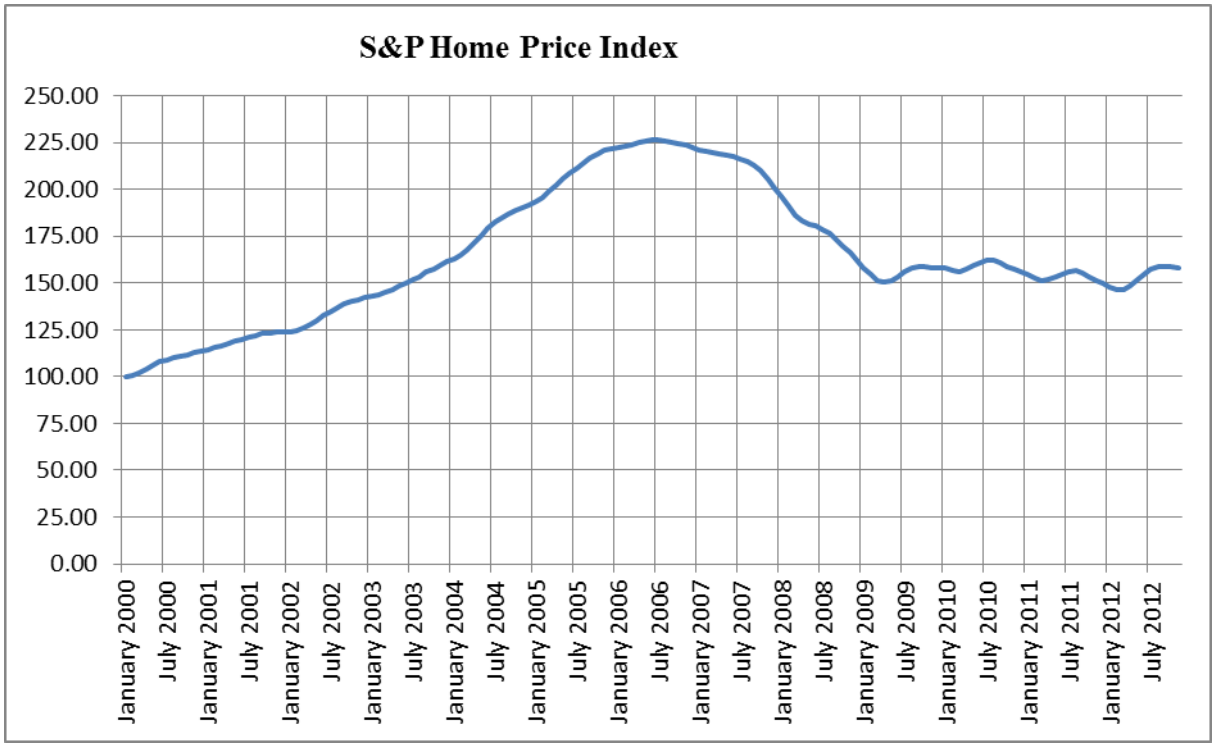

Figure 2.15: The US Home Price Index

Source: S&P Home Price Indices Economic Indicators, 2012

The sub-prime mortgage crises started when a new set of financial products or loans was introduced called “asset-backed security” (ABS), specifically “mortgage-backed security” (MBS), where mortgage portfolios were packaged as securities and sold to investors. This form of securitisation was sold in tranches through “special purpose vehicles” (SPVs) to various investors. This new product allowed the banks to give out loans and augment their lending faster than their deposits but the banks fail to keep tab with the defaulters.

Figure 2.16 shows simplified ABS collateralised debt obligation (CDO) which is a process through which the lender combines other financial assets and later repackages different tiers of financial

instruments to other investors. The diagram shows a mechanism through which credit risk and shocks are transferred to other investors based on the rating of each asset from the senior tranche to the equity tranche. The main culprits behind the sub-prime crisis were the financial institutions for their lapses in transferring credit risk from balance sheet to capital market investors. Most of the financial institutions were not only holding predatory loans or non-conforming loans but were highly volatile and risky in the long run (Hull, 2012: 183).

Prior to the crisis, only creditworthy borrowers (known as prime borrowers) were given residential mortgages. However, improvements in technology and data mining techniques precipitated the advent of the residential mortgage bubble and shadow banking system comprising the hedge funds, money market funds, Over the Counter (OTC) transactions and derivatives market which operated outside the scope of the minimum capital requirements and prudential regulation (Mishkin, 2010: 204; Elson, 2010: 18).

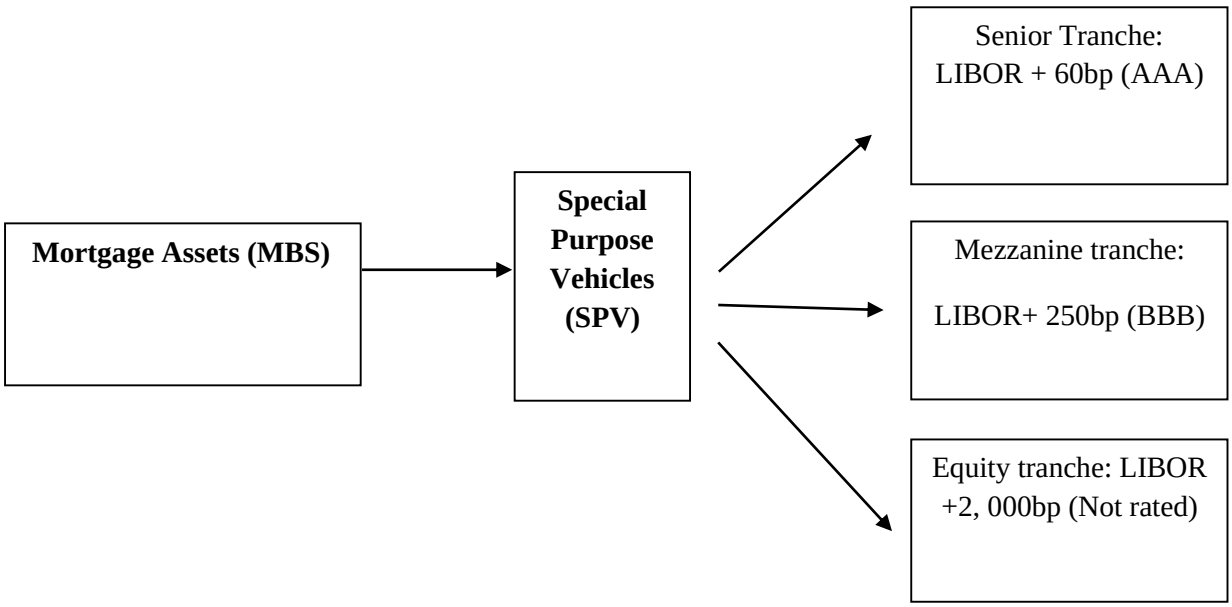

Figure 2.16: ABS collateralised debt obligation (1bp=0.01%)
Source: Adapted from Hull (2012: 183)

Worth mentioning from Figure 2.16 is a class of highly advanced financial products known as collateralised debt obligations (CDOs). These CDOs were paying out income streams from a collection of underlying assets and were designed to have certain risk characteristics that attracted investors of particular preferences.

A financial crisis takes place when an increase in asymmetric information triggered by a disruption in the financial system causes severe adverse selection and moral hazard problems that eventually cause financial markets to fail to execute their intermediary function efficiently (Mishkin and Eakins,

2013). Therefore if the banking system, which plays the most important role within the financial system, fails to facilitate the efficient flow of funds from savers to borrowers, then productive investment opportunities which are the output of banks are lost in the process. For instance, during the crisis, the banking sector of most countries, particularly advanced economies, incurred additional costs of dealing with increasing NPLs and declining bank outputs.

Another major cause of the 2007 financial crisis was the principal–agent problem in the mortgage market. For example, the mortgage brokers who initiated loans did not make the required effort to ascertain whether the borrower was capable of paying off the loan. This lead to problems of adverse selection and moral hazard in the financial system. Hence, brokers have little incentive to monitor the ability of borrowers to fulfil and repay back their financial obligations. In some cases, it was reported that mortgage brokers went through desperate measures of encouraging sub-prime borrowers to take on loans by falsifying information for them in order to qualify for loans (Mishkin and Eakins, 2013).

Credit rating organisations also contributed to the eruption of the crisis. The credit rating organisations for CDOs) were characterised by inconsistencies and irregularities. For instance, the credit rating agencies were also gaining substantial income from rating debt securities of institutions that had an interest in seeing a positive rating. Hence the credit rating process became biased and this stimulated the crisis.

2.4.5 Boom and bursting of a housing bubble

The market for houses in the US contributed significantly to the outburst of the crisis. Mckibbin and Stoeckel (2009) believed that the housing bubble was a result of a long period of low interest rates by the US Federal Reserve. The US slashed their interest rate by a total of 550 basis points between 2001 and 2004. The low interest rate from 2003 to 2004 fuelled a boom in bank lending, and asset prices rose. Rising demand in China and India also fuelled a commodity price boom and surplus funds that led to high competition for borrowers.

Lazarov (2009) stated that the global financial crisis of 2007 started as a result of the credit boom as well as the formation and bursting of a bubble in the housing market. In order to attract home mortgage ownership, policy makers in the US weakened regulations to allow access to the mortgage market which eventually led to sub-prime mortgage borrowers. Mishkin (2010) states that these high prices implied that the appreciation of the value of houses could enable borrowers to refinance their houses with even larger loans. Even in the worst scenario, these sub-prime borrowers had the option of selling their houses to settle their loans. However, market participants did not anticipate any downward trend in house prices and hence the boom in house prices continued.

2.4.6 Consequences of the crisis in South Africa

According to Banking Association of South Africa (2010), the economic recession in 2009 which was a consequence of the global financial crisis affected consumer affordability and spending patterns, resulting in consumers being reluctant to take on more debt. This resulted in the increase in NPLs which had a huge impact on banks' loan books and so total assets and liabilities declined in 2009. However, South Africa's financial sector is believed to have weathered the contagion and catastrophic effects of the 2008 worldwide financial crisis partly on account of a sound regulatory framework and solid macroeconomic policies.

Saayman (2010) explained how the global financial crisis of 2007 affected South Africa. The author believed that the crisis squeezed out liquidity from the South African money and capital markets. The capital market became volatile during this period since many foreign investors pulled their funds from the South African market for safety of their assets. He explained that the capital market experienced a great loss due to contagion of the crisis.

Figure 2.17 shows how ABSA house price index plummeted downwards from 15% in September, 2007 to -0.5% in June, 2009. Similarly, according to SARB (2009a), the Standard Bank mortgage-backed securities in South Africa, which issued about R30 billion worth of asset securities in 2007, also experienced a drastic fall in their assets to about R2 billion in 2008.

Figures 1.4 and 1.5 further point to the effect of the GFC during this period, where the growth in money supply (M3) and credit to the private sector went down rapidly as a result of GFC in 2007.

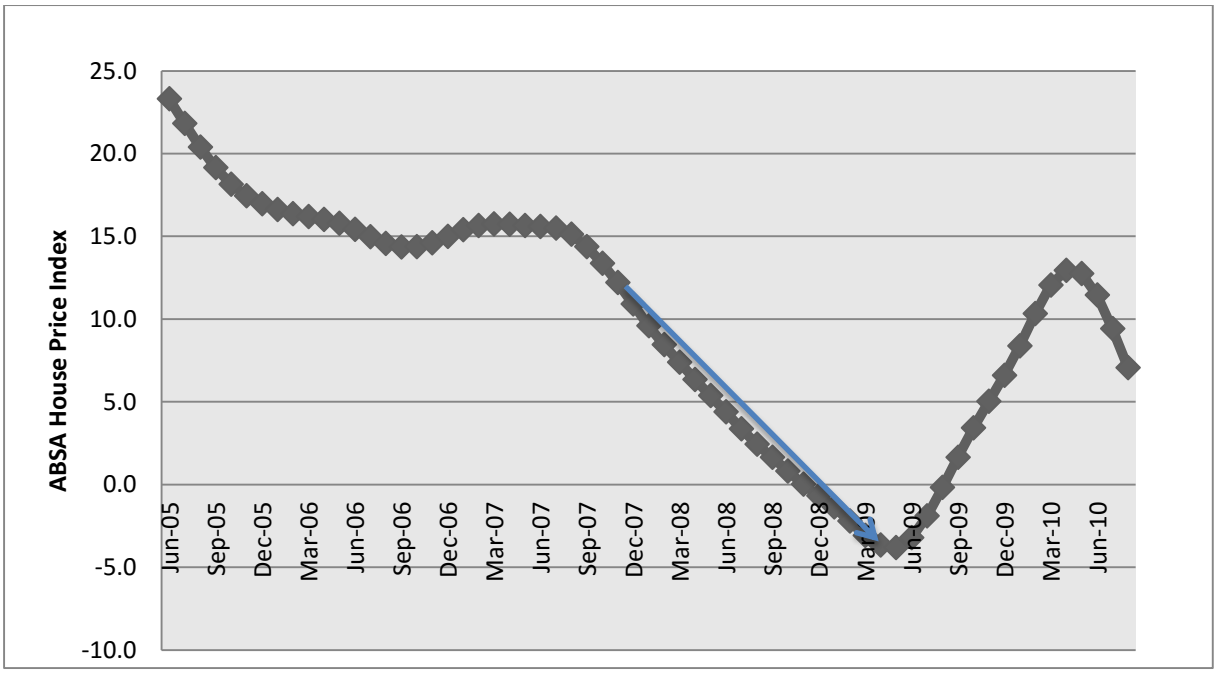

Figure 2.17: ABSA House Price index
Source: SARB, 2011

Table 2.5: SA's Return on equity (ROE) and return on assets (ROA)

	2008	2009	2010	2011	2012	2013
Return on Equity (ROE)	20.65	15.88	14.64	16.39	16.96	16.50
Return on Assets (ROA)	1.15	0.94	0.97	1.15	1.20	1.22

Source: SARB(2013) and Various Quarterly Bulletins SARB

Both the ROA and the ROE deteriorated in 2009, depicting the impact of the financial crisis. The ROE continued to fall in 2010 and rose in 2011. Following the drastic fall in 2009, ROA started recovering in each of the subsequent years as depicted in Table 2.5. According to Table 2.4, ROE and ROA were at 16.50 and 1.22 in 2013, respectively indicating an improvement in profitability in the banking industry.

2.4.7 Issue of international trade and fiscal deficit

The disruption in the financial market also affected the real sectors of many countries both developed and developing, leading to a global recession. For example, the USA, UK and Europe saw a decline in real economic activity as economic growth slipped below zero per cent by the last quarter of 2009 while negative growth rates of about -5 per cent were recorded for some other advanced countries (World Bank, 2009; Saayman, 2010: 8). The trickle-down effect of the global financial crisis of 2007 to developing countries was vividly seen in the reduction of price of commodities in the world. Naude (2009) reported that the crisis caused a decline in foreign investment, foreign aid and remittance flows in many developing countries. South Africa was not spared in this crisis: South African's economy growth rates dramatically reduced to negative growth during this period. The manufacturing and mining sectors also experienced a huge decline due to the reduction in international demand.

2.4.8 Cyprus financial crisis in 2013

Cyprus is a small offshore financial centre for many countries that contributes about 0.2% to the GDP of the euro zone. The country attracts a number of foreign investors because it is a tax haven and has favourable financial regulations (Kalotay, 2013). For instance, many prominent Russian investors keep their funds in the Cyprus banks as a result of its high interest rate strategy to attract capital flows.

However, things turned sour for Cyrus in March 2013 due to the interconnectedness of the Cyprus and Greek economies coupled with the surge of fiscal mismanagement and huge fiscal debt which escalated to about 300% of GDP. In the end, a banking crisis was inevitable after the Greek debt haircut in October 2011 which was disastrous for the Cyprus economy which could not cope with the collapse of its two largest banks. According to the literature, the Cyprus Popular Bank and

Bank of Cyprus in Greece lost about 4.5 billion Dollars, Emergency Liquidity Assistance (ELA) was instigated to rescue the Cyprus economy (Zenios, 2013).

The crucial lessons from the Cyprus debt crisis are the consequences of crises, how less regulated fragile banks can harm other economies and how the euphoria of 'too big to fail' and 'too interconnected to fail' can cause banks to invest recklessly.

2.5 CONCLUSION

The overview of South African banking industry presented in this chapter provided the necessary background for this study. This chapter also attempt to explain the major causes of global financial crisis and how it affected South Africa. Understanding the structure of South African economy will provide more insight into investigating the effect of bank capital requirements on bank lending. The study will continue in the next chapter by reviewing theoretical and empirical studies previously performed, to understand the relationship between bank capital and bank lending.

Chapter 3

LITERATURE REVIEW

3.1 INTRODUCTION

This chapter outlines the theoretical framework and literature that underpins regulations and credit crunch studies as well as the empirical literature behind their impact on the banking sector. The theoretical section explores the conceptualisation of regulations, financial crisis and credit crunch.

3.2 THEORIES ON CREDIT

3.2.1 Credit and development finance

The literature is rich with debate on credit and its effect on the economy, starting from the turmoil days of the great depression of 1930 till the recent global financial crises (GFC) of 2007. There has always been a link between financial systems and the aggregate real activity. Economists have always viewed the financial market as the heart of growth and development in any country. This section of the literature review summarises the role of credit in the economy from the Keynesian view to the current debates on the new business cycle.

The financial market plays a significant role in efficiently circulating funds from lenders to borrowers, fostering economic growth and development. It is a common predication that without a functional financial market, the economy cannot grow or develop (Ikhide, 1992, Ikhide & Alawode, 2001; Levine, 2005; Rajan and Zingales, 1998; Beck *et al.*, 2000, 2004; Knoop, 2008). Essentially, the financial market provides liquidity (Block and Herts, 2002), and contributes to capital formation and investment risk reduction by offering opportunities for portfolio and risk diversification (Levine, 1991). The financial system also acts as a connector to bridge the gap between borrowers and savers.

Empirical evidence has shown that higher levels of financial development stimulate long-run growth (see Schumpeter, 1911; Gurley and Shaw, 1955; Goldsmith, 1969; Hicks, 1969; McKinnon, 1973; King and Levine, 1993a; Levine and Zervos, 1998; Rajan and Zingales, 1998). While some schools of thought believe that finance does not engender growth (Robinson, 1952; Lucas, 1988), Goldsmith (1969) established in a cross-country study of 34 countries that the financial system is a significant contributor to economic growth. However, the study did not detect any relationship between economic growth and financial structure. King and Levine (1993b) later replicated the work of Goldsmith (1969) to a sample size to 77 countries, using a different scope of financial development measurements (credit to private sector over GDP, liquidity liabilities over GDP, bank

credit over bank credit plus central bank domestic assets). The results show a positive relationship between each financial measure and economic growth.

Country case studies on financial depth and growth linkages have been provided by McKinnon (1973), Gelbard and Pereira (1999), Rousseau and Wachtel (1998), Neusser and Kulger (1998), Cole and Park (1983), Patrick and Park (1994), Fry (1995) and Ndebbio (2004). These studies conclude that better functioning financial systems support faster growth. Moreover, since the seminal work of McKinnon (1973), several researchers have emphasised the need for financial institutions to efficiently transfer capital from savings to productive investments (Olowe, 1999; Claessens *et al.*, 1995; Dickinson and Muragu, 1994; Alile, 1992; Romer, 1986).

Researchers have also established the importance of the banking system in facilitating a country's economic growth and stability (Allen and Gale, 2000; Levine, 2006) through credit to the growth sectors of the economy. The credit channel plays a crucial role in the transmission of monetary policy in order to achieve the main macroeconomic objectives of economic growth and financial stability. Empirical evidence has also demonstrated that a deeper credit fosters financial deepening and can help augment economic development, especially through a well-developed credit market. Supply-side driven economic growth holds that an economy with better access to credit will increase productivity and capital accumulation (Schumpeter, 1911; Levine, 1997; Acemoglu & Scott 1997; Hansen and Sulla, 2013). For example, King and Levine (1993b) established a positive relationship between credit market depth and economic growth. Hansen and Sulla (2013) studied credit growth in Latin America using variables such as private credit to GDP level ratio and emphasised the special role of private credit in economic development.

The concepts of financial market liquidity, stability and efficiency have been used to demonstrate how developments in the financial market transmit to economic growth. This liquidity argument is based on the assumption that stock markets and financial intermediaries enable firms to acquire much needed capital quickly and this helps to facilitate capital allocation, investment and growth. Other studies have also found evidence to support the argument that a significant positive relationship between savings, size and liquidity exists (Ezeoha *et al.*, 2009; Yartey, 2008; Levine, 1997; Boyd and Smith, 1998; Levine and Zervos, 1996; Allen and Gale, 2000; Ngugi, et al. 2003).

The link between finance and growth cannot be complete without overcoming the problem of financing constraints, especially among the less developed countries (IMF, 2006). Theories suggest that financial market imperfection can be reduced through the availability of credit to the poor (Galor and Zeira, 1993; Zhuang *et al.*, 2009). Bank loans are usually viewed as pivotal to economic growth and development (Kapur, 1976). However, studies have shown that many banks are usually less willing to finance loans to small scale enterprises since they banks incur high information cost to access information about small scale borrowers. Similarly, most banks are

commercial ventures that are seeking profit, and believe they will be taking a higher risk with little return if they give loans to many small scale borrowers (Aryeetey *et al.*, 1994; Soyinbo, 1994).

Schmidt and Kropp (1987) stated that banks' lending policies in the form of minimum loan amounts and limitations on loans for specific purposes are among the main problems hampering most SMEs from benefiting from loans from the banks. Two theoretical paradigms guided and explained the reasons for loan rationing in the form of credit market fragmentation: a policy-based explanation paradigm and a structural-institutional based paradigm (see Aryeetey *et al.*, 1994). The policy-based paradigm established that repressive policies forced many small borrowers to access loans in the informal sector at a higher rate. Removing the repressive policies will smooth out loan rationing to small borrowers and ultimately remove credit market frictions. On the other hand, the structural-institutional based paradigm holds that the high costs of screening and monitoring and imperfect information on credit scores usually engender market failure that sabotages financial market development (Aryeetey *et al.*, 1994).

The provision of loans to SMEs has taken the centre stage of most debates in recent years because of the peculiar role played by SMEs in providing employment, alleviating poverty and enhancing development in most developing countries (Ayyagari *et al.*, 2007; Beck *et al.*, 2005a, 2009b, 2011; De laTorre *et al.*, 2008; Seo, 2013; Berg and Fuchs, 2013). Banks have a pivotal role in ensuring there is an efficient flow of finance in the form of bank lending to the SME sector. The nature of bank financing for SMEs has been established in the empirical literature (Beck *et al.*, 2009b). A school of thought believes SME loans should be given mainly by small and domestic banks (Berger and Udell, 1996; Mawa, 2008; Sengupta, 2007). Another school of thought believes that SME lending can also be appropriate for large and foreign banks given their use of lending technologies in the form of factoring, credit scoring and asset-based lending (Beck *et al.*, 2009; Berg and Fuchs, 2013). In most of Sub-Saharan Africa, SMEs are usually more credit-stiffened than most developed countries, to the extent that most banks view SME lending as risky and unproductive (De la Torre *et al.*, 2010; Berger and Udell, 1998). For example, in a recent study on five African countries (Nigeria, South Africa, Kenya, Tanzania and Rwanda), Berg and Fuchs (2013) found that SME lending over the total loan portfolios of banks varies from 5 percent to 20 percent. This is relatively low given the magnitude of bank loans in the banking system. The study also showed that banks in Nigeria and South Africa are less involved with SME lending than banks in Kenya, Rwanda and Tanzania.

3.2.2 Theories on credit channels in the financial system

Most theories on credit channels state that the role of credit arises as a result of imperfect information and market failure between agencies in the credit market, since the information each party brings to the exchange will eventually affect the nature of the contracts. The credit market

needs to efficiently link borrowers with lenders. Most banks usually increase transaction costs and ration credit to protect themselves from bad loans.

Keynes (1936) shed more light on the role of financial systems in his explanation of the “General theory of investment”. He looked at two determinants of investment: state of credit, and how borrowers perceive the future investment. Keynes believed that the lender’s confidence in the market can have a strong effect on credit and the ability to invest in the economy. Secondly, for funds and credit to circulate, lenders must have confidence that the borrower will be able to pay back the loans and this is usually ensured through the use of secure collateral (Minsky, 1975). However, Keynes did not touch on the performance of the credit market although he stressed the importance of the “multiplier effect” and fiscal policy in expanding aggregate demand and growth in the economy. Fisher (1933) acknowledged the damage that occurred as a result of the downturn during the Great Depression in 1930. In Fisher’s view, it all started as a ripple effect of the drastic decrease in leverage of businesses and investments as a result of waves of bankruptcies.

Freidman is famously known as the father of the monetary school of thought. He also focused on the idea that “money solves all problems in the economy” (Friedman, 1963). He acknowledged that money comes from the commercial banks’ liabilities side of the balance sheet, where money supply is predominant (Friedman, 1963). He further stressed a correlation between money and output, where a decline in the money supply leads to a change in prices that brings down economic activities and output.

Gurley and Shaw (1955), Patinkin (1961) and Goldsmith (1969) looked at the role of credit supply in another direction. They emphasised the special role credit plays as opposed to money supply. Patinkin (1961) stressed the special role played by intermediaries to facilities borrowing and lending in an economy. Gurley and Shaw (1955) categorised and compared the financial system in developed and underdeveloped countries and found that financial development in the form of an increase in money balance or loanable funds can enhance development in the long run.

The rational expectations macro model of the Classical school of thought came to life in 1970. Proponents started discussing the capacity of a ‘rational economic agent’ and how he can cause a change in the expectation of policies given his ability to be well informed and make expectations before any policy is implemented. The ‘Real Business Model’ and ‘Monetary transmission mechanism’ debates began to gather momentum during this period. Prior to this time, Tobin and Dolde (1963) had come up with the notion of capital market imperfection in terms of asymmetric information due to the principle agent problem. Minsky (1975) and Kindleberger (1978) observed that disruption and crises in the financial market could have an adverse effect on real activity. Mishkin (1978) gathered data on the Great Depression to ascertain how financial variables adversely affected consumption spending. He found that an increase in consumers’ indebtedness

reduced disposable income and affected the output of the whole economy. Bernanke (1983:267) did a similar study on the importance of financial factors during the Great Depression. He highlighted that the "money phenomenon" was not enough to explain the Great Depression, that it was due mainly to the collapse of the financial system ascribable to disruption in the flow of credit to other sectors of the economy. Furthermore, access to credit from the commercial banks was impaired by the contraction in money supply and reduction in value of assets which reduced the balance sheet drastically which later stimulated a banking crisis. Jaffee and Russell (1976) studied credit rationing using borrower's default probability to segregate good borrowers from bad to solve the problem of credit rationing. Bernanke and Getler (1986) observed that a rise in the cash flow of commercial banks will increase the firm's balance sheet, thereby increasing the credit available for investors to finance projects in the economy.

Stiglitz and Weiss (1981) provided a framework in which the banks set an interest rate higher than the equilibrium interest rate to distinguish between good borrowers, risky borrowers and borrowers likely to default in the credit market: borrowers are charged a very high cost for credit where only borrowers with bad projects will want to borrow at this high interest rate. Stiglitz and Weiss (1981) further showed how financial fundamentals can affect risk perceptions and provisions of credit within an economy. Other proponents established the link between imperfect information and credit rationing (Jaffee and Russell, 1976). Credit rationing in banks usually prevents the efficient flow of funds in the financial system, and this usually leads to financial crises where credit drops sharply. The concept of asymmetric information is very useful since it sheds more light on reasons why different governments embrace financial regulations. Stiglitz and Weiss (1981) suggested that an increase in interest rates above the equilibrium interest rate can be employed to identify riskier bad borrowers (higher probability of default) from good borrowers (lower probability of default).

Bernanke *et al.* (1994:1) started the debate on the financial accelerator, defining it as a "small shock large cycle puzzle". They were intrigued to find out how small shocks can lead to a great eruption in economic activities, for example, oil shocks or currency shocks. They suggested that since shocks usually start from the credit market and later affect the real sector, it would be of paramount important to examine factors that can impede access to credit and cause a downturn in the future. They suggested that during a recession borrowers with a high probability of default should be given less credit to avoid insolvency due to agency problems, which they called the "flight to safety" (Bernanke et al. 1994:6).

3.2.3 Financial markets and the need for regulation

Most theories propounded in the literature have established and advocated for regulatory techniques that will create a forum for competitive equilibrium. The earlier work of Keynes (1936) established the need for the intervention of the government to cure market failure, while Stigler

(1971), established the fact that most regulators will not serve a single economic interest because they might be influenced by cartels or power political groups and this might encourage misallocation of resources (Stigler, 1971; Posner, 1974; Peltzman, 1976). Another school of thought asserted that the inefficiency of market failure and the need for a corrective measure was also exclusively established as a failure of natural monopolies, externalities, rent seeking, asymmetric information, unemployment and unequal distribution of wealth and inequitable market practices (Breyer, 1982; Göran and Hägg 1997). The pivotal reasons that regulators are needed in the financial market is because of lack of information, conflict of interest problems, free rider problems, high transaction costs, and contraction incompleteness that usually preclude the efficient performance of financial intermediaries. The financial system has been planned mainly to facilitate the efficiency of the real sector in any economy.

From the above, it can be seen that the literature is replete with the role of credit in economic growth and, in recent times, poverty reduction. However, recent studies have begun to show how regulation could constrain the credit-growth nexus. For instance, Anderson (2010) showed that the tightness of capital regulations has an inverse relationship with the credit market. It is suggested that the Pillar II proposal of Basel II gives discretion to banks and supervisors, which could result in increased risk arbitrage and regulatory tightening. Barth et al. (2004) also found empirical evidence that capital requirements that restrict banking activities have negative implications on credit. In their earlier work, Barth et al. 2001 also established that restricting bank activities has a tendency to cause a major banking crisis and lower banking-sector efficiency (Barth *et al.*, 2001a).

3.2.4 Overview of the Basel Capital Accord

The Basel Committee on Banking Supervision was formed by the G-10 countries at the end of 1974 after the drastic consequences of the banking crises in Germany and the United States known as the Bankhaus Herstatt Crisis and the Long Island Franklin National Bank Crisis. The main objective was to create an avenue for “international active banking and quality banking supervision world-wide” (Basel Committee, 1999a).

Basel I was established as an agreed regulation framework that was implemented in 1988 to ensure financial stability and soundness of the national banking system and the international financial standard. Basel I was established to have a homogenous financial language to compare capital across different countries and jurisdiction, to improve banks’ capitalisation and to curb the problems caused by financial integration and globalisation in the G-10 countries. Basel I was generally focused on credit risk and ensuring a minimum capital standard for banks. Under Basel I, Tier 1 core capital (consisting of the equity capital and disclosed reserves) and Tier 2 capital (loan loss provision, asset revaluation, hybrid instruments and general provision) were developed to address capital risk while ignoring other market risks and operational risks. Banks were expected

to meet a total capital requirement of 8 percent in relation to their risk-weighted assets (Santos, 2001).

Basel I risk-weighted categories:

- 0 percent weight for cash and claims on government / OECD;
- 0 to 50 percent weight on claims on domestic public service;
- 20 percent weight on multilateral development banks;
- 50 percent on mortgage loans; and
- 100 percent private sector and non-OECD.

The assumption under the Basel I is that the risk-adjusted capital requirement could prevent banks from taking excess risks and prevent banking crises. However, Basel I was unrealistic in ignoring other prominent risks in the financial market (liquidity risk, market risk, operational risk and other international shocks (Jackson *et al.*, 1999; Jones, 2000). Most researchers have established that Basel I encouraged regulatory arbitrage and ignored the development of financial innovation over the years, thus most banks were able to manipulate their balance sheets to fit the framework of Basel I (Santos, 2001; Benston and Kaufman, 1996). Basel I was also heavily criticised for treating risk as addictive and ignoring the fact that portfolio risk can be diversified. Every new loan would require additional capital to be allotted separately (Santos, 2001).

After much criticism and several crises, the BCBS recognised the imperative to capture the growing risk innovation in the amended Basel Framework: this resulted in the formulation of Basel II in 2004. Basel II worked under the assumption of providing a “capital buffer” and risk mitigation against contingencies and crises (BIS, 2005). Basel II allows banks to use three different approaches in ascertaining risk for different types of assets: the standardised approach, the foundational internal risk based (F-IRB) approach and the advanced internal risk approach (A-IRB). The internal approach allows banks to estimate “value-at-risk” (VAR) with their own model. VAR is the estimated maximum loss given the bank’s portfolio, using internal modelling techniques to measure risk. The standard approach allows external rating agencies to ascertain the level of risk by allotting different risk levels to different assets (Gottschalk and Griffith-Jones, 2006). Furthermore, risk is also considered for operation risk as a result of international exposure and innovation of many banks, where three methods were proposed for measuring operational risk: the basic indicator method (BIM), the standard indicator method (SIM) and the advanced measurement method (AMM) (BIS, 2005). At this point many countries that are not G-10 countries wanted to adopt the Basel II framework but had to augment their regulatory systems and have a better infrastructure before adopting Basel II. Many low income countries are still having problems

adopting Basel II because of their lack of human and physical capacity (Santos, 2001; Gottschalk and Griffith-Jones, 2006; Gottschalk, 2010).

Basel II has been faulted for looking only at the micro-prudential shock and ignoring the more important macro-prudential shocks of the banking crises. Global Risk Regulator (2006) stated that the Basel Accord Committee failed to capture information asymmetry issues in daily bank activities and these prevented the effectiveness of the capital adequacy rules. Moreover, proponents also stated that the models presented in Basel II were too complex for many local banks to adopt and these adversely affect the competiveness and stability of many local banks against the foreign banks with better infrastructure (Gottschalk and Griffith-Jones, 2006). Many studies have established the fact that Basel II is risk sensitive since it is harder on banks' capital during economic downturns than during economic booms. Recent empirical evidence supports the views that the internal risk based (IRB) approach in measuring risk may be procyclical (Taylor and Goodhart, 2006; Goodhart and Segoviano, 2005).

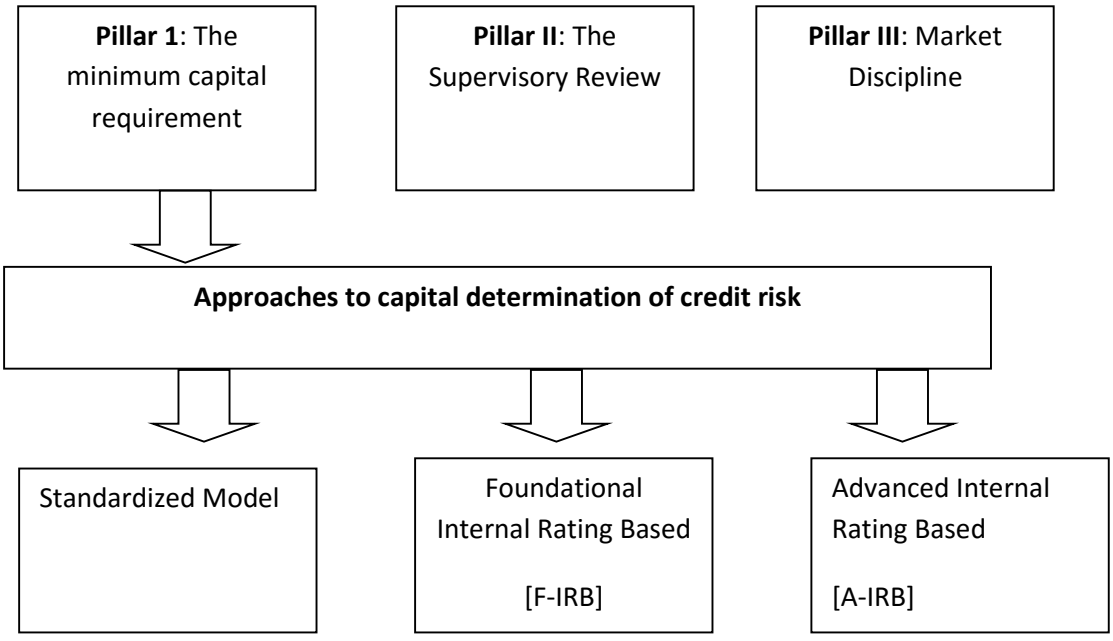

Figure 3.1: Basel II pillars and approaches
Source: Adapted from Gottschalk, 2010:8

Figure 3.1 shows the Basel II framework, which consists of three pillars: minimum capital requirement (now capturing market risk, operational risk and credit risk), supervisory review of capital adequacy and internal assessment process and market disclosure and transparency to enforce safe banking, and market discipline (BIS, 2009).

A crucial aspect of Basel II is that it encourages banks to adopt their own risk-sensitive internal models to measure different types of credit risk. It is different from Basel I where the credit risks are

measured using a standard format provided by the regulatory authorities (Liu and Seeiso, 2011; Mishkin, 2009; Barth *et al.*, 2006; Reinhart and Rogoff, 2008a; Angkinand 2009; Gottschalk, 2010). This raised concern on how risk was determined for capital allocation in many commercial banks. At the same time Gottschalk (2010) has shown that Basel II was not able to prevent the global financial crises of 2007-2009 but instead caused many banks to shift their asset portfolio away from credit to the private sector to government securities. At the same time studies have also shown how Basel II has further aggravated bank concentration especially in countries such as South Africa where the big four banks hold 89% of banks' total assets. The big banks are usually biased towards lending to bigger corporations at the expense of the smaller borrowers such as SMEs (Genesis Analysis, 2004).

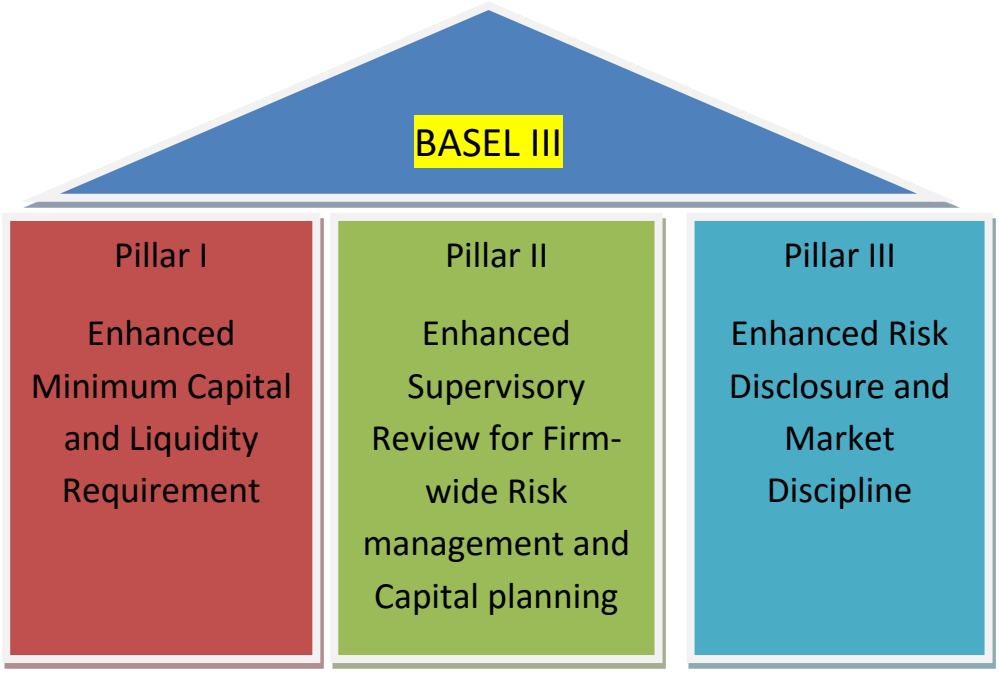

Figure 3.2: Basel III pillars and approaches
Source: Adapted from Moody's Analytics (2012)

Basel III is the third and most novel series of Bank Accord, formed after the global financial crisis of 2007 to capture bank's capital adequacy, stress testing and market liquidity, mainly centred on improving bank's absorption capacity, risk management governance and strengthen banks' transparency and disclosure (BCSC, 2012). Figure 3.2 above shows the new addendum to the Basel Accord, consisting of three pillars.

Studies such as Byres (2012) and Schwerter (2011) have shown that Basel III was able to address some weaknesses of Basel II with the introduction of countercyclical buffers, liquidity ratio and leverage ratio buffer to increase capital requirements, strengthen resilience of the banks during

boom periods and slow down banks' activities to take risks. Internationally recognised banks also are required to hold capital surcharges and contingent capital to guide against loss during crises (Byres, 2012; Schwerter, 2011). Empirical evidence is still lacking on Basel III to check its efficacy on bank's lending ability especially to SMEs.

In conclusion, more regulations usually set up more barriers to lending and reduce competition in the banking sector. Therefore, regulations need to be dynamic rather than just responding to crises in the financial sector.

3.3 FINANCIAL CRISES AND BANKING REGULATIONS

3.3.1 Financial crises, explanations, types and implications

The GFC of 2007–2009 has been disastrous for the world's economy, causing a negative economic growth into the world's economy for the first time in more than 10 years (Saayman, 2010: 1). The crisis has also shed more light on the drastic effects of financial integration, innovation and shallow pricing.

In the past decade, most banks believe that preventing crises and systemic risk can be forestalled by having narrow banks which are focused on investing in more equity rather than demand deposits, making the reserve bank the central bank and lender of last resort (Diamond and Dybvig, 1983). Banks are also required to increase their capital asset ratio as a regulatory precaution to prevent crises. Bank capital regulation is predicated on two main assumptions: firstly, more capital means more financial buffer during crises. Secondly, equity capital encourages risk-taking and enhances moral hazard, and thus restricts bank lending.

There two ways of increasing the capital asset ratio (CaR): reducing assets or issuing new equity. Most banks focus on loan reduction, which ends up enhancing the credit crunch which occurs when loans are difficult to get from banks, especially when borrowers are willing to pay a higher interest rate. It has been established in the literature that raising interest rates and rationing credit to avoid adverse selection can cause further credit crunch and end up causing more crises (Stiglitz and Weiss, 1981; Berger and Udell, 1994; Peek and Rosengren, 1995).

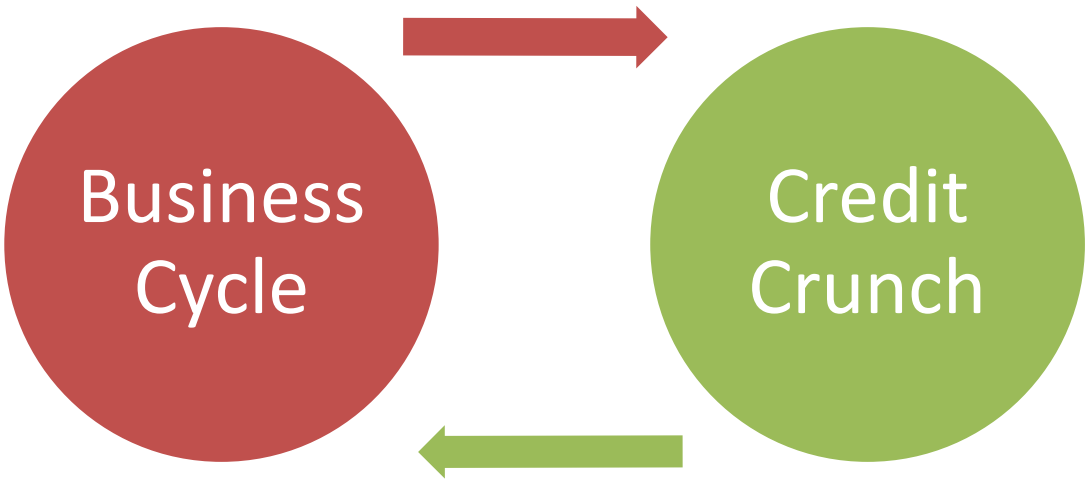

Figure 3.3: The relationship between business cycle and credit crunch especially during recession

Source:Author's computation

Policy makers face a huge problem of preventing bank crises during recession and at the same time prudently responding to the regulatory requirement to prevent credit crunch given the cyclical nature of the banks' behaviour during recession periods. The GFC of 2007 to 2009 exposed the weakness of prudential regulation and the global financial system in preventing crises given the complexity and openness of financial systems around the world.

3.3.2 Summary of Claessens *et al.* (2014) on financial crises

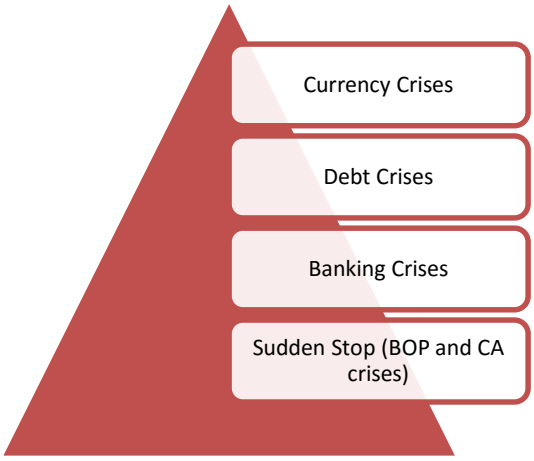

Figure 3.4: Types of financial crisis

Source: Claessens *et al.* (2014)

Literature such as Mitchell (1913); Fisher (1933), Minsky (1977), Kindeberger (1978), Friedman and Schwartz (1963), Bordo (1985), and Gordon (1988) predicted that changes in interest rates, stock returns, deposit to currency ratios and asset prices are indicators of financial crises.

Figure 3.5: Main causes of financial crises

Source: Author's computation

There are still gaps in the literature, for instance:

- Most literature are yet to establish how asset prices and credit booms become unsustainable, uncontrollable or unmanageable in the financial market.
- Policy makers are yet unable to ascertain and envisage the risk in credit boom and bust so as to prevent the menace of financial crises.

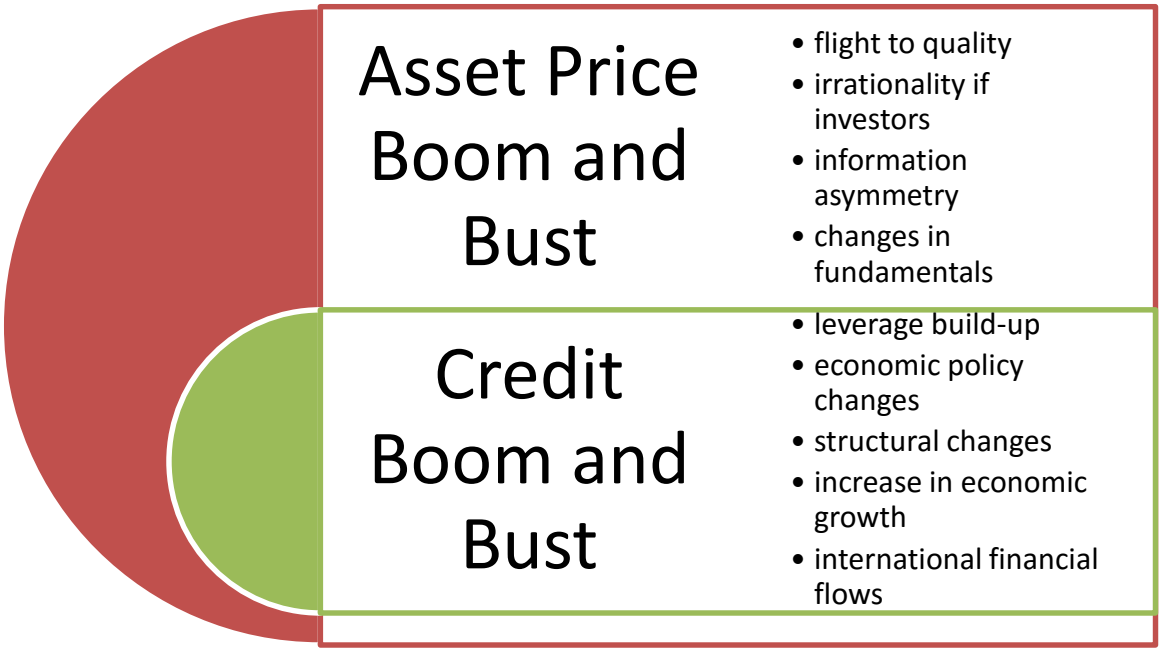

Figure 3.6: Asset price and credit boom and bust

Source: Author's computation

3.3.3 Two theories on bank panic

There are two theories on bank panic. The first theory asserts that bank panic is just a random event, uncorrelated with belief systems or the reality of the economy. The second theory postulates that bank panic is triggered by investors' or depositors' behaviour which can be a result of bad news or bad government forecast, and can be caused by asymmetric information between banks, risk perceptions, systemic risk, bank crises, and recession (Gordon, 1988: 755: Dwyer and Hafer, 2001).

A financial crisis is usually defined as a situation in which a significant group of financial institutions have liabilities exceeding the market value of their assets, leading to runs on banks, portfolio shifts in banks' balance sheets, collapse of some financial firms, government intervention, a sharp reduction in credit and trade, and breakdown in exchange rates (Brunnermeier, 2009; Gorton, 2010; Goldstein and Razin, 2013). A financial crisis can also be defined as a variety of situations in which some financial institutions or assets suddenly lose a large part of their value. Typically, a banking crisis starts when the share of nonperforming loans to total outstanding loans in banks' balance sheets grows, and/or the value of investment in banks' balances drops dramatically, both resulting in solvency and liquidity problems.

Many theories have been developed over the years to explain financial crises. The literature established three main types of crises: banking crises, currency crises and credit and market freezes. These types of crises will be briefly reviewed in the next sections (Dekle and Kletzer, 2001; Klomp, 2010; Gavin and Hausman, 1998; Goldstein and Razin, 2013).

3.3.4 Banking crises

Diamond and Dybvig (1983) provided a scenario where a customer panics as a result of asymmetric information and causes a bank run in the financial system. The idiosyncratic behaviour of the banking system is that they receive demand deposits with a short maturity and invest in long maturities instruments. This makes them very vulnerable to liquidity constraints, especially in a situation where most depositors want their funds. This often leads to a bank run and bank crises (Goldstein and Pauzner, 2004; Santos, 2001). Prior to Diamond and Dybvig's analysis, Kahane (1977) and Sharpe (1978) had already established the need for deposit insurance to secure bank deposits against insolvency.

The main problem with banking crises is that they spread to other banks, especially due to financial innovation and integration. When bank runs cause other banks to fail it is called systemic risk. Studies on the contagion effect of banking crises are divided into three main groups. The first school of thought believes contagion is caused by a pool of investors who decide not to keep all their eggs in one basket but invest in different banks, and when one bank fails it can lead them to pull their funds out of the banks which can eventually lead to bank crises (Goldstein and Pauzner, 2004; Kyle and Xiong, 2001). The second school of thought connects contagion to the high cost of information gathering in the banks. When a bank gets bad signals about the fundamentals of the other banks, it can lead to crises because at this point interbank lending will be suspended and this can have a ripple effect in the long run (Calvo and Mendoza (2000) cited in Goldstein and Razin, 2013). The last school of thought believes that systemic risk can also be caused by the "too big to fail problem", where the big banks believe that because of their big size and concentration, they are too important to fail hence they venture into risky businesses causing moral hazard knowing that the government will always restructure and rescue them if they fail (Farhi and Tirole, 2012; Mishkin, 2009).

3.3.5 Credit crunch and market freeze

"Credit crunch" is generally refers to as the reduction in credit supply available to borrowers, particularly bank lending supply, for some lender specific reasons. (Watanabe, 2005; Seo, 2013; Walsh, 2003; Stiglitz and Weiss, 1981 and Jaffee and Russell, 1976).The major explanation for the credit crunch phenomenon as investigated in this study is the "regulatory driven capital crunch hypothesis".

Minsky (1977:23) stated that “banking crisis is credit boom gone wrong”. In this school of thought assets and loans are assumed to be exogenous. The main players here are the depositors and creditors. He also assumed there is a credit market where the supply shock increases the productivity of capital and investment, causing an expansion of credit in the economy. The bank’s lending and loan increases at this stage and the economy is at its peak, which provides an incentive for bankers to invest in risky assets (moral hazard problem). Consequently, the banks make losses from the risky assets and try to cut back lending by rationing credit from bad decisions. This outcome brings fear and uncertainty to the market, which further precipitates the market freeze. Stiglitz and Weiss (1981) provide a framework that establishes a certain behaviour of banks by rationing credit and increasing interest rates to be able to sieve out the good borrowers in the market from the bad on the assumption that bad borrowers are likely to borrow at a higher interest rate than good borrowers (Holmstrom and Tirole, 1997; Kiyotaki and Moore, 1997; Gertler and Karadi, 2011; Shin, 2008; Claessens *et al.* 2008 Boissay *et al.*, 2013).

3.3.6 Currency crises

Theory states that an increase in international capital flows in terms of current account deficit and exchange rate mismanagement can result in big crises. The “first generation crisis model” states that a government with imprudent budget deficit mismanagement and limited reserves tries to peg its currency but ends up with a currency mismatch which attracts speculative attacks on its domestic currency, leading to banking crises (Krugman, 1979; Flood and Garber, 1984). Obstfeld (1994, 1995) took the debate further to a “second generation crisis model” where the government tries to make an imperative decision either to defend its pegged exchange rate or to be flexible and allow macroeconomic fundamentals to determine the currency value which might attract a bigger cost. It becomes obvious that the government will not be able to defend its currency, hence a speculative attack can arise to cause more crises. The “third generation crisis model” evaluated the importance of bank lending and asset market in terms of causing “boom and bust cycles” in the asset market (Reinhart and Rogoff, 2009a; McKinnon and Pill, 1996). Most economists viewed the Argentinian (1994), Turkish (2000) and Asian crises (1998-1999) through the lens of currency crises theory.

3.4 THEORIES OF FINANCIAL REGULATION

The need for financial regulation arises because of banks’ fragility and market failure, hence financial regulation becomes necessary to consolidate financial system stability, maintain safety and soundness of financial institutions, and protect depositors’ funds against market distortions (Llewellyn, 1999; Brunnermeier *et al.*, 2009; Herring and Schmidt, 2012). Furthermore, increased information asymmetry and financial innovation has made the financial market more complex and opaque so that it is difficult for traditional theories to capture the new developments in the financial

market. For example, there is an urgent need to capture both micro-prudential and macro-prudential aspects of financial systems.

Moreover, most banks' loans are very illiquid. They operate with a mixture of debt (deposits and other debt instruments such as bonds) and equity (also known capital difference between a bank's assets and liabilities). Banks use other depositors' funds to provide capital, therefore it becomes imperative to regulate banks because they are susceptible to crises. When one bank fails, this can trigger other banks to fail causing contagion and systemic risk (Mishkin, 2009; Herring and Schmidt, 2012). Three types of regulation have been established: structural regulation, prudential regulation and conduct of business regulation. Only the first two types of regulation are considered in this thesis. Regulatory issues in the financial system, especially in the banking system, have become a central debate for the obvious reasons that the financial sector plays a prominent role in the economies of many countries. Financial fragility of banks due to volatility in asset prices and the need to prevent financial risk that might lead to moral hazard and financial crises have in recent times dominated the activities of regulators (Caprio *et al.*, 2008; Beck *et al.*, 2006; Barth *et al.*, 2008; Hanke, 2012). This literature review will focus on banking sector regulations.

The first set of structural theories (Kahane, 1977; Koehn and Santomero, 1980; Kim and Santomero, 1988) evaluated banks as a competitive portfolio manager which takes the asset price and yield returns with an optimal and diversified portfolio using a mean–variance approach. However, structural theory holds that tightening of regulations on asset portfolios as a binding constraint on the efficiency of banks since it might encourage banks to take on more risk which can lead to bankruptcy in the long run. Two things emerge from the structural theory: first, a bank should be a risk-averse portfolio manager with optimal assets. Secondly, regulations can enhance a risk-averse manager to invest in riskier assets which can lead to bank runs and bankruptcy in the long run. Structural theories are mainly concerned about the financial soundness and stability of banks.

Keeley and Furlong (1990) and Flannery (1989) take into account the need for deposit insurance to avoid banks runs and bankruptcy. Rochet (1992) elucidated the consequences of capital tightening in banks which can result in three outcomes: (i) combination of portfolios with no increase in capital, (ii) specialisation in one risky asset to meet the requirements, (iii) combination of two risky portfolios which can stimulate more risks. She argued that deposit insurance that takes cognisance of the tendency of managers to take risk is better than establishing a regulation.

The second theory using a portfolio choice approach criticised the previous traditional structural theory for assuming that banks are not forward looking, and held that banks can strengthen their balance sheets to meet the capital requirements (Milne, 2002; Estrella, 2004a; Blum, 1999; Repullo, 2004; Calem and Rob, 1999). Their empirical results show that given the right instruments

of placing deposit ceilings or minimum capital requirements can facilitate banks to invest in prudent assets and avoid bank runs.

The third theory, which has been the subject of most debate in recent times, assesses the different types of asymmetric information (moral hazard and adverse selection problems) faced by many banks and the need for special regulation in the financial market to constantly screen and monitor the market (Berger et al.1995; Thakor, 1996, Diamond and Rajan, 2000, 2001; Dowd, 2000; Cooper and Ross, 2002; Kopecky and VanHoose, 2006). The issue varies from the moral hazard effect on the liability side of the banks' balance sheets to the implication of higher transaction costs as a result of asymmetric information which exacerbates banks' vulnerability. The debate is also centred on the tendency of banks to invest in risky ventures as a result of the deposit insurance commitment, the need for monitoring and screening of bank managers due to the "principle agent" problem, and the credit rationing effect of capital requirements. The third theory sheds more light on the implication of Basel II and Basel III in terms of credit rationing and redistribution of loans away from the poor and SMEs, which is the focus of this study. Barth *et al.* (2001) divided regulations into seven parts: regulation on banks activities, regulation on domestic and foreign bank entry, regulation on capital adequacy, deposit insurance design, supervision, private monitoring, and government ownership of banks. The literature has not reached agreement on how specific regulations influence the performance and stability of banks (Demirgüç-Kunt et al., 20011). Some believe that specific regulations such as private monitoring are the most effective, while others see regulation as an onerous burden that hinders the efficiency of credit and can also cause financial crises if implemented at the wrong time.

3.5 CONCLUSION

This study reviewed the theoretical and empirical literature on credit and development finance, financial regulation and financial crises. The following conclusions can be made.

First, there seems to be broad consensus that a developed financial system that provides credit will enhance growth and development. However, credit market problems arise as a result of market failure, information asymmetry and credit rationing, and these have caused banks to be biased in lending: most commercial banks still prefer to lend to large firms since they consider SMEs as risky ventures with little return. This has posed significant constraints on the credit market resulting in credit rationing.

Second, literature supports the view that prudential regulation is important but not sufficient to prevent systemic risk and financial crises in the long run. Moreover, financial regulation in the form of the Basel Accords overtly emphasised risk-sensitive regulation, hence during recessions bank risks are termed higher, requiring banks to hold higher capital, this makes Basel II "procyclical'.

The implementation of Basel II may adversely affect the expansion of credit to SMEs. Third, poor macroeconomic conditions such as fiscal imbalance, depletion of bank reserves and poor banking practices are among the central causes of financial crises causing a “bubble-burst” situation in the market which later trickles down to cause a credit crunch. In conclusion, existing theories and evidence on different types of crises and regulations has been able to establish some salient issues, namely that banks are fragile in nature hence regulations are needed to stabilise the market. The literature is not agreed on whether financial regulation is associated with an increase in financial instability.

3.7 Empirical Literature

Table 3.1: Review and summary table for empirical study on the Procyclical nature of financial crises and financial regulation

Author and Title	Countries covered	Period Covered And Frequency	Estimation method	Methodological Issues	Summary of Findings
Demirgüç-Kunt *et al.* 2011 (Basel Core principles and Bank soundness)	86 countries in Europeans countries, 3000 banks	2000-2008 data from IMF and world bank BCP assessment	Z score was used to measure banks soundness(standard deviation from the return	Obtain efficiency scores by using data envelope analysis methodology	There is no relationship between systemic risk and Basel core principles
McAleer *et al.* (2013) "Has Basel Accord improved risk management during the GFC"	Daily prices of Standard and Poor's Composite 500Index(S&P500)	Checking Base I(1988) and Basel II(2004)	Value at Risk model (VaR) to determine capital requirements	Volatility test (GARCH, GJR, EGARCH)	risk management behaviour during the 2008-09 GFC crises
Erdinc(2008) "From credit crunch to credit boom: Bulgarian Banking(1999-2006)"	Bulgaria	Bulgarian Banks from 1999 to 2006	Fixed effect/ GMM estimation of credit	Panel data analysis	Credit crunch was caused as a result of bank fragility on 2003 Was later precipitated banking crises.
Heid. F(2007) "The cyclical effects of the Basel II capital requirements"	Lending cycles of banks and pro-cyclical impact of Basel II on macro economy.		Constructed a model to ascertain the business cycle impact on bank's capital and lending decision	Ran a calibration to check if cyclicality effects exist.	Find capital buffer significant in avoiding volatility

Author and Title	**Countries covered**	**Period Covered And Frequency**	**Estimation method**	**Methodological Issues**	**Summary of Findings**
Anderson H(2011) "Procyclical implications of Basel II: can the cyclicality of capital requirement be contained?"	Use Norges Bank's proprietary database. (1988-2007) Data is on Norway.	1988 -2007	Macro model was adopted using Internal rated based approach (IRB) compared to other studies that were using Probability of default (PD) and Loss given default (LGD).		Basel II does not have any cyclical pattern for the measured period.
Fidrmuc *et al.* 2010 " the impact of the Global Financial crisis on business cycles in Asian emerging economies"	China and India from 1980s to 2008	Used quarterly data from IMF International Financial statistics		Use Applying dynamic correlation	How GFC was transmitted to business cycle, find dynamic correlation to be low or negative but were affected by GFC
Hale, 2012 "Bank relationships, business cycles and financial crises"	Constructed a global network of 7938 banking institutions from 141 countries 1980-2009	Used a dialogic Loan analytical database		Computed a network statistics for each banks	Find that recession and banking crisis have negative effects on new connections. GFC retarded formation of new relationship
Kim *et al.* 2013 "Role of Financial regulation and innovation in the financial crisis"	Using financial and macroeconomic dataset of 132 countries	2005-2006 regulatory data and 2007-2009 financial crises data		Adopted Negative binomial regression model can be used.	Examine the effect of financial regulation and innovation on GFC, fin innovation has increased banking crises

Author and Title	**Countries covered**	**Period Covered And Frequency**	**Estimation method**	**Methodological Issues**	**Summary of Findings**
Angkinand (2009) "Banking regulation and the output cost of banking crises'	Cross sectional time series data of 47 banking crises episode in 35 emerging market	1970 to 2003 From database of Deposit Insurance around by Demurguc-Kunt *et al.* 2005 by the World Bank		Used Heckman two stage model (correct the selection bias) and the OLS model were employed	Result shows no significant evidence of bank supervision on output cost

Table 3.2: Impact of regulation and financial crises on bank lending

Author	**Countries covered**	**Period Covered And Frequency**	**Estimation method**	**Methodological Issues**	**Summary of Findings**
Van Roy (2005)	6 OECD countries, namely Canada, Italy, Japan, UK, USA and France	1988 to 1995 period	Unbalanced panel and three stage least square		Overall regulation lead ultimately to increase in capital in most of the OECD countries except Japan where I the relationship is not significant
Montgonerus(2005)	Japan	1988 to 1999			Poorly capitalised banks have slower growth in total asset and loans further decrease credit to private sector.

Author and Title	Countries covered	Period Covered And Frequency	Estimation method	Methodological Issues	Summary of Findings
Hussain and Hassan (2005)	11 developing countries	1992			They found out that poorly capitalised banks did not increase in capital when faced with minimum requirement.
Shrieves and Dahl(1992)		1985 to 1987	Adopted system of simultaneous equation based on two stage least square		Capital and risk are inversely related
Rosergren (1995)	New England (1990 to 1991)				Results shows that new regulatory framework caused credit crunch in England
Ediz, Micheal and Perrundin (1998)	United Kingdom Banks (1990)	1980 to 1995	Looking at the effect of Regulatory Basel Compliance on UK Banks	Adopted multivariate dynamic panel model	Regulatory pressure engender the banker to lend more to larger corporation by increasing higher capital provisioning
Gottschalk and Sen (2010)	Brazil and India	1994-2002	Looking at the effect of Basel an on Banks behaviour		Total Credit to the SMEs fell sharply in both countries

Author and Title	Countries covered	Period Covered And Frequency	Estimation method	Methodological Issues	Summary of Findings
Ikhide, 2003 "Was there a credit crunch in Namibia between 1996 and 2000?"	Namibia	Using quarterly data from 1993 to 2002	Full Information Maximum Likelihood Approach(FIML		Bank lending and total deposit are significantly related to the credit supply and confirms the presence of credit crunch in Namibia
Seo, 2013 "Are banks loans to SME's Procyclical in Korean banks?"	Korea	Cross sectional data from different banks from 1999 to 2008	Vector Error Correction Model (VECM),	Panel Data Generalised Least Square(GLS) and Fixed Clustering effect	Found out that business cycle triggers bank lending and procyclicality among Small and Medium Scale (SMEs) in Korean banks.
Naceur and Kandil, 2013 " Basel Capital Requirement and Credit Crunch in the MENA Region"	MENA Region: Egypt, Jordan, Lebanon, Morocco, Tunisia.	Annual data 1989- 2003		Panel data model	Found out that macroeconomic variables (exchange rate, growth in GDP) have a significant effect on credit growth and asset increase in most MENA region.
Blaes (2011) ' Bank related loan supply Factors During the crisis: Germany bank lending survey"	Germany	Annual data 2003 to 2010		Panel regression	Bank lending is seen to be both supply driven and demand driven even during financial crises

Author and Title	Countries covered	Period Covered And Frequency	Estimation method	Methodological Issues	Summary of Findings
Bassett at all (2012) "Changes in Bank lending standard and The Macroeconomy"	United states	1992 to 2011	VAR model	Panel regression	Gave a more robust model to capture the credit supply model involving macro-model
Beer and Waschiczek (2012) " Analysing corporate loan growth in Austria using Bank lending	Austria	2002-2011	Bayesian Model		Found out that Austria has demand driven loan model.
Bernauer and Koubi, 2002 "Bank regulation in the Hard Time: business cycle, bank capital and the bank failure "	United Nation	1990 to 1998 Used Federal Deposit Insurance Corporation database	OLS		They found out that the weak capitalised bank tend to increase their capital–asset ratio during economic downturn hence policy asset face a difficulty choosing between credit crunch and increase in asset ratio and net worth.
Watanabe (2005) "Prudential Regulation and the credit Crunch: Evidence from Japan"	Japan	Panel data of 180 banks in Japan from fiscal year of 1992 to 1994, 1997	Two stage Least Square regression (2SLS)		They found out that banks constrain their lending supply due to bad capital loss during Asian crises in 1997

Author and Title	**Countries covered**	**Period Covered And Frequency**	**Estimation method**	**Methodological Issues**	**Summary of Findings**
Fidrmuc *et al.* 2010 " the impact of the Global Financial crisis on business cycles in Asian emerging economies"	China and India from 1980s to 2008	Used quarterly data from IMF International Financial statistics		Use Applying dynamic correlation	How GFC was transmitted to business cycle, find dynamic correlation to be low or negative but were affected by GFC
Hale, 2012 "Bank relationships, business cycles and financial crises"	Constructe d a global network of 7938 banking institutions from 141 countries 1980-2009	Used a dialogic Loan analytical database		Computed a network statistics for each banks	Find that recession and banking crisis have negative effects on new connections. GFC retarded formation of new relationship
Angkinand (2009) "Banking regulation and the output cost of banking crises'	Cross sectional time series data of 47 banking crises episode in 35 emerging market	1970 to 2003 From database of Deposit Insurance around by Demurguc-Kunt *et al.* 2005 by the World Bank		Used Heckman two stage model (correct the selection bias) and the OLS model were employed	Result shows no significant evidence of bank supervision on output cost

Table 3.3: Impact of regulation and financial crises on SMEs

Author	Countries covered	Period Covered And Frequency	Estimation method	Methodological Issues	Summary of Findings
Van Roy (2005)	6 OECD countries, namely Canada, Italy, Japan, UK, USA and France	1988 to 1995 period	Unbalanced panel and three stage least square		Overall regulation lead ultimately to increase in capital in most of the OECD countries except Japan where I the relationship is not significant
Montgoneru s(2005)	Japan	1988 to 1999			Poorly capitalised banks have slower growth in total asset and loans hence further decrease credit to private sector.
Hussain and Hassan (2005)	11 developing countries	1992			They found out that poorly capitalised banks did not increase in capital when faced with minimum requirement.
Shrieves and Dahl(1992)		1985 to 1987	Adopted system of simultaneous equation based on two stage least square		Capital and risk are inversely related
Rosergren (1995)	New England (1990 to 1991)				Find that the new regulatory framework caused credit crunch in Engl
Ediz, Micheal and Perrundin (1998)	United Kingdom Banks (1990)	1980 to 1995	Looking at the effect of Regulatory Basel Compliance on UK Banks	Adopted multivariate dynamic panel model	Regulatory pressure engender the banker to lend more to larger corporation by increasing higher capital provisioning

Author and Title	Countries covered	Period Covered And Frequency	Estimation method	Methodological Issues	Summary of Findings
Gottschalk and Sen (2010)	Brazil and India	1994-2002	Looking at the effect of Basel Capital Accord on Banks behaviour		Total Credit to the SMEs fell sharply in both countries

Table 3.4: Basel core principles, credit crunch and financial crises in South Africa

Author	Countries covered	Period Covered And Frequency	Estimation method	Methodological Issues	Summary of Findings
Hirsch, 1989 " The origin and implications of South Africa's Continuing Financial Crises"	South Africa	1980 to 1988		Descriptive chart	SA was found to be sensitive to debt crises given the vulnerability of the economy at that time to political crises
Saayman, 2010 Why money matters – the financial crises and the south African economy"	South Africa			Descriptive Chart	Examine the macroeconomics imbalance such as low interest rate, credit growth and monetary policy can distort the financial market.

Author and Title	Countries covered	Period Covered And Frequency	Estimation method	Methodological Issues	Summary of Findings
Jacobs.*et al.* 2012 "The regulatory Treatment of liquidity Risk in South Africa"	South Africa			Descriptive Chart	Discuss the imperative of using another measurement apart from capital to measure liquidity risk of Basel II since is heterogonous in different banks
Akinboade and Makina, 2010 Econometric analysis of bank leading and business cycles in South Africa'	South Africa	Quarterly data from 1980:01 to 2005: 01	VAR model		Confirms Bank lending hypothesis in South Africa and bank lending is strongly dependent on the cyclical factor such as coincident and real money supply"
Liu and Seeiso, 2011 "Business Cycle and bank capital Regulation: Basel II procyclicality"	South Africa		Incorporate General Equilibrium Model (GEM) to make Simulation and Forecasting		Looks at the relationship between bank capital regulation and business cycle and confirms procyclicality in South Africa banking.

Chapter 4

IS COMMERCIAL BANK LENDING IN SOUTH AFRICA PROCYCLICAL?

4.1 INTRODUCTION

In the last two decades, there has been a development in the theoretical literature highlighting the relationship between theories of credit and how they can enhance the understanding or the "mechanism in the business cycle" (Kiyotaki, 1998: 18). Theoretical literature on how shocks in the macroeconomy can accentuate financial frictions has been extensively discussed by Bernanke *et al.* (1999). However, after the global financial crisis of 2008-2010, there has been an added dimension to the debates by policy makers and researchers on how disruption in the credit and financial market can stimulate crisis in the real sector (Kiyotaki and Moore, 1997; Minsky, 1992; Borio, 2007; Goodhart, 1996; IMF, 2013). Financial systems are implicitly procyclical, therefore any change in credit growth, asset prices or leveraging can amplify financial frictions and prolong business cycle.

Against this backdrop, it will be very interesting to investigate how periods of credit growth or crunch are associated with recession periods, especially in a developing economy context. What role do shocks to the real sector play in amplifying financial imbalances through the credit market in South Africa? To answer these questions this study employed data from the South African Reserve Bank using Vector Autoregressive Modelling from 1990 to 2013. The rest of this chapter is organised as follows: the theoretical foundation of credit procyclicality is presented in Section 4.2, Section 4.3 offers an overview of credit growth in South Africa, the methodology and results are discussed in Sections 4.4 and 4.5 respectively and Section 4.6 concludes the chapter.

4.2 BUSINESS CYCLE AND CREDIT GROWTH THEORETICAL FRAMEWORK

There are two strands of literature that explain the financial cycle and business cycle. One strand of research looked at the amplification of financial accelerators on the financial cycle and the real sector. These researchers believe that shocks or changes in financial assets and collateral can affect access to loans to the real sector (Bernanke, 1993; Gertler and Gilchrist, 1993; Kashyap and Stein, 1994; Bernanke *et al*., 1999; Walsh, 2003). Another school of thought examined the lender's balance sheet and cash flow and their relationship with banks' capital. This school argues that banks' regulation constrains most banks' balance sheet, retards their credit growth and affects their macroeconomic function of enhancing growth and development (Borio *et al.,* 2001; Borio and Lowe, 2002; Kashyap and Stein, 1995; Peek and Rosengren, 1995). However, this chapter is

mainly focused on demand side credit: the Bernanke, Gertler and Gilchrist (BGG) model and its extension on the business cycle. The next chapter focuses on supply side credit.

Financial theorists are now arguing and resisting Modigliani-Miller's view of a complete market where a firm's capital and financial structure is irrelevant, especially after the global financial crisis. The literature has now established that the capital structure of firms is pivotal in determining the External Finance Premium (EFP) and can be affected by business cycle and financial frictions. In addition, a firm's level of investment and inventory decisions is largely reliant on the degree of financial imperfection, information asymmetry, external finance premium and cost of borrowing. Irving Fisher (1933) rightly defined debt-deflation during the Great Depression of 1930 as a situation in which when firms are highly leveraged, affecting their net worth and asset prices, any small shocks to the firm may engender high degree of indebtedness that will ultimately affect productivity and economic activities (Kiyotaki and Moore, 1997; Zhang, 2009; Jeanne and Korinek, 2010).

The EFP is the amount the borrower has to pay as a cost to obtain a loan from the bank, particularly when the investor cannot sustain his internal earning. Bernanke and Gertler (1990) believe that the EFP is usually determined by the monitoring cost, value of collateral, cost of borrowing, agency and insolvency cost, interest rate and level of asymmetric information. They further argue that the size of the EFP is directly proportional to the degree of information asymmetry but inversely proportional to the borrower's net worth. They conclude that when the financial fundamentals (net worth and assets) of borrowers are high, borrowers will be able finance more projects internally and will have quality collateral to secure loans from the banks, thereby reducing the EFP. On the other hand, when lenders have lower net worth, they are usually forced to reduce their risk exposure of assets, increasing EFP and reducing the quality of lending. Therefore, credit usually depends on borrower's net worth, the quantity of collateral in possession and the quality of information which can be provided to the banks.

Now what happens to the firms during recession? A firm's net worth falls and the cost of external finance increases. The fall in net worth coupled with the increase in EFP will have a major implication on its ability to increase investment or access loans from the banks. This is shown in the illustration below:

$$Recession: EFP \uparrow -COB \uparrow -NW \downarrow -\pi \downarrow -INV \downarrow -AD \downarrow$$

$$Boom: EFP \downarrow -COB \downarrow -NW \uparrow -\pi \uparrow -INV \uparrow -AD \uparrow$$

Where EFP: External Finance Premium

COB: Cost of borrowing

NW: Net worth

π: Firm's profit

INV: investment

AD: Aggregate Demand

The bank lending channel emphasises the role of banks and bank's credit in the real sector. Most theories on credit channel state that the role of credit arises as a result of imperfect information and market failure between agencies in the credit market since the information each party brings to the exchange will eventually affect the nature of the contracts. However, the credit market is required to efficiently link borrowers with lenders. The financial accelerator mechanism is a more holistic channel which accentuates the way a shock in the fundamentals of the financial sector can be amplified to cause crises. The risk-taking channel is a more recent concept that examined how a change in interest rate can influence risk perception and risk tolerance which can amplify the financial accelerator mechanism in the financial sector (Borio and Zhu, 2008).

Caballero, R. J. (1999) in the popular book "Handbook of Macroeconomics" started the debate on Financial Accelerators by defining a financial accelerator as a "small shock, large cycle puzzle". They were intrigued to find out how small shocks, for example oil shocks or currency shocks, can lead to a great eruption in economic activities. They suggested that since shocks usually start from the credit market and later spill to the real sector, it would important to examine factors that can impede access to credit and cause a downturn in the future. They suggested that during recessions borrowers with a high probability of default should be given less credit to avoid insolvency; they called this 'flight to safety'. Thus the existence of credit market frictions tends to amplify and propagate business cycle fluctuations through the financial accelerator.

There are many theories in the literature on how central banks' monetary policy can influence aggregate spending and hence the real sector. The central bank monetary policy rate has a major effect on aggregate demand and therefore the real sector. A tightened central banks' monetary policy through an increase in interest rates will increase borrowing costs; similarly the leverage ratio (debt/equity ratio) will rise, causing net worth to fall. Consequently, the cost of doing business will rise since most investors and consumers will be apprehensive of investing and borrowing at a high cost. This will in turn reduce the level of economic activity and hence reduce aggregate demand and output. The balance sheet channel concentrates on how monetary policies of the central bank can make things unmanageable for borrowers and banks. A rise in interest rate usually makes it difficult for borrowers to qualify for loans and at the same time reduces the profit margin for the banks, affecting their ability to lend.

There is ample evidence in the literature to support the argument that increases in credit and asset prices have a tendency to precede banking crises and can signal accumulation of risks in the system. Strong credit growth can indicate that economic agents are heavily indebted and thus

have low capacity to absorb shocks, while strong growth in asset prices can reflect a greater degree of price misalignment (Borio and Lowe, 2002; Borio and Drehmann, 2009).

Aghion *et al.* (2005) developed a model that examined the cyclical nature of investment in the presence of an imperfect credit market for 14 OECD countries from 1960 to 2000. They concluded that constraints to access to the credit market can engender a procyclical nature of investment such that it might accentuate the business cycle effect in the long run and make growth explosive. Eichengreen and Arteta (2000) examined the cause of banking crises among 75 emerging markets between 1975 and 2000, and concluded that rapid domestic credit growth is one of the major causes of banking crises in emerging economies. Their evidence further shows how credit growth can influence economic activities in the long run. Cardarelli *et al.* (2011) gave an interesting explanation of why some financial disruptions amplify economic downturn by employing a financial stress index to assess their impact on the real sector of the economy. Their key finding shows that periods of financial turmoil are usually related to longer recession periods. They also found that a rapid increase in aggregate credit and house prices are usually good signals of impending financial stress (Cardarelli *et al.*, 2011: 79).

Mendoza and Terrones (2008) provided a comprehensive report on how to measure credit booms. They adopted event study methodology to capture credit booms in both developed and emerging economies and concluded that most credit booms in emerging markets are more pronounced than the credit booms in developed countries but not all credit booms ended in crises. Elekdag and Wu (2013) followed Mendoza and Terrones' methodology and similarly found that credit booms are usually associated with financial cycle imbalance causing a deteriorating balance sheet, large capital flows and loose monetary policies. They identified 60 credit booms for the period 1960 to 2010 across 43 emerging markets. The authors examined the period of rapid credit growth by using event study methodology to capture macroeconomic and financial data. Their result also shows that credit booms are usually followed by upswings in economic activities (Elekdag and Wu, 2013: 47-52).

Claessens *et al*. (2008) examined the relationship behaviour of macroeconomic variables and financial variables over the business cycle in 21 OECD countries between 1960 and 2007. Their results show that the interaction between macroeconomic variables and financial variables are paramount in determining the intensity and duration of a downturn. They concluded that a recession that lasted for four quarters can reduce output growth by 2%. They also supported earlier studies of Eichengreen and Arteta (2000) and Jorda *et al.* (2012) that periods of property price bust and credit crunches take more time than periods of recessions. Jorda *et al.* (2012) and Schularick and Taylor (2010) did similar studies and explored 14 and 12 advanced economies

respectively from 1870 to 2008 and also concluded that period of credit expansion are associated with recession periods and financial crisis.

The Global Financial Stability Report for 2012 (IMF, 2013) reported that in most credit crises, the macroeconomic policies introduced in the economy usually prompt an imbalance in the domestic economy and further amplify the business cycle, since the policies might further reduce assets prices in the financial market during crises. They found that shortage of excessive debt in the household, and shortage of collateral and capital in banks are usually the principle causes of credit crunch and reduction in credit demand in different countries. Credit crunch may further accentuate the period of recession and increase the business cycle. The report further highlighted the importance of having specific country studies since the constraints to the availability of credit differs from country to country (IMF, 2013: 63). Stolz and Wedow, 2011 examined the role of banks in transmitting shocks to local German banks from the period of 1993 to 2004. Their findings strongly suggest that the prudential regulatory mechanism of Basel II fluctuates along the business cycle during this period.

4.3 CREDIT GROWTH AND BUSINESS CYCLE IN SOUTH AFRICA

The South African Reserve Bank, which is the regulatory authority for deposit-taking institutions, has a method for determining the business cycle in South Africa. This is by computing the composite leading and coincident business cycle indicators (Pretorius *et al.*, 1999; Venter and Pretorius, 2001; Laubscher, 2002; Akinboade and Makina, 2009). This method involves calculating the 'current diffusion index' for South Africa which entails calculating a 'comprehensive composite index' of various economic events and evolutions that can engender or change the economic activities in South Africa over the years (Akinboade and Makina, 2010: 3805).

Akinboade and Makina (2009, 2010), Fourie *et al.* (2011), Liu and Seeiso (2011), Jacobs *et al.* (2012), Raputsoane (2014) and Bernstein *et al.* (2014) have provided some empirical evidence of procyclicality of credit in South Africa. Akinaboade and Makina (2010: 487) adopted VAR modelling to confirm procyclicality of bank lending with business cycle in South Africa. They ascertained that between 1980 and 2005, bank lending was strongly dependent on real money supply and private credit. Fourie *et al.* (2011: 13079) confirmed a similar result: there is a positive relationship between credit extension of banks and business cycle using coincident business cycle as a proxy. This current study differs from the studies cited here in a number of aspects. First, the study is broader based (coverage is more encompassing, from 1990 to 2013) which covers more business cycles and financial crises, thus providing an opportunity to observe the behaviour of bank lending. Secondly, the Johansen Cointegration and Vector Error Correction model (VECM) method adopted in this study will ascertain the co-movement in the behaviour of bank lending and business cycle.

The General Equilibrium Model (GEM) used by BGG (1999) and Liu and Seeiso (2011) has a major problem of incorporating unrealistic neoclassical assumptions, such as constant return to scale and assuming a perfectly competitive market. GEM has also been criticised for underestimating the role of money and financial institutions. For instance, Markovic (2006) argued that financial intermediaries, which are assumed in the BGG model, can only function as deposit receivers, since the model assumes that the level of deposit loans is equal to the level of loans. This assumption is very unrealistic and undermines the functions of a bank in the first place. Zhang (2009) also criticised the BGG model for not incorporating an interaction between borrowers and lenders such that both can share a common "systemic risk" where contractionary aggregate shocks in the system can affect a firm's balance sheet and net worth negatively. This study adopts a more realistic methodology that will help explain the relationship between bank lending and business cycle.

4.4 METHODOLOGY

4.4.1 Model specification

The model used in this study attempts to capture the relationship between business cycle and credit growth following from Seo (2013). It is assumed that the lending behaviour is related to the business cycle. Domestic GDP growth and change in money supply are used as proxy variables for business cycle (Jokipii and Milne, 2008; Seo, 2013). Seo (2013) adopted a VECM and panel data analysis to capture the hypothesis that fluctuations in bank lending to SMEs and large enterprises are due to business cycle changes in Japan. In this study VAR modelling is used to capture the relationship between bank lending and business cycle because using panel data on individual banks will not be able to accurately elicit the macroeconomic long-run relationship between business cycle and bank lending since some banks might slow down bank lending due to some idiosyncratic factors unrelated to the downturn in the economy.

The model estimated in Jokipii and Milne (2008) is of the form:

Equation 4.1

$Loan_t = f$ [In Loan, GDP_t, Control (BIS_t), Control (ABD_t), Control (NIM_t)] …4.1

Where ABD is the buffer of credit risk, NIM is the variable for profit making conditions, and GDP is Gross domestic product growth rate.

However, the model to be estimated was modified, and can now be written as:

Equation 4.2

$$\mathrm{In}B_t = \propto_o + \propto_1 InB_{t-1} + \beta InGDP_{t-1} + \emptyset COIN_{t-1} + \partial InMS_{t-1} + \propto_3 X_t + \varepsilon_t \quad \ldots 4.2$$

Where the dependent variable (B_t) is total banking loans at time t and the explanatory variables are the lagged dependent variable(B_{t-1}), business cycle coincident index $(COIN_t)$ and other control variables (X_t). GDP_{t-1} is the domestic GDP growth at time (t-1) while MS is the money supply (M3) at time t-1. The model in this study contains variables which are endogenous to some extent, that is, are determined by at least one of the variables within the model. The VAR/VEC model is adopted in this study since contemporaneous relationships might exist between the variables in the analysis and this model provides an avenue for sorting out such relationships (Bernanke, 1987; Sims, 1980). The model is designed for the verification of the procyclicality hypothesis. Equation 4.2 will be used to verify the hypothesis that credit growth exhibits a procyclical pattern in South Africa.

4.4.2 Data and variable definitions

GDP at level and growth rate: GDP at level (ln GDP), Δ GDP= ln GDPt - ln GDPt-1 it is assumed that lending behaviour is associated with the business cycle. Therefore, domestic GDP growth at level is used as a proxy for the business cycle. However, domestic GDP growth or real GDP do not capture changes in different sectors of South African economy, and real GDP is usually influenced by agricultural and mining production. However, as macroeconomic shocks affect banks' lending during economic downturn, bank behaviour might reduce loans during recessions and increase it during booms. GDP is expected to move together with the trend in bank loans.

Composite Coincident Index: The South African Reserve Bank employs about 200 individual time series variables to capture the cyclical movement of the South African economy**.** These variables are used to examine the current and future economic situation. Business cycles are identified by comparing the turning points of the cyclical components of individual time series with the reference turning points. If the specific turning point tends to coincide with the reference turning point, the relevant variables are called 'coincident indicators'. If the variables predate the reference point, they are called 'leading indicators', and if the variables happen after the reference point they are called 'lagging variables'. The real GDP is not a very good measurement or proxy for the business cycle because any aggregate changes in real GDP do not capture the invariable changes in other sectors of the economy. Similarly, the real GDP is biased towards changes in agricultural production which might cause a bias to economic activities. Therefore the composite coincident index is a better indicator than real GDP or GDP growth (Mohr, 2012: 76). The South African coincident index is adopted to capture the business cycle index, as it will accurately capture the business cycle and the shocks that will affect bank loans during recessions and boom periods.

Money supply (M3 to GDP): Money supply and credit are expected to flow in the same direction. Changes in monetary policy through the South African Reserve Bank are expected to affect bank

lending, hence it is another important variable in the model used in this study which is different from the model adopted by Seo (2013) and Jopikii and Milne (2008).

Private sector credit to GDP (B): Prior studies such as Fourie et al. (2011) and Raputsoane (2014) showed that private sector credit to GDP is important in confirming credit flow during the business cycle. Fourie *et al.* (2011), Raputsoane (2014) and Bernstein *et al.* (2014) used similar variables in their analysis.

Inflation (CPI): This is an index for the accumulation of a basket of consumers' goods and services which is usually used as a proxy for measuring the inflation rate (the persistent increase in general price levels). Inflation is expected to have both negative and positive effects on credit. Borrowers of funds usually gain during inflation but lenders usually have the opposite effect.

Investment (INV): Since this study concentrates on demand side credit, it will be important to see the effect of investment on credit in the long run. Gross fixed capital formation is employed as a proxy for measuring investment. The literature has established that in the BGG model, credit constraint to a borrower can negatively affect the investment and reduce inventories.

Table 4.1: Definition of Variables

VARIABLES	***A priori* expectation**	**DEFINITIONS AND SOURCES**
Real Gross Domestic Product	(+): The business cycle is expected to vary directly with credit from the perspective of the credit procyclicality theory	Real Gross Domestic Product annually standardised using natural logarithmic scale and GDP growth rate (Seo, 2013)
Composite coincident index	(+/-): The business cycle is expected to vary directly with credit from perspective of the credit procyclicality theory	The South Africa coincident index that captures the current business cycle in South Africa (SARB)
M3 to GDP	(+): Money supply and credit are expected to flow in the same direction	The ratio of M3 to GDP (SARB)
Investment	(+): Investment and credit demand are expected to flow in the same direction following BGG Model	Gross fixed capital formation: Private business enterprises (Investment)
Consumer Price Index (CPI)	(+/-): Inflation is expected to flow in either direction to affect borrowers (firms) positively and lenders negatively	Consumer price index (SARB)
Bank rate	(-): Bank's interest and credit are expected to move in opposite directions	SARB's prime rate is used as a proxy for interest rate
Private sector credit to GDP	+: this study is interested in the co-movement of business cycle and credit growth	The ratio of private credit provided by banks to GDP (SARB)

4.5 MODEL ESTIMATION AND DISCUSSION

This study employed the VAR-based co-integration and VEC models accompanied by impulse response and variance decomposition. In estimating the VAR, this study takes into account the fact that most macroeconomic variables are usually non-stationary at level hence VAR-based co-integration methodology is employed to explore the long-run relationship between the variables. Although first differencing would have removed non-stationarity, this would result in the loss of the long-run relationship (Johansen, 1995). Secondly, the existence of a contemporaneous relationship between bank lending and business cycle suggest the use of VAR. In other words, there are no unique dependent or independent variables. The model provides a way to incorporate such relationships (Sims, 1980; Bernanke, 1987).

The major reasons for cointegration tests are to ascertain whether the variables are co-integrated or not. This will examine whether there is a unique long-run relationship between business cycle and credit growth in South Africa. The following steps are used when implementing the Johansen Cointegration procedure:

Step 1: Test the order of integration. The first step in the Johansen approach is to test for the order of integration of the variables under examination. All variables are preset to assess their order of integration. When all the variables are integrated of the same order, the cointegration test can be carried out. The data may be plotted to see if a linear time trend is present.

Step 2: Set the appropriate lag length of the model. Estimate the model and determine the rank of π.

Step 3: Choose the appropriate model regarding the deterministic components in the multivariate system. Analyse the normalised cointegrating vector (s) and speed of adjustment coefficients.

Step 4: Determine the number of cointegrating vectors. Causality tests are applied to the error correction model to identify a structural model and determine whether the estimated model is reasonable.

The VECM has co-integration relations built into the specification so that it restricts the long-run behaviour of the endogenous variables to converge to their co-integrating relationships while allowing for short-run adjustment dynamics. Thus, the vector error correction model (VECM) specification will be used to analyse the short- and long-run relationships between the variables of interest in this model. VECM will also enable us to derive information on both the long- and short-run dynamics of the model and estimate the speed of adjustment.

Table 4.2 presents the pair-wise contemporaneous residual correlation matrix of the variables. The largest observed correlation is 0.3649 between the money supply (M3 to GDP) and credit to GDP. This shows that there are some common trends driving these variables in the same direction but

generally correlation between the other variables is low. The residual correlation matrix is more of correlation among shocks. Since the VAR model is more about the analyses of shocks to the variables, the analysis is essential to be able to explain short-run relationships among the variables and at the same time if the pair-wise correlation is high it signals the existence of multicollinearity.

Table 4.2: Residual Correlation Matrix of Variables

	CPI	CREDITGDP	INCOININDEX	ININV	INPRIM_RATE	INRGDP	M3GDP
CPI	1.000000	-0.122215	-0.239011	0.075813	0.339823	0.009404	-0.015357
CREDITGDP	-0.122215	1.000000	-0.071147	0.103588	-0.161630	-0.108635	0.364970
TOTAL LOANS	-0.041116	0.235557	0.084212	0.103395	0.131776	0.077493	0.231196
COINCIDENT INDEX	-0.239011	-0.071147	1.000000	0.236282	-0.059062	0.295664	-0.174071
INVESTMENT	0.075813	0.103588	0.236282	1.000000	0.078228	0.145032	0.037813
PRIM_RATE	0.339823	-0.161630	-0.059062	0.078228	1.000000	0.028420	-0.098965
RGDP	0.009404	-0.108635	0.295664	0.145032	0.028420	1.000000	-0.095663
M3GDP	-0.015357	0.364970	-0.174071	0.037813	-0.098965	-0.095663	1.000000

4.5.1 Unit root test

A stationary series can be defined as one with a constant mean (μ), constant variances (θ) and constant auto covariance [Cov ($\mu_t\mu_{t-1}$)] for each given lag. The stationarity of a series ultimately affects this behaviour and properties, hence if a series is non-stationary it will be differenced d times before it becomes stationary, and then it is said to be integrated of order d. A non-stationary time series will have a time-varying mean and variance or both (Brooks, 2008: 319). Unit root tests were carried out in order to avoid spurious regression that might occur when running a regression with non-stationary variables. A spurious regression will indicate a statistically significant relationship between variables in the model, when it is just a contemporaneous correlation (Enders, 2004; Brooks, 2008).

The results of the Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) tests are presented in Appendices 4.12 and Appendix 4.13 respectively. The tests are applied to the data under two different deterministic trend assumptions: a constant and no trend, and both constant and trend. The results of the PP test are similar to those of the ADF test. According to PP tests, the series are non-stationary in their levels. One advantage of the PP tests over the ADF tests is that the PP tests are robust to general forms of heteroskedasticity. Another advantage is that the user does not have to specify a lag length for the test regression. However, while the PP tests tend to be more powerful, they are also subject to more severe size distortions. The size problem in PP test is more pronounced because the actual size of the variable is larger than the nominal one when autocorrelation exits in the model. PP tests are also more sensitive to model specification. One way to get around some of the weaknesses of ADF and PP tests is to use the Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test. KPSS test results are presented in Table 4.2. However under KPSS test, the data usually appear stationary by default if there is little information in the sample (Brooks, 2008).

The KPSS approach is based on a Lagrange Multiplier score testing principle and assumes that the univariate series can be decomposed into a deterministic trend, a random walk and a stationary error. The KPSS test statistic is computed based on residuals from a regression with an intercept but no time trend (Kwiatkowski *et al*., 1992: 160). The ADF/ PP tests are compared with KPSS test to ensure the same conclusion is found as suggested by Brooks (2008).

The Ng-Perron test is further conducted to ascertain the unit root properties of the variables in the model. Maddala and Kim (1998) suggested that an important way of overcoming the problem of failing to reject a null hypothesis when it is false is to use different tests and compare them. The results of the KPSS and NG Perron unit root tests are given in Tables 4.3 and 4.4 below.

Table 4.3: KPSS stationarity test result

KPSS TEST STATISTICS BOTH AT LEVEL AND FIRST DIFFERENCED				
Variables	**Model**	**Level**	**1st diff.**	**Order of integration**
M3_GDP	**Intercept**	1.244324**	0.508676	I(1)
	Intercept & Trend	0.296383**	0.115903	
CREDIT_GDP	**Intercept**	1.249349**	0.392759	I(1)
	Intercept & Trend	0.2767**	0.085023	
GDP_SA	**Intercept**	1.267914**	0.523036**	I(1)
	Intercept & Trend	0.277473	0.127857	
COINCIDENT_ INDEX	**Intercept**	1.128096***	0.241803	I(1)
	Intercept &Trend	0.201531***	0.052158	
INV	**Intercept**	1.291916***	0.08113	I(1)
	Intercept &Trend	0.088552*	0.081486	
BANK_RATE	**Intercept**	1.061974	0.040131**	I(0)
	Intercept &Trend	0.072355**		
CPI	**Intercept**	0.728035**	0.088266	1(1)
	Intercept &Trend	0.198394**	0.025776	
TOTAL LOANS(Bt)	**Intercept**	1.299309**	1.299309	I(1)
	Intercept & Trend	0.15456**	0.097856	

Note: *** shows significance of 1%, **, 5% level, and *, 10%, respectively.

Source: Author's computation

Table 4.4: NG Perron stationarity test

Model	Variables			
		Ng-Perron Level	**1st diff**	**DECISION**
Intercept	**M3_GDP**	1.94721	-26.9034***	I(1)
Intercept & Trend		-1.73179	-33.9228***	
Intercept	**CREDIT_GDP**	1.9733	-28.4117***	I(1)
Intercept & Trend		-2.59876	-32.7172***	
Intercept	**IN GDP_SA**	1.77354	-17.8729***	I(1)
Intercept & Trend		-3.43446	-26.9836***	
Intercept	**TOTAL LOANS**	0.95401	-21.2026**	I(1)
Intercept & Trend		-10.9697	-22.6503***	
Intercept	**GDP_GROWTH**	-20.4780***		I(1)
Intercept & Trend		-13.9812	-69.7816***	
Intercept	**CPI**	-2.14865	-17.6831***	I(1)
Intercept & Trend		-26.2613***		
Intercept	**COINCIDENT_INDEX**	-0.47803	-21.9067***	I(1)
Intercept & Trend		-9.90424	-26.1548***	
Intercept	**INV**	1.50155	-28.6943***	I(1)
Intercept & Trend		-10.0392	-33.4204***	
Intercept	**BANK_RATE**	-0.71096	-62.8600***	I(0)
Intercept & Trend		-27.8668***		

Note: *, **, *** implies significance at 10%, 5% and 1% level

Source: Author's computation

The unit root tests conducted revealed all variables have unit root in their levels except bank rate that is stationary at its level form, thus have to be differenced in order to ensure stationarity. The result is confirmed using KPSS and NG Perron tests.

4.5.2 Optimal lag length selection

Table 4.5: Lag length selection

VAR Lag Order Selection Criteria

Endogenous variables: CREDITGDP INCOININDEX BANK_RATE CPI ININV

Exogenous variables:

Sample: 1990Q1 2013Q4

Included observations: 88

Lag	LogL	LR	FPE	AIC	SC	HQ
1	478.6527	NA	2.29e-11	-10.31029	-9.606499	-10.02675
2	549.0057	124.7168	8.21e-12*	-11.34104*	-9.933462*	-10.77396*
3	573.3548	40.39732	8.43e-12	-11.32625	-9.214879	-10.47563
4	595.7815	34.65949	9.15e-12	-11.26776	-8.452607	-10.13361
5	623.9537	40.33737*	8.87e-12	-11.33986	-7.820912	-9.922162
6	640.4394	21.73122	1.14e-11	-11.14635	-6.923617	-9.445117
7	659.1353	22.52001	1.45e-11	-11.00307	-6.076553	-9.018303
8	687.5708	31.02057	1.52e-11	-11.08115	-5.450844	-8.812844

* indicates lag order selected by the criterion

Source: Author's computation

Having tested for unit roots, the next step is to conduct the cointegration test in order to establish whether a long-term relationship exists among the variables of interest. However, the Johansen cointegration test requires that the optimal lag length for the VAR system first determined. A fundamental requirement in conducting Johansen (1991, 1995) cointegration tests and estimation of a VAR system, especially in its restricted Vector Error Correction (VEC) forms, is the choice of an optimal lag length.

The choice was made by examining the lag structure in an unrestricted VAR originally specified using the maximum number of lags (8) and using VAR lag order selection criteria. This is important to avoid spurious rejection or acceptance of estimated results. If there are n variables with lag length k, for example, it is necessary to estimate n(nk+I) coefficients. The lag length also influences the power of rejecting hypothesis. For instance, if k is too large, degrees of freedom may be wasted. However, if the lag length is too small, important lag dependences maybe omitted from the VAR, and if serial correlation is present the estimated coefficients will be inconsistent. The widely used information criteria are the Akaike Information Criteria (AIC), Schwarz Information Criterion (SIC), Hannan-Quinn Information Criterion (HQIC), Final Prediction Error (FPE) and the

Likelihood Ratio (LR) test. More fundamental is the fact that the lag length selected must conserve degrees of freedom.

Table 4.5 shows that LR choose lag 5 while FPE, AIC, SC and HQ choose lag 2. The optimal lag length 2 is chosen after checking each lag length for stability and ensuring that it meets all the criteria.

4.5.3 Block exogeneity test and cointegration test

The study performed block exogeneity and cointegration tests to ascertain the long-run relationship among the nonstationary variables. Table 4.6 reports the Granger causality block exogeneity test, and suggests that Credit_GDP is endogenously determined in the model because the p-value of the joint exogeneity test is 0.0124. There is a uni-directional relationship between coincident index and credit to GDP, this signifies that business cycles have a strong impact on credit to GDP given the p-value of 0.0758 in Table 4.6.

The models with co-integration were reported with most of the models having at least one co-integrating equation. The result of the Trace statistics and Max-Eigenvalue statistics are reported in Table 4.7.

Table 4.6: Block Exogeneity Test

VEC Granger Causality/Block Exogeneity Wald Tests			
Sample: 1990Q1 2013Q4			
Included observations: 94			
Dependent variable: D(CREDITGDP)			
Excluded	Chi-sq	df	Prob.
D(COIN_INDEX)	3.151982	1	0.0758
D(BANK_RATE)	0.478524	1	0.4891
D(CPI)	0.078684	1	0.7791
D(INV)	1.177587	1	0.2778
All	12.77716	4	0.0124
Dependent variable: D(INCOININDEX)			
Excluded	Chi-sq	df	Prob.
D(CREDITGDP)	0.554139	1	0.4566
D(BANK_RATE)	1.018010	1	0.3130
D(CPI)	5.899919	1	0.0151
D(ININV)	0.019019	1	0.8903
All	6.311708	4	0.1770

Source: Author's computation

Table 4.7: Johansen Cointegration Test result

Sample (adjusted): 1990Q4 2013Q4				
Included observations: 93 after adjustments				
Trend assumption: Linear deterministic trend (restricted)				
Series: CREDITGDP INCOININDEX BANK_RATE CPI ININV				
Lags interval (in first differences): 1 to 2				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.366960	104.2514	88.80380	0.0025
At most 1	0.282811	61.72983	63.87610	0.0748
At most 2	0.160776	30.81518	42.91525	0.4546
At most 3	0.109531	14.51436	25.87211	0.6150
At most 4	0.039269	3.725685	12.51798	0.7814
Trace 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				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.366960	42.52156	38.33101	0.0156
At most 1	0.282811	30.91465	32.11832	0.0696
At most 2	0.160776	16.30081	25.82321	0.5180
At most 3	0.109531	10.78868	19.38704	0.5352
At most 4	0.039269	3.725685	12.51798	0.7814
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				

Source: Author's computation

Trace value: Using a sequential testing procedure r=0 against the alternative of at most one cointegrating equation, the test statistic is 104.25, which is greater than the 95% critical value of 88.80. Thus the null hypothesis of no cointegrating vectors is rejected. Testing for at most 1 against the alternative of at most 2 cointegrating equations, the test statistic is 61.73, which is less than, 63.876. So the null hypothesis that there is at least one but not two or more convectors is accepted.

Eigen value: Using a sequential testing procedure r=0 against the alternative of at most one cointegrating equation, the test statistic is 42.52156 which is greater than 38.33 at 95% critical value, thus the null hypothesis of no cointegrating vectors is rejected. We now test at most 1, against the alternative of at most 2 cointegrating equations. The test statistic is less than 32.11832, so the null hypothesis that there is at least one but not two or more convectors is accepted. The result shows that at least one cointegrating equations was reported by both trace test and maximum eigenvalues statistics. The null hypothesis of no cointegration(r=0) at 5% significance level is rejected and conclude that the variable in the models are cointegrated at 5%. This result further supports that there is a long-run relationship among the variables and also the suitability of using the Vector Error Correction Model (VECM).

A stability test is required to ensure that the residuals of the model are not serially correlated in the long run. A robustness test is further conducted to avoid spurious regression in the model. The VAR for Autoregressive Roots test and serial correlation is tested. The AR Roots Graph shows the inverse roots of the characteristic AR polynomial. The estimated VAR is stable (stationary) if all roots have modulus less than one and lie inside the unit circle. If the VAR is not stable, certain results, such as impulse response standard errors, are not valid. Figure 4.1 shows the AR stability test which depicts that lag length 2 satisfies the stability test result.

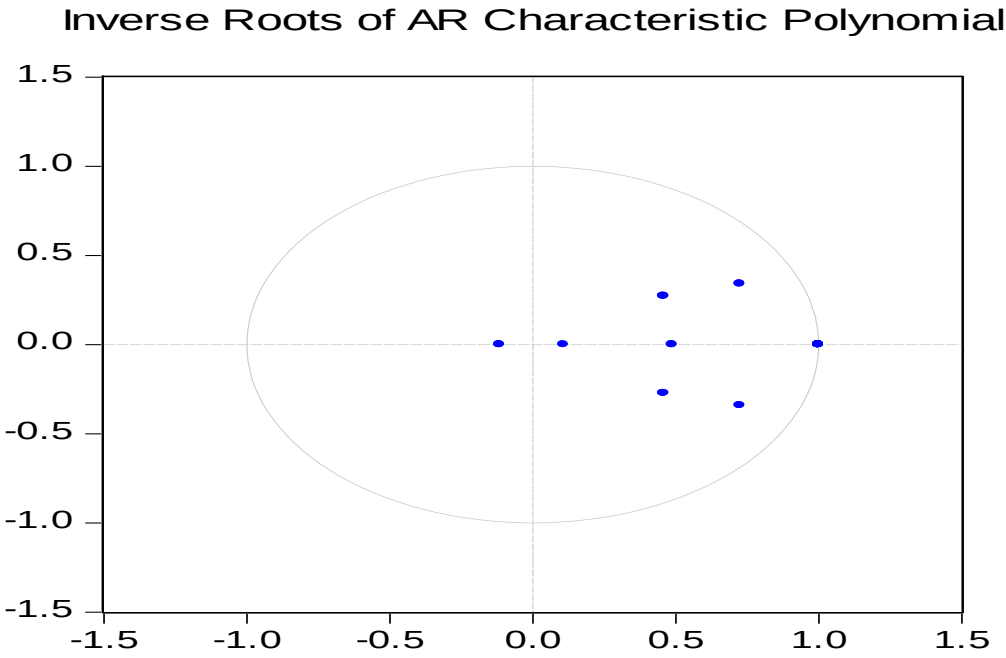

Figure 4.1: Inverse Roots of AR stability test

Source: Author's computation

Table 4.8: VEC Residual serial correlation LM Test

VEC Residual Serial Correlation LM Tests		
Null Hypothesis: no serial correlation at lag order h		
Lags	LM-Stat	Prob
1	31.01849	0.1884
2	25.56810	0.4309
3	34.26424	0.1024
4	45.14353	0.0081
5	14.29454	0.9564
6	22.99846	0.5777

Source: Author's computation

4.5.4 Vector Error Correction Model

Once it is established that the relevant variables are cointegrated it is appropriate to estimate an error correction model by specifying the number of cointegrating vectors, taking into account the trend assumption used in the previous step and normalising the model on the true cointegrating relation(s). Once estimation is complete, the residuals from the VECM must be checked for normality, heteroskedasticity and autocorrelation.

Our main concern is to ascertain which variables have the greatest impact on credit growth in South Africa, especially the impact of the business cycle (Coincident index). We estimated a VECM normalised on Credit to GDP ratio. The long-run regression is provided in Equation 4.3.

$Credit\_GDP_t$ = - 3.046009 + 0.013995Trend [-3.10371] + 0.424172 $COIN\_INDEX_{t-1}$ [2.10041] + 0.038603 CPI_{t-1} [-7.58026] + 0.016100 $BANK\_Rate_{t-1}$ [-2.29277] + 0.052551 INV_{t-1}[-0.32695] …4.3

Note: t values in [ ] square brackets

The cointegration relation indicates that Coincident index, which is a measure of the business cycle, has a positive and significant long-run impact on credit to GDP. The Coincident index has a

(t statistics test of 2.1) at 5% significance level. Similarly, inflation rate and bank interest rate also have a significant effect on credit to GDP.

Table 4.9: Speed Adjustment of Model 4.1

Error Correction:	D(CREDIT GDP)	D(INCOINDEX)	D(M3GDP)	D(BANK_RATE)	D(CPI)	D(ININV)
CointEq1	**-0.007252**	0.016605	-0.006787	0.575355	1.554368	0.009410
Standard errors	(0.00275)	(0.00418)	(0.00242)	(0.22261)	(0.30391)	(0.00666)
t values	[-2.63385]	[3.97407]	[-2.80507]	[2.58456]	[5.11455]	[1.41228]

Source: Author's computation

The coefficient of the error correction terms is interpreted as the speed of adjustment to the long-run equilibrium. The coefficient of the error correction term of total bank loans is negative and significant, and the coefficient is below unity which implies that any disequilibrium to the credit might be persistent for some time. The speed of adjustment of credit to GDP to its own long-run equilibrium will be slow as shown by the adjustment coefficient. Every quarter, just over 0.72% of the disequilibrium in credit to GDP is adjusted back to equilibrium. But the adjustment coefficient of business cycle is also positive but will be faster than the others.

4.5.5 Impulse response analysis

Impulse response analysis traces out the responsiveness of the dependent variable in the VAR to shocks to each of the other variables. It shows the sign, magnitude and persistence of real and nominal shocks to the dependent variable.

Impulse response functions show the dynamic responses of a dependent variable, in this case credit/GDP, to a one-period standard deviation shock to the innovations of each variable determinant, in particular, the coincident index. To investigate the potential impact of the business cycle shock, impulse response analysis is conducted. These impulse response functions show the dynamic response of the credit/GDP ratio to a one-period standard deviation shock to the innovations of the system and also indicate the directions and persistence of the response to each of the shocks over a 10 quarter (2.5 years) period. Figure 4.2 part A shows the effect of Coincident Index (Business cycle) shock on credit growth in South Africa. Figure 4.2 part A shows that the impact of business cycle shock is very persistent and lasting. This also shows that the shocks to the business cycle result has a persistent impact on credit. In fact they still seem to persist after ten years. This is also explained by the slow correction for disequilibrium to long run equilibrium. This shows that there is a long lasting effect of business cycle. South Africa's business cycle

experienced the longest economic downturn of 51 months in length in 1999. According to Van Den Heever (2007), the banking sector in South Africa was responsible for more than 90% of the total household debt in South Africa at the end of March 2006. When household debt rises excessively, there is a probability of greater default rate in loan repayment which can ultimately dampen investor confidence. This result further confirms the assertion in theory that credit follows business cycle and can amplify credit crunch.

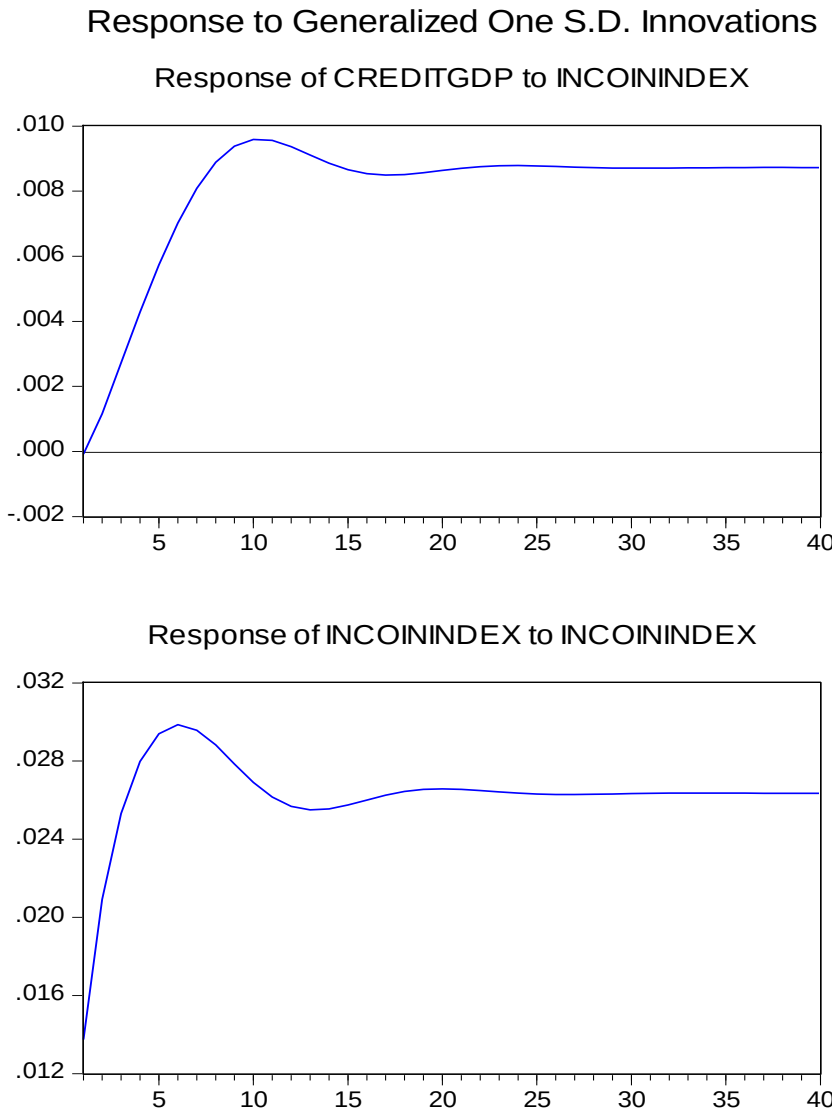

Figure 4.2: Response of total loans to a one period shock to other variables
Source: Author's computation

Figure 4.2 shows that a shock to the business cycle has a positive and persistent impact on the credit to GDP and itself for about 5 year period before eventually dying out. A one-period shock to

business cycle leads to an increment of the credit to GDP by over 3 per cent after a period of 5 years.

4.5.6 Variance Decomposition

Variance decomposition measures the forecast error variance of any variable, explained by innovations to each explanatory variable over a series of time horizons to a system when a shock is applied. In summary, this technique shows the relative importance of each random innovation to each explanatory variable over a series of time horizons. Variance decompositions performed on the VECM may provide some information on the relative importance of shocks to the independent variables in explaining variations in the dependent variable. In the context of this study, it therefore provides a way of determining the relative importance of shocks in explaining variations in credit to GDP and business cycle. The results of the variance decomposition analysis are presented in Table 4.10. These results show the proportion of the forecast error variance in the credit to GDP explained by its own innovations and innovations in its determinants.

Table 4.10: Variance Decomposition of CREDITGDP

Variance Decomposition of CREDITGDP:						
Period	**S.E.**	**CREDITGDP**	**INCOININDEX**	**BANK_RATE**	**CPI**	**INV**
1	0.009470	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.016745	97.57740	0.572195	0.801976	0.654299	0.394127
3	0.023758	92.87477	1.725043	2.475957	2.329408	0.594820
4	0.030806	88.13479	3.091996	4.269106	3.945682	0.558421
5	0.037821	84.81148	4.475980	5.488668	4.753946	0.469925
6	0.044589	83.09992	5.819141	5.905753	4.765044	0.410137
7	0.050935	82.50620	7.094791	5.679035	4.322901	0.397075
8	0.056773	82.44350	8.264628	5.112078	3.747259	0.432531
9	0.062081	82.51469	9.287996	4.469378	3.218535	0.509404
10	0.066872	82.55084	10.14058	3.900444	2.796028	0.612117
Variance Decomposition of INCOININDEX:						
Period	**S.E.**	**CREDITGDP**	**INCOININDEX**	**BANK_RATE**	**CPI**	**INV**
1	0.013744	0.006580	99.99342	0.000000	0.000000	0.000000
2	0.025171	0.339176	98.93959	0.673560	0.045765	0.001909
3	0.036290	1.064846	96.36812	2.379989	0.186073	0.000974
4	0.047329	1.651956	91.69763	5.385687	1.252339	0.012384
5	0.058423	1.815527	85.57484	9.412094	3.114368	0.083174
6	0.069357	1.634311	79.29584	13.74631	5.106114	0.217419
7	0.079695	1.330330	73.85440	17.72672	6.718735	0.369823

8	0.089035	1.069403	69.65588	20.98921	7.789484	0.496023
9	0.097170	0.912101	66.69108	23.44064	8.379301	0.576877
10	0.104113	0.846076	64.76100	25.15101	8.627108	0.614808

Source: Author's computation

In the first quarter, all of the variance in the credit to GDP is explained by its own innovations (shocks). Credit to GDP explains about 100 per cent of its variation. However, after a period of 4 to 5 years, the credit to GDP explains about 86 per cent of its own variation, while its determinants explain the remaining 14 per cent. The influence of the business cycle increases gradually to about 9.4 per cent, explaining the largest component of the 14 per cent variation in the credit to GDP that is explained by its determinants. Thus, the business cycle explains the largest component of the variation in the credit to GDP followed by the bank rate. These results, therefore, are similar to those from the impulse response analysis.

4.6 CONCLUSION AND POLICY RECOMMENDATION

The study started with the aim of examining the extent of linkages between business cycle and credit growth in South Africa employing the VECM framework, in order to understand the extent to which business cycle fluctuation can affect credit crunch in the financial system. The Johansen Cointegration approach was used to ascertain whether there is indeed a long-run co-movement between credit growth and business cycle, by first testing the stationarity of the series under the NG–Perron and KPSS framework, and established that all the series were I(1) – a property essential for cointegration analysis. Results from the test and VECM model show that there are significant linkages among the variables, especially between credit to GDP and business cycle. The result shows that in the long run fluctuations in the business cycle can influence the credit growth in South Africa.

Appendix A

Table 4.11: Summary statistics of data employed, 1990Q1 to 2013Q4

Variables	CPI	CREDITGDP	INTOTAL LOANS	INCOININDEX	ININV	IN BANK_RATE	M3GDP
Mean	7.556250	0.595718	13.52251	4.398048	11.81665	2.658658	0.572708
Median	6.883333	0.485689	13.58515	4.326337	11.75891	2.696625	0.451701
Maximum	16.16667	1.276104	14.88301	4.766155	13.10415	3.218876	1.245269
Minimum	0.433333	0.135524	11.85855	4.097672	10.53180	2.140066	0.136703
Std. Dev.	3.759751	0.367629	0.948426	0.200489	0.810446	0.295303	0.366660
Skewness	0.539790	0.501716	-0.124394	0.374059	-0.057055	-0.265779	0.532564
Kurtosis	2.754168	1.784426	1.686216	1.747824	1.699162	1.918423	1.789914
Jarque-Bera	4.903711	9.937982	7.151695	8.510509	6.820804	5.809454	10.39522
Probability	0.086134	0.006950	0.027992	0.014189	0.033028	0.054764	0.005530
Sum	725.4000	57.18897	1298.161	422.2126	1134.398	255.2312	54.98001
Sum Sq. Dev.	1342.894	12.83936	85.45355	3.818615	62.39811	8.284376	12.77178
Observations	96	96	96	96	96	96	96

Source: Author’s computation

Table 4.12: Summary of Augmented Dickey-Fuller Test

		Augmented Dickey-Fuller Test both at level and difference				
Variable	**Model**	**Level**	**1st difference**	**Intercept(I)**	**Trend(T)**	**I(1)**
COINCIDENT_INDEX	**Intercept**	-0.156992	-3.937238***	0.413358		I(1) with T
	intercept and trend	-2.79038	-4.102787***	1.281191	-3.937238***	
CREDIT_GDP	**Intercept**	1.076334	-4.844006***	1.590996		I(1)
	intercept and trend	-1.751784	-5.129619***	0.792817	2.100016	
GDP_SA	**Intercept**	9.114049***		2.107345		I(0)
	intercept and trend	0.598838	-10.39615***	0.631037	1.947130	
M3_GDP	**Intercept**	1.152941	-4.944730***	1.827442		I(1)
	intercept and trend	-1.856427	-5.265716***	0.700408	2.260698	
TOTAL LOANS (Bt)	**Intercept**	-1.482453	-3.773265***	1.872680		I(1)
	intercept and trend	-1.332137	-4.017721***	1.406038	1.186148	
BANK_RATE	**Intercept**	-1.744038		1.449743		
	intercept and trend	-3.381299**		3.214563**	-2.855250	I(0) with I
INV	**Intercept**	-0.448089	-5.646147***	0.817957		I(1)
	intercept and trend	-2.251520	-5.615706***	2.308469	2.211510	
CPI	**Intercept**	-2.693706*	-4.462004***	2.175291		I(1)
	intercept and trend	-2.863446	-4.515538***	2.145765	-1.236042	

Source: Author's computation

Table 4.13: Summary of Philips-Perron Test

Philips-Perron Test both at level and difference				
Variable	**Model**	**Level**	**1st difference**	**I(1)**
COINCIDENT_INDEX	**Intercept**	0.314058	-4.043937***	I(1)
	intercept and trend	-2.246476	-4.102787***	
CREDIT_GDP	**Intercept**	1.367715	-4.710233***	I(1)
	intercept and trend	-1.637558	-5.038340***	
M3_GDP	**Intercept**	1.605106	-4.854730***	I(1)
	intercept and trend	-1.758746	-5.243659***	
INV	**Intercept**	-0.224907	-5.586268***	I(1)
	intercept and trend	-1.995028	-5.551185***	
BANK_RATE	**Intercept**	-1.384241	-6.171277***	I(1)
	intercept and trend	-2.673657	-6.132661***	
CPI	**Intercept**	-2.359046*	-5.994950***	1(1)
	intercept and trend	-2.850068	-5.968672***	

Source: Author's computation

Table 4.14: Weak Exogeneity test

Variables	**Chi-square**	**Probability**	**Outcome of the Variables**
Credit_GDP	3.864450	0.049319	endogenous
Coincident index	13.45675	0.000244	endogenous
CPI	16.82694	0.000041	endogenous
Bank Rate	7.321061	0.006815	endogenous
Investment	1.932842	0.164448	exogenous

NB: we imposed restriction on α (alpha restriction of the VECM) t to identify the endogenous variables and ascertain the robustness of our model.

Source: Author's computation

Chapter 5

FINANCIAL REGULATION PROCYCLICALITY IN SOUTH AFRICA

5.1 INTRODUCTION

Financial globalisation and financial innovation have increased the appetite of most banks in taking risk and therefore engendered financial fragility in the financial system (Goodhart *et al.*, 2004; Drumond, 2009; Mishkin, 2010). Therefore, prudential regulation in the form of the International Basel Accord (Basel I and II) was introduced to curtail systemic risk and ensure stability in the banking system. However, the introduction of the capital requirement in the form of Basel I and Basel II may have amplified the business cycles. A number of studies (Berger and Udell, 1994; Jackson *et al.*, 1999; Santos, 2000; Stolz, 2002; Goodhart, 2004) have drawn attention to the procyclicality of bank capital regulation.

According to the literature on the bank capital channel and balance sheet channel, the presence of financial frictions and imperfect markets necessitates the regulation of the financial market. However, the introduction of bank capital regulations may amplify financial shocks to the real sector. Against this background, it will be interesting to examine the co-movement between business cycle and bank capital adequacy requirements in South Africa. What role does financial regulation play in promoting financial crisis and hence accentuating the business cycle in South Africa? To answer these questions, this study employs quarterly data from the South African Reserve Bank (SARB) using Vector Autoregressive modelling from 1990 to 2013. The chapter is organised as follows: Section 5.2 presents the overview of capital regulation in South Africa. Section 5.3 examines the theoretical foundation of bank capital procyclicality. The methodology and results are discussed in Sections 5.4 and 5.5 and Section 5.6 concludes the chapter.

5.2 BASEL ACCORD COMMITTEE ON BANKING SUPERVISION IN SOUTH AFRICA

Bank regulators have emphasised the importance of capital adequacy requirements for financial system stability especially in cross-border banking. The commencement of the Basel system was the aftermath of the Herstatt Bank failure and the collapse of Franklin National Bank (New York) in 1974 which apparently engendered crises in the banking and currency market. The initial focus was on establishing rules for bank closures, but during the 1980s the Committee became concerned about capital ratios of major international banks as the international situation became more and more risky. The Basel Accord aimed to harmonise different countries' national capital requirements while strengthening the overall banking system. According to Dowd *et al.* (2011), Basel has transformed into a "Basel Empire" whose main function was to expand and establish "Basel rule books". The committee is responsible for setting minimum standards and procedures which international bank supervisors may adhere to as best practice guidelines. In the Basel

Accord's most basic form, bank capital should be able to offset risk assets in banks' portfolio (BCBS, 2013). This is meant to reduce risk in the banking sector. Post-Basel, most central banks induced regulations, taking their origin from the Basel Committee on Banking Supervision (BCBS). South Africa is a member of G20 which established the BCBS. South Africa implemented Basel II on 1st January 2008 and followed through the latest Basel reform (Basel III) on 1st January 2013. South Africa is the only country in Sub-Saharan Africa that has fully implemented the Basel Accord Reform.

South Africa has further reformed its financial sector regulation by implementing a "twin peak approach" such that monitoring will be handled by both the central bank, SARB and the Financial Services Board (FSB). SARB is mandated to ensure the safety, soundness and stability of the financial system by monitoring the macro-prudential supervision of the financial system in South Africa, while the FSB is responsible for supervision of market conduct across the financial system by enforcing information sharing and transparency among bankers and regulators (Van Wyk *et al.*, 2012: 121; SARB, 2014: 30).

Basel I: Basel I is the first agreed regulatory framework for capital adequacy that the BCBS recommended for implementation in 1988, and it aimed at improving the efficiency and soundness of the international financial system. Basel I, although formerly designed for all internationally active banks from developed countries, has been popularly accepted around the world. As a member of BCBS, South Africa is meant to meet at least 8% of the total capital requirement in relation to their risk weighted assets (Gottschalk, 2010: 5).

Under Basel 1, the assets of financial institutions were divided into five categories according to the level of riskiness. Banks were required to reserve part of their capital to reduce their level of exposure to risk when giving out loans. All assets are assigned 0%, 10%, 20%, 50% and 100% depending on how risky the assets are. Government assets are the safest, hence are set at 0% since government are not likely to default on debt in domestic currency. This means that banks do not need to hold any capital as a reserve in the balance sheet against such assets, unlike corporate bonds, which are assigned a 100% risk-weight. Basel I therefore specified the capital adequacy ratio as the ratio of capital to risk weighted asset (RWA) to be greater than 8%. However, it became evident for example in South Africa that the 8% RWA excludes important information on bank exposures, such as the availability of collateral to cushion riskiness of an exposure. At the end of 1994 South African banks increased their capital ratios in relation to RWAs to become more attractive to foreign markets (SARB, 1994).

Since the inception of Basel I in 1988, over 100 countries have adopted Basel I, even though it has been criticised for not having any economic basis for selecting 8%. There were no provisions to

capture market[1] risk and credit risk in the modelling of Basel I which encouraged regulatory arbitrage.

Criticism of Basel I: The regulatory arbitrage[2] was pronounced since Basel I was only meant to cater for credit risk while ignoring other types of risks, but later on most banks started exposing their asset portfolio to foreign exchange markets, options and Over-The-Counter market. Basel I ultimately increased bank's risky behaviour. Therefore, the Basel Accord had to improve the capital regulatory framework to include other types of risk.

Basel II improved on Basel I. The Basel Committee introduced three approaches in setting capital requirement. These include three pillars:

1. Pillar I: entails different types of risk (operational risk, market risk and credit risk). It encompasses not only credit risk like Basel I but also market risk and operational risk.
2. Pillar II: Supervisory review involves strengthening the supervisory process, and increasing transparency and disclosures rules and risk management. Banks are required to use either internal risk model or a standardised model to calculate their risk weight.
3. Pillar III: Market discipline focused on improving market discipline through disclosure of bank's credit exposure and the reserve requirement.

Although Basel II was established in 2004, the new Basel accord permits banks to employ internal rating for calculating regulatory capital requirements. This was done to ensure that the regulatory capital is very close to the economic capital requirement.

However, the credit risk framework and measurement in Basel II seem more complex than Basel I. The underlying assumption of Basel II is to increase banks response to risk by adopting two patterns for measuring capital requirement of credit risk: the internal based rating approach (IRB): fundamental IRB and the advanced IRB(A-IRB) and the standard approach. Basel II increased risk sensitivities by introducing these two approaches by employing different data sources such as the historical company rating from external ratings and market prices from the bond market and stock markets. (BIS, 2004).

SARB started the implementation of Basel II in 2008. Since this was a major shift in banks' supervision, SARB required years of planning and consultation of financial institutions and governing bodies before its implementation. The objective of Basel II was to significantly add to

[1] Market risks are changes in financial assets prices which can affect the balance sheet of most financial institutions.

[2] Regulatory arbitrage is the practice of taking advantage of regulatory differences in two or more markets, in this case most regulated banks will calculate the difference between real market risk and the capital adequacy regulatory position. Under the Basel I regulation, banks will hold 8% capital buffer against default risk, if the real market risk is lower than 8%, then it will be profitable to securitide the risk asset removing the low risk asset from its portfolio.

security and efficiency of the banks and the financial system as a whole. This is also believed to have increased the ratings of creditworthiness of banks with the implementation of Pillar III (market discipline) (SARB, 2008).

Criticism of Basel II: Basel II was criticised for concentrating only on micro-prudential regulation and being weak to cope with systematic risk in macro-prudential regulations. Traditional micro-prudential regulation seeks to enhance the safety and soundness of individual financial institutions while macro-prudential regulation focuses on the welfare of the financial system as a whole. In other words, macro-prudential regulations usually consider the holistic behaviour of different banks and their characterisation of risk to avoid systemic risk and contagion between banks in a country. Similarly, Basel II was criticised for being too complex and difficult to implement. Secondly, risk weights in the standardised approach are dependent on internal credit rating companies which were found to be very unreliable during the subprime lending in 2009. Thirdly, Basel II was also found to be procyclical In other words, Basel II requires banks to hold less capital during boom periods and more in recession periods. This may accentuate bank lending and affect the real sector in the long run.

Basel III: is an improvement of the three pillars of Basel II to incorporate lessons from the global crises of 2007 to 2010. The aims of Basel III are mainly to improve the quality and quantity of capital, coverage of risks and to set limit on banks' leverage. Following the global financial crisis, SARB agreed to improve financial regulation by reducing the opacity of the financial system and reducing financial arbitrage. For instance, the OTC derivative market in South Africa is regulated to report to the trade repositories and should be cleared through central counter parties to avoid off-balance sheet trading (SARB, 2014: 31).

Quality of Capital: Under Basel I and II, 'Tier 2 capital' such as debentures and changes in fixed assets could be added in absorbing bank's losses, and therefore, Basel III aimed at having common equity as capital, set at 4.5% of RWA. Converting common equity as capital is particularly important in situations where the regulatory authority can write off or convert other capital instruments to absorb bank losses during banking crises. Similarly, some instruments are aimed at preventing the procyclicality of the financial system on the asset and liability sides:

- Capitals are levied on loan-to-value ratio and loan loss provisions. Capital should also be made available on debt-to-income ratio.
- Countercyclical capital requirement – to avoid excessive balance sheet shrinkage from banks in trouble.
- Capital on leverage meant to limit asset growth by tying banks' assets to their equity (finance).

- Non-core liabilities – to prevent excessive asset growth and price distortion.

Quantity of Capital: Banks are first required to hold a 'capital conservation buffer' in the form of common equity set at 2.5% of RWA so the total common equity is set at 7%. This is to ensure that bank capital does not fall below the minimum capital requirement when losses occur and to mitigate the problems banks face during the financial crises. Secondly, Basel III requires that a 'countercyclical capital buffer' in the form of common equity from 0 to 2.5% of RWA is implemented to cater for the problem of procyclicality in Basel II. This is to prevent excess systemic risk caused by credit growth. Moreover, Basel III requires stricter treatment of securitised assets for trading and derivatives activities. Therefore, to limit banks against off-balance sheet activities and as a contingency against the risk-based capital requirement, the 'non-risk based leverage ratio' was introduced in the banking regulations.

Under Pillar II, Basel III introduced supplemental requirements for supervisory review to cover more robust risk management practices, prevent off-balance sheet exposure and securitisation activities, risk concentration within the banks and valuation problems. Under Pillar III, Basel III suggested that banks should disclose all securitisation exposure and off balance sheet activities. Basel III also entails the introduction of the 'global liquidity coverage ratio' which requires that all banks should have liquidity assets to withstand for up to 30 days during stress periods. The 'net stable funding ratio' was meant to spur banks to hold stable sources of funding to avoid liquidity mismatch and 'additional loss absorbency capacity' ranging from 1 to 2.5%.

5.3 THEORETICAL ISSUES IN BANK CAPITAL PROCYCLICALITY

5.3.1 Capital requirements and bank portfolio behaviour

Bankers are usually seen as custodians and handlers of portfolios of assets, hence the major goal of bankers is to decide on the optimal asset ratio that will maximise their profit and at the same time cater for the depositors' funds and maintain the shareholders market value. VanHoose (2007) explained the rationale behind the portfolio theory by assuming that banks as 'managers of portfolio of asset' usually respond to any constraint in capital requirement by modifying their selection of asset portfolio or their "portfolio leverage (asset-capital) ratio" (VanHoose, 2007: 3682). For instance, a binding capital requirement on a bank's portfolio usually constrains the leverage ratio of the bank which ultimately impacts the 'bank's efficient asset investment frontier'. The bank will respond to this tightening in leverage ratio by manipulating the mix of assets in its 'portfolio per unit of capital' (VanHoose, 2007). VanHoose further explained that portfolio selection is usually determined by the degree of "risk aversion" across banks.

It is important to establish that banks' behaviour and their response to the restrictions of capital requirements is also dependent on the level of risk each bank allows on their balance sheet.

However, for capital requirements to have an effect on banks' portfolio selection and reduce the level of risk taken by the banks, the underlying bank must be exposed to asset regulation (Kahane, 1977). It is interesting to note that Basel I was introduced to tame and influence most banks' portfolio selection by imposing risk weights for different levels of banks' assets. However, studies have shown that increases in capital requirements do not necessarily result in a reduction in banks' high-risk assets. Some of the major seminal works of Sharpe (1978), Santomero and Watson (1977), Koehn and Santomero (1980) and Kim and Santomero (1988) have established the effect of binding capital regulation on the behaviour of banks in terms of increasing their portfolio risk. They further agreed that most banks will respond to higher capital requirement by choosing a riskier 'portfolio of asset mix' prior to the increase in capital requirement. Consequently, such action by the banks can render the intentions of capital regulation futile and at the same time create instability in the financial system.

Giovanoli (2009: 82) observed that most financial and international regulation was established as a a "child of crisis". He observed that the "modern banking supervision" was developed after the "Great Depression" of 1930s; similar cases were the Euromarkets after the collapse of the Bretton Woods system and then the establishment of the BCBS after the collapse of the Herstatt Bank in 1974. The International Financial Architecture (IFA) was established in 1999 after the 1998 Asian Crisis. The FSB was formed by the G20 in response to the global financial crisis of 2008 and 2009. It appears that after every circle of crisis, there is a new regulation. It can be observed that banks' behaviour regarding capital requirements and their effectiveness in maintaining stability on the banking system is dependent on banks' affinity to take on riskier assets.

The introduction of strict capital requirements could make some banks respond by investing in safer assets, while other banks could invest in riskier assets. Hence, the response of banks is not homogenous. Some choices will make the system stable, while others leave it unsecured (VanHoose, 2007). A bank that likes to take risks will choose a riskier portfolio of assets that will be detrimental to the net worth of the bank. Koehn and Santomero (1980) considered a mean variance method of portfolio selection to ascertain if capital requirement would augment the risk conduct of banks. They believe that an increase in capital requirement reduces the profit of the banks and might induce banks to invest in riskier assets. This is usually called "the expected income effect" (Koehn and Santomero, 1980: 1235). Kim and Santomero (1988) used a mean variance model to examine the effect of capital asset ratio on risk propensity of banks but in their case they considered the role of an "inefficiently priced" deposit insurance and how it promotes risk-taking behaviour of banks because it ignores the individual banks' optimal capital structure (Kim and Santomero, 1988: 1231). Santos (2000) established that "deposit insurance" is effective in preventing bank runs and protecting depositors funding. However, deposit insurance companies also encourage banks to invest in risky assets which elicit more problems of moral hazard from the

banks (Santos, 2000: 16). Merton (1977, Pyle (1986), Kane (1990) and Keeley (1990) have also all established deposit insurance deficiency as reducing moral hazard from the banks. Deposit insurance firms are usually insensitive to risk-taking by banks. This emanates as a result of having an “unfairly priced deposit insurance premium” that encourage the arbitrage of banks to take on more risk. The weakness of deposit insurance has generated argument on the issue of “too big to fail” or “too interconnected to fail” justification of bailing out large banks who deliberately invest in risky assets in the hope that public bailout will be available when they become insolvent. Deposit insurance is not really relevant to this study since South Africa has not established deposit insurance as a requirement for banks in South Africa, hence this study does not examine the role and impact of deposit insurance.

Furlong and Keeley (1989) have a different view about the impact of capital regulation on banks’ behaviour. They criticised Koehn and Santomero (1980) for using an incompatible mean-variance framework for measuring banks’ returns in time of crises. Their analysis shows that capital regulation ratios can actually reduce the risk incentive of the banks by integrating the value of deposit insurance into the state preference model. They argue that an increase in capital should be an added incentive for bankers to be prudent in asset selection since banks will have to provide for the loss of capital when they default. Furlong (1989) also examined the balance sheet impact of capital regulation and concluded that in the presence of efficiently valued deposit insurance, capital regulation will cause banks to diversify their portfolio and ultimately reduce risk conduct of banks. Gennotte and Pyle (1991) concluded that the effect of capital regulation and deposit insurance on a bank’s portfolio behaviour is usually equivocal when the bank’s marginal costs rise as the portfolio of assets (which is a combination of safe and riskier assets) increases. But if the bank respondsby investing more in risky investments then the capital tightening will have an increased tendency to for the bank to go bankrupt (Furlong and Keeley, 1989: 889; Flannery, 1989: 256; Gennotte and Pyle, 1991: 820; VanHoose, 2010: 143). The exact nature of the relationship between bank regulation and portfolio behaviour is inconclusive and this research attempts to shed more light on the debate.

5.3.2 Capital requirement and incentives

The school of thought on capital regulation and incentives examined the way banks weigh the benefits of lending and making profits against the costs of breaking the capital regulatory rules on banks’ balance sheet. They consider different options before adhering to the capital regulation. Most of the models assume that banks are “forward looking optimizers” (VanHoose, 2007: 3685). However, capital regulation usually keeps a close watch on banks and penalties are levied on banks that default on capital regulation rules.

Milne (2002:9) believes that prudential bank supervision has a limited capacity to “monitor banks continuously” hence can only impose some strict penalties on banks. However, these strict penalties are only used as an “incentive mechanism” to encourage banks to adhere to rules of capital regulations. Milne further argued against previous studies that view capital regulators as “strictly binding” on banks. He believes that prudential bank supervision can only influence the portfolio choice of banks in reducing the “expected future cost on debt” and equity finance of the banks. He gave examples of how some banks will shift their portfolio choice in lending to large corporate organisations such as the OECD government bond compared to giving loans to small and medium scale enterprises (Milne, 2002: 2-9). However, Blum (1999) using a dynamic model confirmed that capital adequacy will encourage excess risk-taking by banks since most bankers are more interested in maximising profit.

Estrella (2004b) examined a model where the regulators follow three stages to ensure banks adhere to the minimum capital rules. The higher a bank’s capital, the easier it becomes for the banks to meet the regulator’s mandate. In the first stage, the regulator applies public information and quantitative capital requirement to determine whether banks meet the minimum capital requirement. Therefore, at this stage most banks are focused on adhering to the minimum capital requirement. The model further assumes that banks’ capital can be raised both internally through retained earnings and externally through the financial market. At this stage, any bank that defaults from the minimum capital benchmark is closed down. In the second stage, most banks that passed the first stage can implicitly raise capital to invest in risky investment assets given their limitation to meet the minimum capital requirement. In the final stage, the banks will have to report to the regulator “voluntarily” whether they have adhered strictly to the minimum capital rules or have failed. At this stage, it is left to the banks to decide on the information they may share with regulator whether it is veracious or not. Implicitly at these three stages, some banks might be able to meet the minimum capital requirement and use their funding to invest in risky investments while some banks might close down due to insufficient funding (Estrella, 2004b: 146-147).

Estrella’s model believes that banks have the incentives to adhere strictly to regulators’ rules based on the strict penalties and tight market surveillance from the regulator. However, during business downturns, where most banks are faced with low solvency ratios, there are usually high levels of defaulters and liquidity problems which might create a crisis and render the Basel rules ineffective due to information asymmetry and voluntary disclosure from the banks.

5.4 METHODOLOGY

5.4.1 Model specification

The model attempts to capture the relationship between bank regulation and business cycle following Berger *et al.* (1995), Stolz (2007), Van Hoose (2010) and Drumond (2010). It is assumed that capital buffers force banks to hold equity that they would otherwise not hold to enhance financial stability and prevent banks from taking "excess risk" that can lead to bank crises which may accentuate a business cycle. However, the cost of capital to most banks is drastic since its increase may accentuate the procyclical tendencies of the banking sector. The model estimated in this work tries to capture the co-movement of banks' capital regulation and the business cycle by modifying the empirical works of Watanabe (2005) and Seo (2013). The model is designed for the verification of the procyclicality hypothesis. The Vector Autoregressive model and Vector Error correction model (VAR/VEC) is adopted in this study since a contemporaneous relationship might exist between business cycle and capital adequacy in the analysis and this model provides an avenue for resolving such relationship. The risk-based capital (RBC) standard bank capital regulation played a predominant role in Watanabe's (2005) framework[3].

The model estimated is of the form:

Equation 5.1

$$\mathrm{In}COIN_t = \propto_o + \propto_1 InCOIN_{t-1} + \beta CAR_{t-1} + \gamma\, DUM_{crisis} + \partial \mathrm{M3\_}GDP_{t-1} + \propto_3 X_t + \varepsilon_t \quad \ldots 5.1$$

Where the dependent variable $(COIN_t)$ is the coincident business cycle index, (CAR_{t-1}) captures the book-based ratio value of the Capital Asset ratio at time t-1 while $(\mathrm{M3\_}GDP_{t-1})$ measures the money supply to GDP at time t-1, (money supply to GDP is included based on previous studies and estimations where monetary policy is established to affect business cycle). (DUM_{crisis}) represents dummy variables that captures crisis periods (mainly the global financial crisis of 2008 and 2009) while other control variables are captured by (X_t).

Co-integration analysis and VEC models accompanied by impulse responses and variance decomposition were employed in the analysis of interaction between capital regulation and business cycle. The data set for the study covers 23 years from 1990Q1 to 2013Q4. This period was covered because at least two of the banking crises are included in the period (Asian Crisis, 1997–1998 and Global Financial Crises, 2007–2009) and to incorporate the introduction of Basel regulation in South Africa. The financial variables and control variables was obtained from SARB.

[3] The effect of capital regulation on credit crunch is investigated in another paper. This study will mainly focus on capital regulation, business cycle and banking instability.

Figure 5.1 shows a stylised picture of the movement between business cycle index and capital adequacy ratio in South African banks. One can observe a correlated movement in the coincidental index and the regulatory Tier 1 capital to risk-weighted assets

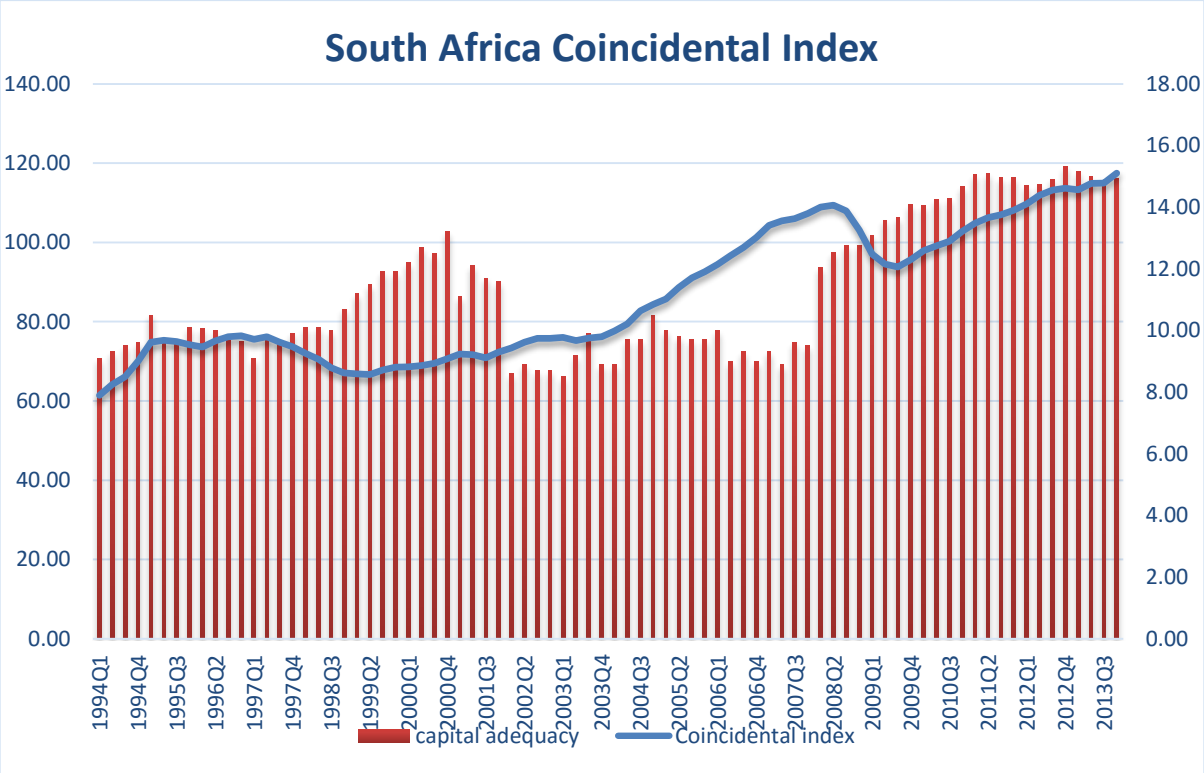

Figure 5.1: Trends showing the relationship between business cycle index and capital adequacy regulation in South Africa

Source: SARB (2014)

5.4.2 Definition of variables

Capital Asset ratio (CaR): captures the book based ratio value of the capital asset ratio in South Africa which reflects the regulatory Tier 1 core capital to RWA. Banks are required to hold at least 50% of capital to meet the minimum standard under the Basel regulatory rule depending on the type of asset.

Coincident Index: South Africa's coincident index is adopted to capture business cycle movement. The coincident index will accurately capture business cycle shocks that will affect bank loans during recessions and boom periods. The coincident index is a better proxy for business cycle than using the real GDP or GDP growth since any aggregate changes in real GDP do not reflect the invariable modifications in all the sectors of the economy.

Operating expenses: is the total operating expense to total assets in South African commercial banks. An increase in required capital adequacy usually influences the banks' funding and monitoring costs. Many banks in South Africa have excess capital adequacy which usually increases their operational expenses, which are usually seen in the theoretical literature as a screening mechanism to prevent the problem of adverse selection in banks. The monitoring cost is an additional expense which usually affects bank's profit and ROA. Operating expenses of banks affects bank profitability in the long run and hence determine if crises would occur in the banks which may ultimately affect the business cycle in South Africa (Albertazzi and Gambacorta, 2009).

Net interest margin: is a gauge usually employed to ascertain the return and profit of banks' investments and their lending activities. Net interest margin is also the difference between the amounts of interest banks paid out to their lenders and the interest earning of the banks over the average earnings' assets. Bikker and Hu (2002) assert that lower capital ratios will increase ROA and ROE of most banks, which will eventually affect the profit and earnings of most banks. The return on equity is affected inter alia by the amount of capital the bank has. On the other hand, holding more capital implies a lower return on equity. The capital amount that a bank decides to hold is directly informed by the risk the bank is exposed to. On the other hand, "The risk taking channel" of monetary transmission mechanism believes that the risk prevailing in the market can affect the short run interest rate (term spread), reducing net interest margin and the marginal loans of banks. This can ultimately affect the supply of credit in the bank and in turn amplify the business cycle (Adrian et al.2010; Bolt et al .2012; Hancock, 1985).

Financial Condition index: is a composite of five time series: real effective exchange rate, earning yield on shares, real interest rate, money supply growth and yield curve) for South Africa. Most Central banks prefers to adopt the financial condition index after episodes of many global financial crisis and the interest rate may give an incomplete picture of the monetary policy impact

on the economy. The financial condition index depicts the evolution of the overall financial situation in an economy. Most Central bank used the index to address both financial stability and price stability and to gauge the prospect of economic activities in an economy. In this study we are adopting as a proxy to measure financial crisis in South Africa. A lower value of financial condition index represent a contraction in the economic activities and vice versa.

M3 to GDP: The ratio of money supply to GDP. In an interest rate targeting regime, the injection of high powered money into the system to keep short-term rates in line with the central bank policy rate can significantly contribute to procyclicality through the impact on lending rates.

Table 5.1:Definition of Variables

VARIABLES	A prior Expectation	DEFINITIONS AND SOURCES
Business Cycle Proxies	(+/-): We expect business cycle to vary with capital regulation.	The South Africa Composite coincident index captures the business cycle in South Africa (SARB).
Consumer Price Index (CPI)	(-): we expect inflation and business cycle to move in opposite direction.	CPI inflation index captures increase in general price level of goods and services in South Africa.
Financial condition Index (FCI)	(+): we expect financial condition index to move directly with business cycle.	Financial Condition index is a composite of five time series: real effective exchange rate, earning yield on shares, real interest rate, money supply growth and yield curve) for South Africa.
Capital Adequacy ratio (CAP_ADE)	(+) we expect the capital adequacy ratio to move with the business cycle.	CARt captured the regulatory element Book based ratio (Tier 1 measure in the Basel accord) for South Africa.
Operating expenses	(-)we expect operating expenses and business cycle to flow in the opposite direction since operating expense will adversely affect profit.	Operating expenses captured the total operating expense to total assets in South Africa commercial banks. The variable is pertinent to measure the significance of transaction and monitoring cost in the banking system.
Net interest margin	(-) we expect net interest margin and business cycle to flow in the opposite direction since a negative net interest margin will adversely affect profit.	Net interest margin is performance meter that examines the success of banks investment and earnings.
M3to GDP	+/-: we are interested in the co-movement of business cycle and money supply.	The ratio of money supply(M3) to GDP in South Africa

5.5 MODEL ESTIMATION AND DISCUSSION

This study will employ the VAR based co-integration and VEC models accompanied by impulse response and variance decomposition. In estimating the VAR, this study takes into account the fact that most macroeconomic variables are usually non-stationary at level, hence we employ VAR based co-integration test using the methodology developed by Johansen (1995).

The purpose of cointegration tests in this study is to measure whether a long-run relationship exists between financial regulation and business cycle. Similarly, we also want to ascertain whether periods of financial crises coincide with periods of financial regulation in South Africa. Co-integration will also be tested to determine the need to use a VEC model.

The VECM has co-integration relations built into the specification so that it restricts the long-run behaviour of the endogenous variables to converge to their co-integrating relationships while allowing for short-run adjustment dynamics. VECM will enable us derive information on both the long- and short run dynamics of the model and estimate the speed of adjustment.

Table 5.2 shows the pair-wise contemporaneous correlation matrix for the residuals of the variables. The largest observed correlation is between the FCI and money supply to GDP ratio which is (-0.36). There is a negative relationship between the crisis period dummy variable and business cycle showing -0.1590 in Table 5.2. It is also worth noting that there is a positive and strong correlation between capital adequacy and business cycle (0.1750). The correlation matrix further strengthens the evidence that there is apparently a relationship between the business cycle, capital adequacy and financial crisis periods. This shows that there may be some common trends driving these variables.

Table 5.2: Residual Correlation Matrix

Variable	INCOIN_INDEX	CAP_ADE	M3_GDP	OPE_EXP	DUMMY1	CPI	INFCI
INCOIN_INDEX	1.0000	0.1750	-0.2144	0.0477	-0.1590	-0.0427	0.0068
CAP_ADE	0.1750	1.0000	-0.2317	-0.0115	0.0664	0.1967	-0.0411
M3_GDP	-0.2143	-0.2317	1.0000	-0.1762	0.0690	-0.1569	-0.3601

OPE_EXP	0.0477	-0.0115	-0.1762	1.0000	0.1217	0.1447	0.2295
DUMMY1	-0.1590	0.0664	0.0690	0.1217	1.0000	0.0381	0.0994
CPI	-0.0427	0.1967	-0.1569	0.1447	0.0381	1.0000	-0.3036
INFCI	0.0068	-0.0411	-0.3601	0.2295	0.0994	-0.3036	1.0000

Source: Author's computation

Covariance analysis exemplifies the linear association between two variables: in other words, how a change in one variable can be linearly connected with a change in another variable. Covariance analysis is essential in this case because of the contemporaneous correlation between the macroeconomic variables, especially the relationship between capital adequacy and business cycle variables. The Covariance Analysis depicts the covariance, t-statistics and p-value between two variables. The t-statistics and p-values are designed to measure the extent of the correlation between two variables. In other words, if the p-value is 0.01 then one can be 99% confident and conclude that there is a correlation between two variables.

Table 5.3: Covariance Analysis

Covariance Analysis: Ordinary shows Covariance, t-Statistic, Probability values consecutively							
	CAP_ADE	CPI	DUMMY1	INCOIN_INDEX	INFCI	M3_GDP	OPE_EXP
CAP_ADE	4.778529						

CPI	-0.842036	7.453326					
	-1.258700	-----					
	0.2119	-----					
DUMMY1	0.008475	0.356135	0.174375				
	0.082001	**2.904309**	-----				
	0.9349	**0.0048**	-----				
INCOIN_INDEX	0.236634	-0.043554	-0.012020	0.035115			
	6.250288	-0.754639	-1.372921	-----			
	0.0000	0.4527	0.1737	-----			
INFCI	-0.034901	-0.054118	0.000592	-0.006826	0.004304		
	-2.215901	**-2.799323**	0.190729	**-5.895523**	-----		
	0.0296	**0.0065**	0.8492	**0.0000**	-----		
M3_GDP	0.553009	-0.143514	-0.015063	0.060880	-0.012392	0.120383	
	9.409192	-1.353718	-0.923221	**23.55856**	**-5.731660**	-----	
	0.0000	0.1797	0.3587	**0.0000**	**0.0000**	-----	
OPE_EXP	-0.871130	0.292978	0.017834	-0.108043	0.024390	-0.224346	0.500175
	-6.023822	1.355828	0.534313	**-12.43288**	**5.457375**	**-19.93234**	-----
	0.0000	0.1791	0.5946	**0.0000**	**0.0000**	**0.0000**	-----

Source: Author's computation

Table 5.3 shows the covariance analysis between two variables. There is a high correlation between the capital adequacy and business cycle (t-statistics value is 6.25). There is also a negative and high correlation relationship between the FCI, capital adequacy and business cycle (t-statistics:-2.21,-2.79 and -5.89) respectively (see Table 5.3).Covariance analysis further strengthens the evidence that there is apparently an association between the business cycle, capital adequacy and financial crisis periods.

5.5.1 Unit root tests

A stationary series can be defined as one with a constant mean, constant variances and constant auto covariance. The stationarity of a series ultimately affects its behaviour and properties hence if a series is non-stationary it will be differenced d times before it becomes stationary, then it is said to be integrated of order d. A non-stationary time series will have a time-varying mean and variance or both (Brooks, 2008: 319). We carried out unit root tests in order to avoid spurious regression that might occur when running a regression with non-stationary variables. A spurious

regression will indicate a statistically significant relationship between variables in the model, when it is just a contemporaneous correlation (Enders, 2004; Brook, 2002).

ADF and PP test results are shown in Tables 5.16 and 5.17 . The tests are applied to the data under two different deterministic trend assumptions: a constant and no trend, and both constant and trend. The ADF test helps to determine whether each variable in the model has an intercept, stochastic trend or deterministic trend (Seddighi *et al*., 2000).

The results of the PP test is similar to those of ADF test. The series according to PP are non-stationary in their levels. One advantage of the PP tests over the ADF tests is that the PP tests are robust to general forms of heteroskedasticity. Another advantage is that the user does not have to specify a lag length for the test regression. However, the PP test tends not only to be more powerful but also subject to more severe size distortions. The size problem in PP tests is more pronounced because the actual size of the variable is larger than the nominal one when autocorrelation exits in the model. Moreover, the unit root tests lead to false non-rejection of the null if we do not consider the structural breaks. In the case of this study, we do not need to capture structural break since the Basel Accord series (Basel I to Basel III) are all improved versions of the other. Since there was no break between the Basel series, structural break should not be captured.

KPSS test are presented in Table 5.4. KPSS test and Ng-Perron stationary test are improved versions of unit root test. They are more powerful tools in testing if unit roots exist in variables of interest. However under KPSS tests, the data usually appear stationary by default if there is little information in the sample (Brooks, 2008: 331). The KPSS approach is based on a Lagrange Multiplier score testing principle and assumes the univariate series can be decomposed into a deterministic trend, a random walk and a stationary error. The KPSS test statistic is computed based on residuals from a regression with an intercept but no time trend (Kwiatkowski *et al.*, 1992: 160). We tried to compare ADF/ PP tests with KPSS tests to ensure the same conclusion is found as suggested by Brooks (2008). Both Ng-Perron and KPSS tests were conducted to ascertain the unit root properties of the variables in the model. Maddala and Kim (1998) suggested that an important way of overcoming the problem of failing to reject a null hypothesis when it is false is to use different tests and compare them. The result of KPSS and NG Perron unit root tests are given in Tables 5.4 and 5.5.

Table 5.4: KPSS Stationarity test result

Variables	Model	Order of integration		
		Level	1st diff.	
M3_GDP	Intercept	1.244324	0.508676**	I(1)
	Intercept & Trend	0.296383	0.115903***	
INFCI	Intercept	0.814908	0.039611***	1(0)
	Intercept & Trend	0.034554**		
COINCIDENT_ INDEX	Intercept	1.128096	0.241803***	I(1)
	Intercept &Trend	0.201531	0.052158***	
CPI	Intercept	0.728035	0.088266***	I(1)
	Intercept &Trend	0.198394*	0.025776***	
CAP	Intercept	0.674726**	0.113248	I(1)
	Intercept & Trend	0.195646**	0.071354	
INT_MARGIN	Intercept	0.274496**		1(0)
	Intercept & Trend	0.293988		
OPE_EXP	Intercept	1.131878	0.500000***	1(0)
	Intercept & Trend	0.112481***		

For KPSS: Null hypothesis is stationary.(*, **, *** is not significant at 1%, 5% and 10% respectively)

Source: Author's computation

Table 5.5: NG Perron stationarity test

Model	Variables			
		Ng-Perron Level	**1st diff (MZa)**	**DECISION**
Intercept	**M3_GDP**	1.94721	-26.9034***	I(1)
Intercept & Trend		-1.73179	-33.9228***	
Intercept	**INFCI**	-7.37848*		I(0)
Intercept & Trend		-160.084***		
Intercept	**CAP_ADE**	-0.96209	-37.8720***	I(1)
Intercept & Trend		-5.89478	-37.7116***	
Intercept	**OPE_EXP**	-1.17010		1(0)
Intercept & Trend		-5.89478	-37.7116***	
Intercept	**INT_MARGIN**	-11.8124**		1(0)
Intercept & Trend		14.9019*		
Intercept	**CPI**	-2.14865	-17.6831***	I(1)
Intercept & Trend		-26.2613***		
Intercept	**COINCIDENT_INDEX**	-0.47803	-21.9067***	I(1)
Intercept & Trend		-0.47803	-24.8510***	

Note: *, **, *** implies significance at 10%, 5% and 1% level using Modified Philips Peron test (MZa)

Source: Author's computation

The unit root tests conducted revealed all variables have unit root in their levels except operational expenses which is I (0), thus these I(1) variables have to be differenced in order to ensure stationarity. This result is confirmed using KPSS and NG Perron tests

5.5.2 Optimal lag length selection

Table 5.6: VAR lag length selection criteria results

VAR Lag Order Selection Criteria Endogenous variables: INCOIN_INDEX CAP_ADE INFCI M3_GDP CPI						
Lag	LogL	LR	FPE	AIC	SC	HQ
1	440.4850	NA	7.84e-12	-11.38315	-10.59875*	-11.07055
2	484.1994	75.45227	4.73e-12	-11.89587	-10.32707	-11.27068*
3	507.1675	36.49730	5.11e-12	-11.84021	-9.486994	-10.90241
4	532.7252	37.11111	5.25e-12	-11.85548	-8.717869	-10.60509
5	576.9785	58.19608*	3.33e-12*	-12.38297*	-8.460952	-10.81998
6	591.6847	17.32519	4.95e-12	-12.10095	-7.394528	-10.22536
7	621.1882	30.71599	5.18e-12	-12.22434	-6.733508	-10.03615

Source: Author's computation

Having tested for unit roots, the next step is to conduct the cointegration test in order to establish whether a long-term relationship exists among our variables of interest. However, the Johansen cointegration test requires that we first determine the optimal lag length for the model. The choice was made by examining the lag structure in an unrestricted VAR originally specified using maximum number of lags (7) and using VAR lag order selection criteria. If there are n variables with lag length k, for example, it is necessary to estimate n (nk+I) coefficients. The lag length also influences the power of rejecting hypothesis. For instance, if k is too large, degrees of freedom maybe compromised. Moreover, if the lag length is too small, important lag dependencies maybe omitted from the VAR, and if serial correlation is present the estimated coefficients will be inconsistent.

The widely used information criteria are the AIC,SIC,HQIC, FPE and the LR test. More fundamental is the fact that lag length selected must conserve degrees of freedom. Table 5.5 shows that LR, AIC and FPE choose lag 5 while SC and HQ choose lag 1 and lag 2 respectively. We choose the optimal lag length 5 after checking each lag length for stability and ensuring that lag length 5 meets all the criteria.

Table 5.7 summarises the stability test for VAR residual test for the model when lag 5 was picked. The probability result for LM serial correlation test for lag 5 is 0.7729. We can reject the null hypothesis that there is serial correlation in the model since the probability value is less than 0.05. Similarly, in the case of the joint residual heteroskedasticity test, the result shows a probability of 0.2024. We can also reject the null hypothesis that there is heteroskedasticity in the model (in other words the residuals are jointly correlated). The model also passed the normality test given the probability value of 0.1115.

Table 5.7: VAR Residual Stability Test

Stability Test for VAR Residual	Probability Result
Residual Serial correlation LM Test	0.7729
Residual Joint Heteroskedasticity Test	0.2024
Residual Joint Normality Test	0.1115

Source: Author's computation

5.5.2 Cointegration analysis

We are interested in the co-movement of capital regulation and business cycle. We also want to ascertain whether there is a long-run relationship between financial regulation, financial crisis and the business cycle. Cointegration analysis is a good tool that will help us to investigate the long-run relationship among these non-stationary variables. This study employs Johansen and Juselius's (1990) cointegration approach to examine the long-run relationship. The model takes into account the effect of the intercept and trend. The result of the Trace and Max-Eigenvalue statistics are reported in Table 5.8. The result of the Trace and Max-Eigenvalue statistics showing the numbers of cointegrating equations (CE) are reported in Tables 5.9 and 5.10.

Table 5.8: Johansen Cointegration Trace Test results

Hypothesized No CE(S)	Trace Statistics	Critical values (5%) Trace
None**	84.92212	69.81889
At most 1**	40.60864	47.85613
At most 2**	17.17636	29.79707

*(**) denotes rejection of the hypothesis at the 5% level

Trace test indicates 1 cointegrating equation at 5% level

Source: Author's computation

Table 5.9: Johansen Cointegration Max-Eigenvalue Test results

Hypothesized No CE(S)	Trace Statistics	Critical values (5%) Trace
None**	44.31348	33.87687
At most 1**	23.43228	27.58434
At most 2	10.71235	21.13162

*(**) denotes rejection of the hypothesis at the 5% level

Max_Eigenvalues test indicates 1 cointegrating equation at 5% level

Source: Author's computation

Trace value: Using a sequential testing procedure in Table 5.8, r=0 (no cointegrating vector) against the alternative of at most one cointegration vector (r≤1), the trace test statistic is 84.922, which is greater than the 95% critical value of 69.819, thus we reject the null hypothesis of no cointegrating vectors. We now move on to the next row, the trace test statistics (40.608) less than the critical values of (47.856), so that the null hypothesis of at most one cointegrating vector is not rejected.

Eigen value: Using a sequential testing procedure in Table 4.9, r=0 against the alternative of at most one cointegration. The test statistic 44.313 is greater than 33.877 at 95% critical value, thus we reject the null hypothesis of no cointegrating vectors. We now test the null hypothesis of at most one cointegration vector, where eigen values test statistics (23.432) is greater than (27.5843). The null hypothesis of at most one cointegrating vector is accepted. We accept that there is at least one convector. The result shows that at least one cointegrating equation was reported by both trace test and maximum eigenvalues statistics. This result further supports that there is a long-run relationship among the variables and also suggests the suitability of using the VECM. A stability test is required to ensure that the residuals of the model are not serially correlated in the long run. We further conducted a robustness test to avoid spurious regression in the model. We test the VAR for heteroskedasticity and serial correlation. Tables 5.11 and 5.12 depict the various tests. Table 5.10 summarises the stability test for VEC residual test. The probability result for LM serial correlation test is 0.2537. We can reject the null hypothesis that there is serial correlation in the model since the probability values are less than 0.05. Similarly, in the case of joint residual heteroskedasticity test, the result shows a probability of 0.6699. We can also reject the null

hypothesis that there is heteroskedasticity in the model (in other words the residuals are jointly correlated).

Table 5.10: VEC Residual Stability Test

Stability Test for VEC Residual	**Probability Result**
Residual Joint Normality Test	0.3427
Residual Serial correlation LM Test	0.2537
Residual Joint Heteroskedasticity Test	0.6699

Source: Author's computation

Table 5.11: VEC Residual serial Correlation LM Test

VEC Residual Serial Correlation LM Tests		
Null Hypothesis: no serial correlation at lag order h		
Lags	LM-Stat	Prob
1	21.12001	0.6859
2	43.95530	0.0110
3	30.89870	0.1924
4	**29.24720**	**0.2537**
5	24.63281	0.4831
Probs from chi-square with 25 df.		

Source: Author's computation

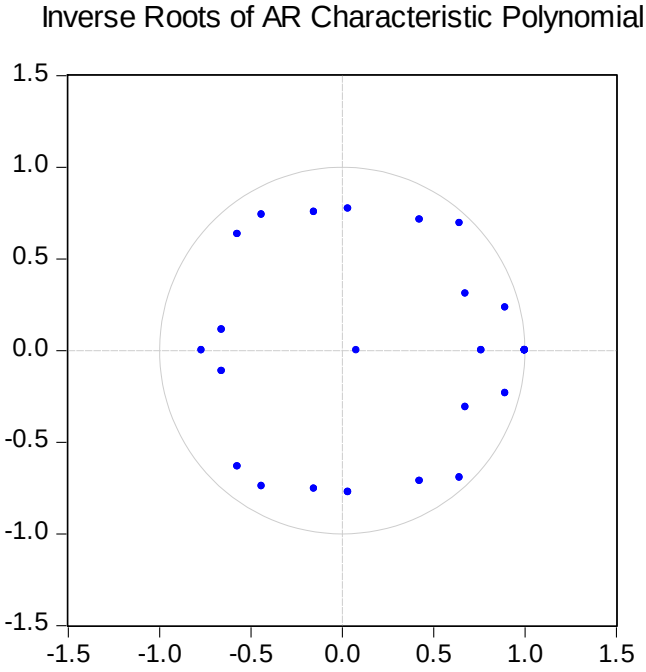

Figure 5.2:Inverse Root of Autoregressive Regressive Characteristics

Source: Author's computation

Table 5.12: VEC Residual Heteroskedasticity Test

VEC Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)					
Joint test:					
Chi-sq	df	Prob.			
613.8704	630	**0.6699**			
Individual components:					
Dependent	R-squared	F(42,32)	Prob.	Chi-sq(42)	Prob.
res1*res1	0.514960	0.808904	0.7429	38.62202	0.6201
res2*res2	0.578822	1.047082	0.4512	43.41168	0.4110
res3*res3	0.508408	0.787968	0.7677	38.13061	0.6415
res4*res4	0.616380	1.224189	0.2785	46.22853	0.3019
res5*res5	0.420801	0.553540	0.9638	31.56004	0.8801
res2*res1	0.492614	0.739724	0.8217	36.94608	0.6920
res3*res1	0.490994	0.734944	0.8267	36.82456	0.6971
res3*res2	0.774579	2.618014	0.0029	58.09342	0.0503
res4*res1	0.553046	0.942757	0.5760	41.47847	0.4937
res4*res2	0.550564	0.933340	0.5878	41.29227	0.5019
res4*res3	0.632741	1.312667	0.2138	47.45559	0.2600
res5*res1	0.433676	0.583447	0.9492	32.52570	0.8530
res5*res2	0.647481	1.399411	0.1633	48.56108	0.2255
res5*res3	0.613580	1.209796	0.2904	46.01849	0.3094
res5*res4	0.475180	0.689841	0.8713	35.63854	0.7450

Source: Author's computation

We test the VAR for heteroskedasticity, normality and serial correlation to ensure that our model is stable and the residuals of the model are not serially correlated in the long run. Tables 5.12 and 5.13 depict that there is no serial correlation or heteroskedasticity problem.

5.5.3 Vector Error Correction Model

We estimated a VECM and normalized[4] on coincident index where we express business cycle (coincident index) as a function of the remaining variables. The result shows that capital adequacy has a positive and significant long-run impact on business cycle. FCI is also found to be positive but not significant in the long run.

[4] For more details on VECM approach and normalisation see Endresz (2011) and Harris and Sollis (2003)

Table 5.13: Vector Error Correction Estimates

Vector Error Correction Estimates Standard errors in ( ) & t-statistics in [ ]					
Cointegrating Eq:	**CointEq1**				
INCOIN_INDEX(-1)	1.000000				
CAP_ADE(-1)	-1.045590				
	(0.26030)				
	[-4.01682]				
INFCI(-1)	-2.357023				
	(9.98440)				
	[-0.23607]				
M3_GDP(-1)	-4.020617				
	(5.52832)				
	[-0.72728]				
CPI(-1)	0.857822				
	(0.32447)				
	[2.64379]				
@TREND(90Q1)	0.147473				
	(0.09727)				
	[1.51616]				
C	-9.603842				
Error Correction:	**D(INCOIN_INDEX)**	**D(CAP_ADE)**	**D(INFCI)**	**D(M3_GDP)**	**D(CPI)**
CointEq1	-0.003887	-0.134412	0.013814	0.000220	-0.115593
	(0.00159)	(0.07621)	(0.00285)	(0.00123)	(0.11073)
	[-2.44047]	[-1.76362]	[4.84898]	[0.17954]	[-1.04389]

Equation 5.2

The long-run regression is provided in Equation 5.2.

$$\mathrm{INCOIN_t} = 9.604 - \ 0.147\, TREND_t\ [1.52] + 1.046\ CAP_t[4.02]$$

$$-\ 0.858\, CPI_t[-2.64] + 4.020 M3\_GDP_t[0.73] + \ 0.232 INFCI_t[0.24] \qquad \ldots 5.2$$

Note: t values in [ ] square brackets.

The indication from the cointegration relation is that capital adequacy has a significant long-run impact on business cycle. This is indicated by the reported coefficient 1.046 and the t statistics test of 4.017. The coefficient of the error correction terms is interpreted as the speed of adjustment to the long-run equilibrium. The coefficient of the error correction term of business cycle is negative,

which implies that any disequilibrium to the composite coincident index might be persistent for some time. The speed of adjustment of coincident index to its own long-run equilibrium is slow, as shown by the adjustment coefficient. Every quarter just over 0.3% of the disequilibrium in business cycle is adjusted back to equilibrium. The stability of the VECM is checked again after identifying our model to ensure there is no serial correlation and heteroskedasticity problem.

Tables 5.16 and 5.17 show the dynamic causal interaction between business cycle and capital regulation in a VEC form. This allows us to access the causality from one variable to the other using the chi-square test of the lagged first differenced terms. The weak exogeneity test allows us to ascertain the direction of causality in the VECM framework. The weak exogeneity test was carried out following Demetriades and Hussein (1996) and Arestis and Demetriades (1997), where restrictions are placed on each variable within the system to determine which is endogenous. In the business cycle model, the causality between business cycle and capital adequacy was assessed and established. There is a bidirectional relationship between bank capital adequacy and business cycle in South Africa, which indicates that there are significant linkages between capital adequacy and business cycle in the long run.

5.5.4 Impulse response analysis

Impulse response functions also show the dynamic responses of a dependent variable in this case coincident index to a one-period standard deviation shock to the innovations of each variable determinant in particular, the capital adequacy. To investigate the potential dynamic impact of the capital regulation shock, impulse response analysis is conducted. These impulse response functions show the dynamic response of the coincident index ratio to a one-period standard deviation shock to the innovations of the system and also indicate the directions and persistence of the response to each of the shocks over a 10 quarter period. We applied the generalized impulses which builds an “orthogonal set of innovations that does not depend on the VAR ordering”.where the ordering of variables are not very sensitive to the choice of ordering.

Figure 5.4A shows the effect of capital adequacy shock on business cycle in South Africa. Figure 5.4A shows that the response of business cycle to one standard deviation shock of capital adequacy is negative and persistent for over 25 quarters before stabilising. This vividly shows the procyclicality effect of business cycle.

Figure 5.4B shows that the response of business cycle to one standard deviation shock of FCI is positive and persistent for over 20 quarters before steadying. The impulse analysis also supports the volatility in the financial system in South Africa when there is a global financial crisis. The effect of the response of capital adequacy to one standard deviation shock of FCI is also negative and

persistent for 20 quarters, as is depicted in Figure 5.4C. Figure 5.4D shows the response of business cycle to one standard deviation shock of consumer price index is also negative and tenacious.

The results of the impulse response test shows that the impact of capital adequacy shock is very persistent and lasting. This result further confirms the assertion in theory that capital adequacy amplifies business cycle. The focus of this study is not just on the capital adequacy but also in the relationship between crisis periods and business cycle variables. The impact of the FCI is very significant and persistence. Shocks to the FCI might reflect an increase in fragility or financial crisis by the business cycle variable. In addition, we also tested for the relationship between price stability, business cycle and financial crisis period. There are a number of reason shocks to FCI might reflect an increase in fragility by the business cycle. First, financial fundamentals are vulnerable to fluctuation in money value and economic condition. Similarly, any case of asset price misalignment or excessive growth boom will ultimately amplifies the business cycle. South Africa went through a period of turmoil after the global finance crisis of 2008 where concomitant reduction in private credit to GDP and money supply. The result is also shows that the “risk taking” channel and the credit channel plays a vital role in the transmission of monetary policy in South Africa.

Figure 5.4A: Response of INCOIN_INDEX to Generalized One S.D. CAP_ADE Innovation

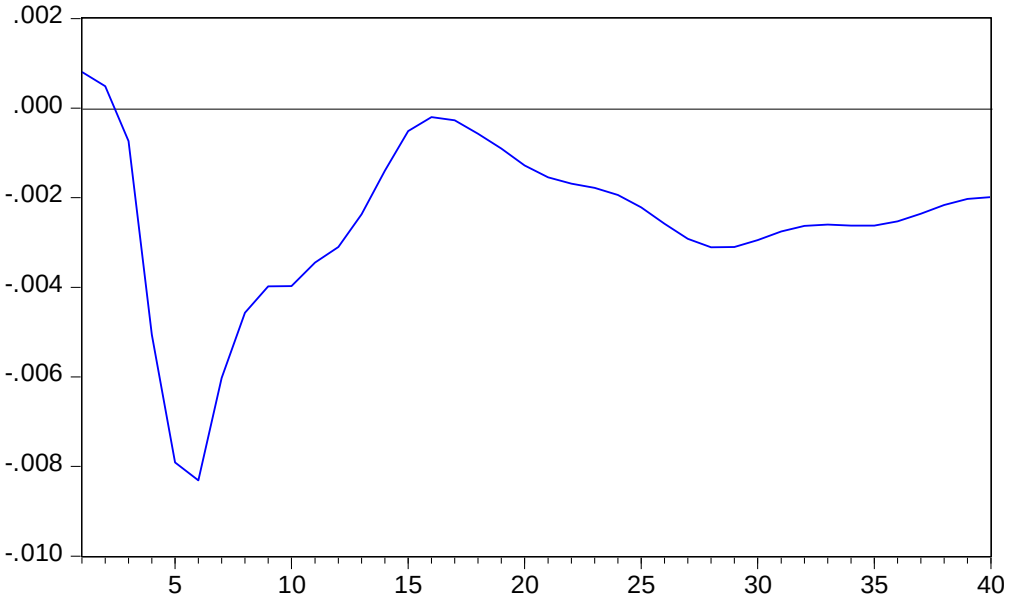

Figure 5.4B: Response of INCOIN_INDEX to Generalized One S.D. INFCI Innovation

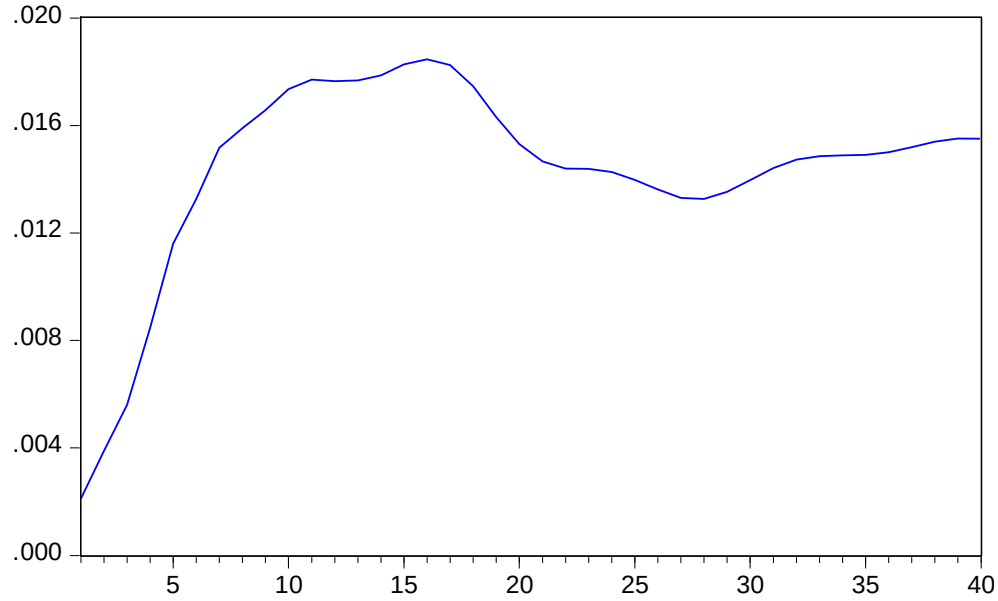

Figure 5.4C: Response of CAP_ADE to Generalized One S.D. INFCI Innovation

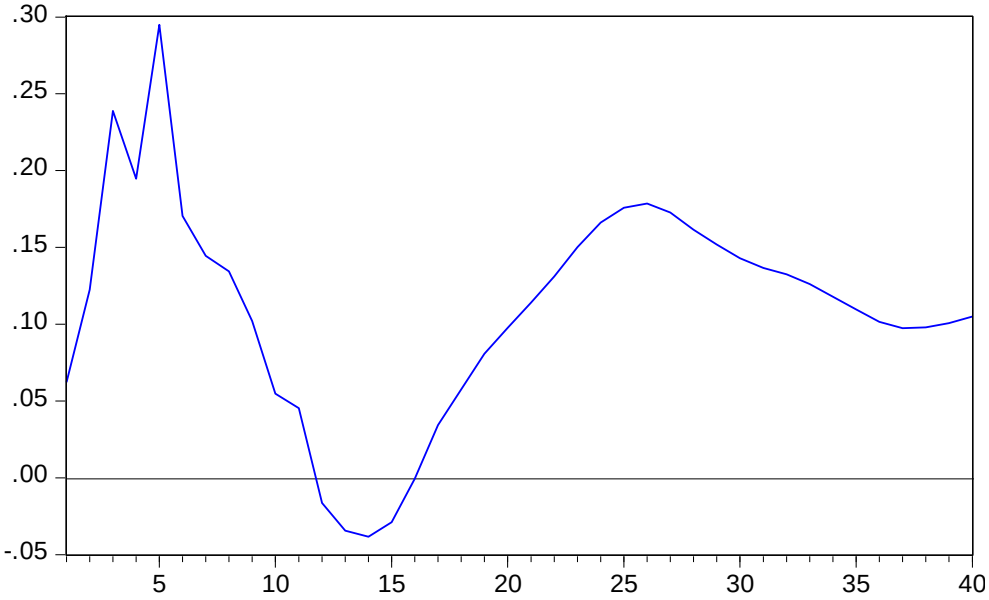

Figure 5.4D: Response of INCOIN_INDEX to Generalized One S.D. CPI Innovation

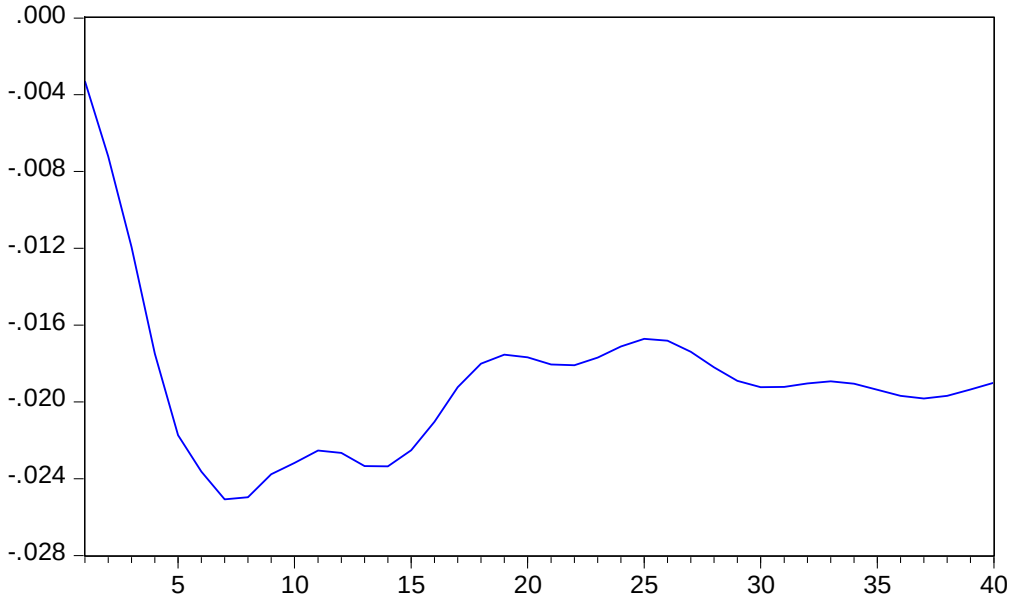

Figure 5.3: Response of business cycle to a one period shock to capital regulation and Financial Condition Index

Source: Author's computation

5.5.5 Variance Decomposition

Variance decomposition measures the forecast error variance of any variable, explained by innovations to each explanatory variable over a series of time horizons to a system when a shock is applied. In summary, this technique shows the relative importance of each random innovation to each explanatory variable over a series of time horizons. Variance decompositions performed on the VECM may provide some information on the relative importance of shocks to the independent variables in explaining variations in the dependent variable. In the context of this study, it therefore provides a way of determining the relative importance of shocks in explaining variations in capital adequacy and business cycle. The results of the variance decomposition analysis are presented in Table 5.14 and show the proportion of the forecast error variance in the business cycle explained by its own innovations and innovations in its determinants.

Table 5.14: Variance Decomposition of business cycle, capital adequacy using the model with financial condition index and money supply

Variance Decomposition of INCOIN_INDEX						
Period	**S.E.**	**INCOIN_INDEX**	**CAP_ADE**	**INFCI**	**M3_GDP**	**CPI**
1	0.011960	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.023126	98.71369	0.131060	0.048959	0.410313	0.695976
3	0.035258	96.98289	0.559097	0.149082	0.250226	2.058701
4	0.047585	91.89962	2.511370	0.789325	0.352555	4.447130
5	0.060090	86.68579	4.408034	1.850746	0.554043	6.501386
6	0.071060	83.45717	5.359331	2.799544	0.460780	7.923175
7	0.080957	81.72260	5.186040	3.745155	0.387971	8.958232
8	0.089756	80.73140	4.804050	4.490314	0.496029	9.478205
9	0.097467	80.11948	4.483206	5.203035	0.642246	9.552029
10	0.104348	79.43401	4.259616	5.975657	0.800418	9.530298
11	0.110259	78.61772	4.063544	6.778448	0.970059	9.570232
12	0.115580	77.66883	3.888155	7.502297	1.210257	9.730465
13	0.120631	76.62166	3.693663	8.127504	1.539219	10.01796
14	0.125456	75.59299	3.482015	8.691917	1.955297	10.27778
15	0.129976	74.64613	3.275929	9.268657	2.403288	10.40600
16	0.134096	73.81334	3.098706	9.859373	2.841829	10.38675
17	0.137753	73.09492	2.955878	10.43518	3.253194	10.26083
18	0.141015	72.48717	2.843983	10.91938	3.635448	10.11402
19	0.143964	71.98453	2.757026	11.27076	3.979136	10.00854
20	0.146748	71.56248	2.689276	11.50455	4.285665	9.958024
Variance Decomposition of CAP_ADE						
Period	**S.E.**	**INCOIN_INDEX**	**CAP_ADE**	**INFCI**	**M3_GDP**	**CPI**
1	0.572291	0.454263	99.54574	0.000000	0.000000	0.000000
2	0.753322	1.575073	94.93408	1.589270	1.521364	0.380212
3	0.927642	1.058428	88.90141	5.444889	3.062352	1.532918
4	1.031002	0.868717	84.76871	6.949049	4.280747	3.132780
5	1.222972	0.618425	80.45437	9.031647	5.690129	4.205428
6	1.328732	0.629333	79.19787	8.730659	6.399354	5.042782
7	1.429633	0.583458	78.02850	8.121224	7.798506	5.468309
8	1.500481	0.626412	76.37946	7.762250	9.352107	5.879766
9	1.599018	0.551684	73.47999	6.997387	12.30914	6.661801
10	1.681480	0.515338	70.25536	6.341431	15.09267	7.795205
11	1.768829	0.500951	66.66428	5.733194	18.34745	8.754130
12	1.853758	0.595650	62.76507	5.310260	21.76468	9.564344
13	1.945288	0.796513	58.76187	4.985309	25.74491	9.711400
14	2.032285	1.336721	55.02740	4.763175	29.45393	9.418776
15	2.123023	2.036998	51.47734	4.528151	33.01747	8.940045
16	2.214774	3.162317	48.15876	4.250627	36.04458	8.383714
17	2.308218	4.382151	45.23229	3.939452	38.59374	7.852367
18	2.398952	5.668407	42.72454	3.652915	40.54873	7.405415
19	2.487970	6.915638	40.55550	3.396279	42.15160	6.980983
20	2.573328	8.094486	38.68980	3.179431	43.44952	6.586761
Variance Decomposition of INFCI:						
Period	**S.E.**	**INCOIN_INDEX**	**CAP_ADE**	**INFCI**	**M3_GDP**	**CPI**
1	**0.021392**	**3.137463**	**0.941891**	**95.92065**	**0.000000**	**0.000000**
2	0.029396	1.664912	0.864004	84.53663	9.606479	3.327976
3	0.036283	1.145103	0.939088	67.77593	24.14019	5.999692
4	0.044876	1.746474	1.651821	56.58024	34.51304	5.508418
5	0.050352	2.194213	2.836395	47.64169	37.91571	9.411994
6	0.055987	3.290729	6.914076	39.25032	38.03750	12.50737

7	0.061459	4.499629	11.26965	33.28243	36.94381	14.00448
8	0.067552	7.068484	14.00792	27.58556	34.36321	16.97482
9	0.072779	8.428166	16.57666	24.19881	32.32770	18.46866
10	0.077204	8.717981	19.35428	22.11807	30.78752	19.02215
11	0.081652	8.815933	21.84793	20.76330	28.73822	19.83462
12	0.085412	8.428449	24.89668	19.82734	26.91103	19.93650
13	0.088717	7.984642	27.89379	18.95339	25.35741	19.81078
14	0.091874	7.519373	30.54636	18.14955	24.08153	19.70319
15	0.094600	7.092378	33.02272	17.47956	23.15303	19.25231
16	0.097050	6.755675	35.19551	16.81393	22.45847	18.77642
17	0.099378	6.482964	37.06588	16.12850	21.97431	18.34834
18	0.101535	6.273454	38.69911	15.48375	21.66298	17.88071
19	0.103582	6.071040	40.03039	14.87893	21.51619	17.50345
20	0.105610	5.863492	41.06146	14.31616	21.57053	17.18837

Source: Author's computation

In the first quarter, all of the variance in the coincident index is explained by its own innovations (shocks). Coincident index explains about 100 per cent of its variation, however, after a period of 6 quarters, the coincident index explains about 80 per cent of its own variation, while its determinants explain the remaining 20 per cent. The influence of the capital adequacy, FCI and inflation index increased gradually to about 24 per cent after a period of 13 quarters, explaining the largest component of the variation in the business cycle. Thus, the FCI explains the largest component of the variation in the business cycle, followed by the CPI. The result also shows evidence of a link between financial instability and price stability in South Africa.

Similarly with both capital adequacy and FCI variance in the first quarter, 99 percent of all the variance in the capital adequacy and dummy variance is explained by its own innovation (shocks). However, after 10 quarters the influence of the money supply, inflation and business cycle increased dramatically to about 30 percent, showing that business cycle influences bank capital adequacy. South African banks tend to change their behaviour during upturns and during downturns, and procyclicality of South African banks tends to be associated with the function of the monetary policy, banks' monitoring costs and capital adequacy.

The result shows evidence of a link between financial instability and price stability in South Africa which is similar to the result of Blot *et al.* (2015). The result shows that business cycle influences bank capital adequacy.

5.6 CONCLUSION AND POLICY RECOMMENDATION

The aim of this study was to examine the extent of linkages between business cycle and capital adequacy requirements in South Africa employing the VECM framework. We want to understand the extent to which the imposition of capital adequacy can accentuate and deepen the business cycle in the financial system. The Johansen Cointegration approach was used to ascertain whether there is indeed a long-run co-movement between capital adequacy and business cycle, but first we

tested the stationarity of our series under the NG–Perron and KPSS framework, where we established that all the series were I(1), a property essential for cointegration analysis. Results from the tests and VECM model show that there are significant linkages among the variables, especially between capital adequacy and business cycle. In other words, the imposition of a capital adequacy requirement can amplify the business cycle in South Africa.

Appendix B

Table 5.15: Summary statistics of data employed, 1990q1 to 2013q

	INCOIN_INDEX	CAP_ADE	INFCI	M3_GDP	CPI	OPE_EXP
Mean	4.442427	11.31400	5.686373	0.653532	6.391250	3.574625
Median	4.344426	10.10000	5.693362	0.560254	6.116667	3.600000
Maximum	4.766155	15.33000	5.799658	1.245269	13.40000	5.000000
Minimum	4.117953	8.500000	5.549805	0.201373	0.433333	2.340000
Std. Dev.	0.188572	2.199777	0.066020	0.349152	2.747303	0.711692
Skewness	0.229124	0.553668	-0.293830	0.349031	0.155635	0.062083
Kurtosis	1.552067	1.812468	2.016208	1.596689	2.873911	1.875441
Jarque-Bera	7.688342	8.788083	4.377303	8.188580	0.375959	4.266831
Probability	0.021404	0.012351	0.112068	0.016668	0.828632	0.118432
Sum	355.3942	905.1200	454.9098	52.28255	511.3000	285.9700
Sum Sq. Dev.	2.809188	382.2823	0.344337	9.630637	596.2661	40.01399
Observations	80	80	80	80	80	80

Source: Author's computation

Table 5.16: Summary of Augmented Dickey-Fuller Test

		Augmented Dicker Fuller Test both at level and difference				
Variable	**Model**	**Level**	**1st difference**	**intercept**	**trend**	**I(1)**
COINCIDENT_INDEX	**Intercept**	-0.156992	-3.937238***	0.413358		I(1) with intercept and trend
	intercept and trend	-2.79038	-4.102787***	2.605909**	3.026860**	
M3_GDP	**Intercept**	1.152941	-4.944730***	1.827442		I(1)
	intercept and trend	-1.856427	-5.265716***	0.700408	2.260698*	
IFC	**Intercept**	-2.250425	-5.260572**	2.204027		I(0) with intercept and trend
	intercept and trend	-4.696183**		4.653973	-3.269192	
OPE_EXP	**Intercept**	-1.318312	-5.516766***	1.136648		I(1) with intercept
	intercept and trend	-3.204385*	-5.486645***	3.106036**	-2.901539	
CAP_ADE	**Intercept**	-0.982545	-10.52827***	1.155627		
	intercept and trend	-1.721493	-10.49419***	1.500646	1.472606	I(1)
INT _MARGIN	**Intercept**	-3.147180**	7.883455***	2.695068	3.134879	I(0) with intercept
	intercept and trend	-3.101184		0.670962		
CPI	**Intercept**	-2.693706*	-4.462004***	2.175291		I(1)
	intercept and trend	-2.863446	-4.515538***	2.145765	-1.236042	

Table 5.17: Summary of Philips-Perron Test

Philips-Perron Test both at level and difference				
Variable	**Model**	**Level**	**1st difference**	**I(1)**
COINCIDENT_INDEX	**Intercept**	0.314058	-4.043937***	I(1)
	intercept and trend	-2.246476	-4.102787***	
M3_GDP	**Intercept**	1.605106	-4.854730***	I(1)
	intercept and trend	-1.758746	-5.243659***	
IFC	**Intercept**	-2.190943	-9.326491***	1(0)
	intercept and trend	-3.303273**		
CAP_ADE	**Intercept**	-0.922641	-10.50067***	I(1)
	intercept and trend	-1.721493	-10.46776***	
OPE_EXP	**Intercept**	-1.397520	-14.57593***	I(0)
	intercept and trend	-3.495941**		
CPI	**Intercept**	-2.359046*	-5.994950***	1(1)
	intercept and trend	-2.850068	-5.968672***	

Source: Author's computation

Table 5.18: Weak Exogeneity test

Variables	**Chi-square**	**Probability**	**Outcome of the Variables**
Coincident index	24.77407	0.000004	endogenous
Cap_ade	5.412031	0.066802	endogenous
M3_GDP	7.268079	0.026409	endogenous
INFCI	11.47413	0.003224	endogenous
Crisis Dummy	0.511877	0.774189	exogenous
CPI	1.433204	0.488409	exogenous

Note: We imposed restrictions on α (alpha restriction of the VECM) to be able to identify the endogenous variables and ascertain the robustness of our model.

Source: Author's computation

Table 5.19: Block Exogeneity Granger causality Results based on VECM

	Independent Variables						
Dependent Variable	**χ-Statistics of lagged 1st differenced term (p-value)**						**ECT_{t-1} Coefficient (t-ratio)**
	Δ ln_Coin	**Δ M3_GDP**	**Δ Cap_ade**	**ΔFCI**	**Δ CPI**	**Δ Dummy**	
Δ ln_Coin	--	8.999** (0.0611)	**14.626** (0.0055)**	9.590** (0.0479)	23.594** (0.0001)	21.295** (0.0003)	(-6.5196)]
Δ Cap_ade	**5.683** (0.2240)**	5.069** (0.2803)	--	20.156** (0.0002)	3.121 (0.5377)	3.238 (0.5188)	-
Note that ** denotes 5 % significant level and […] represents p-value.							

Source: Author's computation

Chapter 6

BANK REGULATION PROCYCLICALITY AND CREDIT GROWTH IN SOUTH AFRICA

6.1 INTRODUCTION

Many studies have shown that credit market frictions usually have a huge effect on the real sector (Borio *et al.*, 2001; Borio and Lowe, 2002; Ikhide, 2003; Gertler and Kiyotaki, 2010; Kiyotaki and Moore, 2012). Similarly, the recent credit crunch which started from the US mortgage market in 2007 has affected proponents' view on the impact of credit on business cycle. However, a strand of literature is beginning to emerge on the role of financial regulation in deepening the contraction occasioned by falling credit during a business cycle (Giovanoli, 2009; Barth *et al.*, 2006; Reinhart and Rogoff, 2008a). Bank regulation constrains most banks' balance sheets, and cash flows which usually retards banks' credit and affects their macroeconomic function of enhancing growth and development (Hanke, 2013a; Gottschalk, 2010). During a business cycle downturn, bank regulators tend to reduce bank's credit and lending since most banks are vulnerable to crises during periods of instability. This must be clearly distinguished from firms' inability to repay their loans due to a decline in asset prices during recessions, occasioning a higher risk of default at this time (an issue which was addressed in Chapter 4 of this thesis).

The need for financial regulation arises because of banks' fragility, hence financial regulation becomes necessary to consolidate financial system stability. For example, fast growth in credit and asset prices can accentuate more consumption and investment, which can lead to a spiral growth effect in credit and asset prices which eventually lead to a 'bubble and burst' in the financial system. However, a burst in the financial system will reduce the prices of credit and assets which will amplify the contraction in economic activities. Therefore, financial regulation maintains safety and soundness of financial institutions and protects depositors' funds against market distortions and business cycle amplification (Brunnermeier *et al.*, 2009); Borio and White, 2004); Helbling *et al.*, 2010).

Some empirical evidence of procyclicality of credit in South Africa has been provided by Akinboade and Makina (2009, 2010), Fourie *et al.* (2011), Liu and Seeiso (2011), Jacobs *et al.* (2012), Raputsoane (2014) and Bernstein *et al.* (2014). This thesis is more holistic and robust since it will contribute to the literature by explicitly examining the link between bank regulation and credit procyclicality in South Africa. The goal of this chapter is to provide evidence on the co-movement of bank regulation and credit growth. In other words, how do regulatory activities of the central bank deepen or weaken a financial system's ability to create credit and hence deepen a financial

crisis? This chapter is organised as follows: Section 6.2 discusses the theoretical foundation of credit procyclicality and financial regulation, Section 6.3 presents the methodology, results are discussed in Section 6.4 and Section 6.5 concludes the chapter.

6.2 THEORETICAL LITERATURE

The literature is replete with theories on how central bank monetary policy can influence aggregate spending and hence the real sector. However, in recent times, the emphasis has shifted to the pivotal role of the credit market. The credit school of thought believes that the financial sector plays more roles in macroeconomics than it is given credit for. For instance, the credit channel perspective believes that the financial assets and liabilities of banks can actually determine the direction of the real sector in any economy. All sources of financial assets are categorised into internal and external financing. The demand-side credit proponents have highlighted the pivotal functions of the financial market to the real sector in an imperfect market. According to the theory, an increase in asset prices can augment the net worth of a firm and facilitate its ability to borrow and invest in the real sector. The Financial Accelerator theory has established the co-movement between financial variables and the real sector following a general equilibrium modelling approach. The credit channel distinguishes between 'bank capital channel', 'financial accelerator mechanism' through the corporate balance sheet channel and the recent 'risk-taking channel'. Some studies that surveyed the credit channel include Bernanke (1993), Getler and Gilchrist (1993), Kashyap and Stein (1994), Bernanke *et al.* (1999), Walsh (2003), Markovic (2006), Adrian and Shin (2013), and Gertler and Kiyotaki (2010). These theories were discussed in detail in Chapter 4 of this thesis.

6.2.1 Bank regulation procyclicality and credit growth

This chapter concentrates on theories of bank regulation procyclicality and credit growth. Bank capital theories have established that the introduction of capital requirement regulation in the banking sector usually inflates the effect of monetary and exogenous shocks. During economic downturns, most banks find it unmanageable and costly to raise new capital as a result of asymmetric information coupled with the introduction of capital adequacy requirements. This prompts most banks to reduce supply of credit and loans to the real sector.

Procyclicality defined in this manner is a mechanism through which financial regulation can amplify the business cycle and exacerbate financial instability in the long run. Procyclicality of capital requirement can be observed when banks are forced to cut down their loans due to capital crunch during recession. How does it occur? Firstly, banks and borrowers in good times are usually confident about investment projects and borrowers' ability to repay loans. Similarly, banks usually take on risky projects by financing negative net present value (NPV) projects which might later go sour, where the borrowers renege on payments.

Moreover, during economic downturns, banks are pessimistic about future projects. Having a weak balance sheet and nonperforming loan projects, banks are usually stricter and more prudent in giving out loans during such periods. Bank capital regulation is meant to be stronger during boom periods to prevent banks from taking on risky projects and milder during times of recession to be able to preclude credit rationing. However, in practice the opposite is the case with Basel I and Basel II where capital requirements are raised during bad times. For instance, Basel II has been established in the literature to increase volatility in regulatory capital requirements in bad times compared to Basel I. This makes it very onerous for banks to give out loans during recessions (Saurina and Jimenez, 2006: 66; Van den Heuvel, 2002; Shin and Shin, 2011; Repullo,2012; Athanasoglou *et al.*, 2014: 67).

Theories relating to market failure and information asymmetry by the pioneer Akerlof (1970: 24), Stiglitz and Weiss (1981) and Jaffee and Russell (1976) have all established the implication of information asymmetry in the credit market in preventing efficient credit flow to the real sector. Asymmetric information is usually conceived to engender procyclicality and can take on different forms in a financial system (Drumond, 2009).

VanHoose (2007) and Dewatripont et al. (2010) suggested that if banks are seen as custodians of a portfolio of assets, it will enhance the understanding of the effect of capital requirements on bank behaviour. Banks respond to changes in capital requirement by changing their portfolio of assets. Therefore, capital regulation can either influence banks' affinity for risk-taking or reduce their optimal asset selection to include more risky assets and less safe assets. Similarly, during downturns in the business cycle, many banks stiffen their credit supply by changing their portfolio of assets. Most regulations are intended to regulate the behaviour of banks from investing in risky portfolios at the expense of depositors' funds. In the end, the consequences of banks' behaviour will either engender market distortion or leave banks stable. However, the question that needs to be asked after the recent global financial crisis of 2007 is: has the prudential regulation been innovative and forward-looking to cope with the behaviour of banks in terms of preventing shadow banking and systemic risk in the long run? The answer is No. Dewatripoint *et al*. (2010) believe, that apart from other pertinent causes such as the 'global macroeconomics imbalance' and 'loose monetary policy' in the world market, the global crisis of 2008 was caused by the inefficiency of the prudential regulation standard.

6.2.2 Capital requirement, moral hazard and credit crunch

Banking literature is replete with how information asymmetry and agency problem can distort the banking system. Similarly, the foundation of most bank capital theories is embedded in how agency and moral hazard problems have infiltrated the balance sheet of most banks and distorted the major function of the banking sector. The major functions of banks are mainly to monitor and

ensure liquidity of funds to both depositors and investors, and produce accurate information about lenders of funds and borrowers of funds. However, the information advantage that most banks have over their depositors usually encourages moral hazard since most banks prefer to invest in assets that will increase their risky asset and decrease their capital at the expense of the safety of the depositors' funds since the bank managers of most banks are expected to balance the interest of the shareholders and also ensure bank regulatory rules are followed (VanHoose, 2007: 3688; Berger *et al.* 1995:395).

Berger *et al.* (1995) noted that there is a difference between 'market based capital'[5] and regulator's enforced capital. Banks usually determine the optimal debt to equity structure, hence in the absence of capital regulation there is usually a trade-off between the tax advantage from debt issues and the buffer from equity capital. Berger *et al.* (1995) also believed that most banks hold market-based capital to avoid systemic risk. Moral hazard leads to banks investing in riskier assets that are sub-optimal to depositors and shareholders decisions so as to maximise their equity. Diamond and Rajan (2000, 2001) and Stolz (2002) approach the theory of bank capital by accessing the liquidity side of the balance sheet of banks and observing the apprehension of banks in avoiding failure due to the information asymmetry between most banks and the shareholders. This act as an incentive to discipline the banks to choose the optimal capital choice and portfolio choice that will meet the demand of the depositors and ensure a higher net worth. The effect of a binding capital might be overbearing to the bank to the extent of stiffening credit to the entrepreneur and increasing the chances of bank runs.

6.2.3 Capital requirement, adverse selection and credit crunch

Some literature have given attention to issues on adverse selection problem and how this has accentuated the effect of capital requirement. Most banks screen borrowers or applicants before giving out loans to avoid high levels of payment default. Banks employ screening mechanisms which ultimately entail additional cost, and this cost is later passed to borrowers in the form of additional interest rate. VanHoose (2007) believes that high capital regulatory requirement can be more effective and efficient to banks when the banks incur a regulatory screening that is low.

Thakor (1996) examined the cost of monitoring and bank screening on the ability of banks to give out loans using Nash's equilibrium technique. In this study, Thakor (1996) confirms that banks will set an interest rate for loans where they will be able to maximise profit and recuperate the cost of screening. The paper asserts that banks are likely to reduce loans as the cost of funding rises due to the additional burden set by the capital requirement.

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[5] "Market capital requirement can be defined as the capital ratio that maximises the value of the bank in the absence of regulatory capital requirements" (Berger, 1995: 3).

The Institutional Memory Hypothesis (IMH) gives an explanation of the fluctuation in bank lending behaviour and reasons it follows a procyclical pattern. Firstly, the IMH holds that banks may tend to forget or have 'amnesia' about their loan problems or banking crisis experience some time after their last loan "bust" and tend to relax in their monitoring and enforcement of loans to high risk borrowers (Rajan, 1994; Berger and Udell, 2003). The IMH may exacerbate and increase information asymmetry and systemic risk or affect banks' lending behaviour in a recession, and according to Berger and Udell (2003) it might be serious for developing countries with a fragile and underdeveloped financial market.

According to Acharya and Yorulmazer (2002) 'Procyclical Bank Herding' behaviour states that banks lend to similar industries and increase their inter-bank correlation and herding (Acharya and Yorulmazer, 2002: 3). Consequently, during crises, contagion effect, systemic risk and 'flight to safety' issues might escalate among the banks, where bank owners prefer to work together and survive crises together instead of having different policies. This observed behaviour among bankers can lead to systemic crises and at the same time can be responsible for increased transaction costs and information asymmetry in most financial sectors.

Traditionally, financial markets were presented to be efficient in a perfectly competitive market, void of market failures and crises. However, in recent times, especially after the global financial crisis of 2007–2009, financial markets are seen in a different light. Asymmetric information and market failure (self-fulfilling rational panics, bank runs, interconnectedness of banks, contagion) are still predominant in the financial system, especially in the banking system (Diamond and Rajan, 2000).

Theories have also been established with regard to ways in which the business cycle can amplify risk and how regulatory response has led to credit crunch. For instance, during recessions, the supply of and demand for credit are usually very low. Banks face a daunting task of maintaining depleting prices of assets, low solvency ratio and liquidity problems. Investors and borrowers envisage a gloomy future hence they invest and spend less funds. This eventually leads to a slow growth in the economic activities. Banks also stiffen their lending rates to be able to cope and maintain their balance sheet. Prudential regulatory burdens on the banks coupled with the low level of solvency during recession causes most banks to tighten their credit and reduce the supply of credit leading to credit crunch, which further amplifies the slow growth in the economy (VanHoose, 2007: 3690-3691; Santos, 2000), Stolz, 2002: 11; Drumond, 2009). Adrian and Shin (2008) also established that during boom periods, banks engage in reckless lending which later leads to higher probability of default and loan loss causing a "Boom and Burst" problem.

Many studies (Borio et al. 2001; Borio and Zhu, 2008; Heid, 2007) have examined the fact that Basel II is risk-sensitive since it is harder on the banks' capital during economic downturns than

during economic booms. Some empirical literature has established evidence of a higher rate of default during recession (Pederzoli and Torricelli, 2005: 3; Carey, 2002: 943). However, Borio *et al.* (2001) indicated that high rates of default during recession are just a result of the risk accumulated during the boom period as opposed to the effect of the capital requirement. Borio *et al.* (2001: 4) believe that one of the fundamental problems with Basel II is the fact that it was difficult for the prudential regulations to measure risk, hence risk was either underestimated during boom periods or overestimated during economic slowdowns.

A crucial aspect of Basel II is that it encourages banks to adopt their own risk-sensitive internal models to measure different types of credit risk. For example, banks that adopt internal ratings are meant to use time horizons longer than one year in assigning ratings (BCBS, 2004: 415-416). The implication of adopting this method of rating is that the risk horizon will not be able to assess and reflect the true risk of various assets in the banks. Moreover, the various credit-risk measurements should be calculated at different business cycles. For example, the probability of default (PD) and the loss given default (LGD) are all rated according to the borrower's ability to pay over different credit horizons (Borio et al., 2001; Liu and Seeiso, 2011); Barth *et al.*, 2006; Reinhart and Rogoff, 2008a; Gottschalk, 2010). Basel II further aggravates the underlying procyclicality in the banking sector. For example, Goodhart and Segoviano (2004) established that the IRB approach of Basel II is procyclical and is more sensitive to credit risk than other standard approaches. Similarly, Basel II has the weakness of concentrating on micro-prudential regulation (Basel II was only concerned with the well-being of individual banks) as opposed to the holistic banking sector, therefore the treatment of systemic risk was very weak. Consequently, the implementation of Basel requirements may adversely affect the expansion of bank lending and credit expansion in the long run due to the high capital requirement (Liu and Seeiso, 2011).

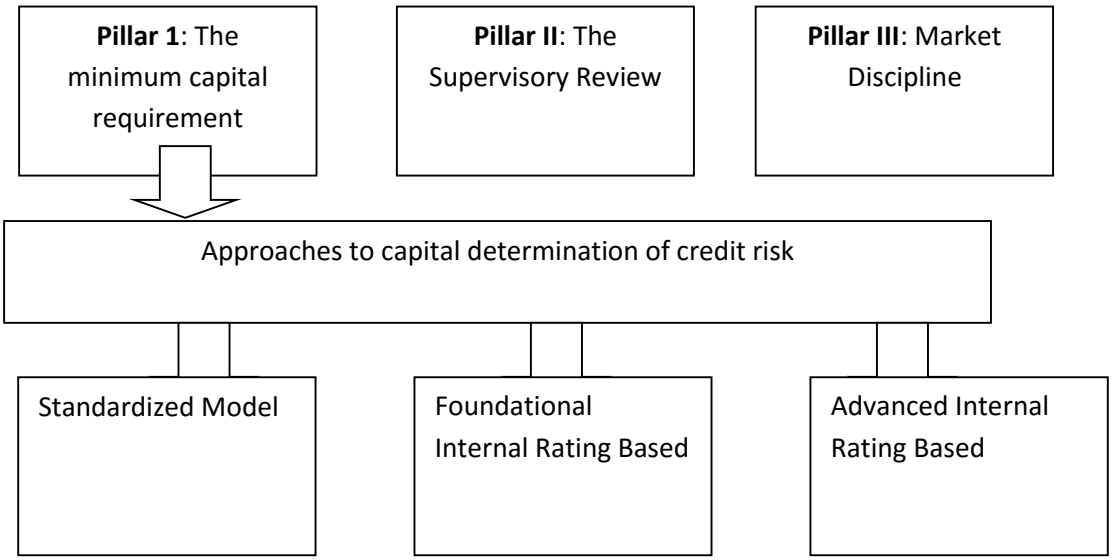

Figure 6.1:Basel II Pillars and approaches

Source: Adapted from Gottschalk (2010)

Figure 6.1 shows the Basel II framework which consists of three pillars: minimum capital requirement (now capturing market risk, operational risk and credit risk), supervisory review of capital adequacy and internal assessment process, and market disclosure and transparency to enforce safe banking and market discipline (BIS, 2009). It is different from Basel I where the credit risks were measured using a standard format provided by the regulatory authorities (Liu and Seeiso, 2011; Mishkin, 2009; Barth *et al.*, 2006; Reinhart and Rogoff, 2008; Angkinand, 2009; Gottschalk, 2010).

Angkinand (2009) studied the relationship between bank regulation and the output cost of the 47 banking crisis episodes in 35 emerging countries between 1970 and 2003 using Heckman two stage least squares model, and established that bank supervision and deposit insurance can help to prevent systemic crises in emerging markets. He believes that bank capital requirement can prevent bank crises systemic risk. However, the study found that the effect of bank regulations in explaining banking crises is different across countries because of their differences in financial deepening and soundness. Hence, it is important to conduct specific studies in order to ascertain the real effect of bank regulations for each country.

Bailey (2005), Heid (2007), Barth *et al.* (2008), Demirgüç-Kunt *et al.* (2010), Kim *et al.* (2013) and Cihak *et al.* (2013) among others have examined the relationship between the Basel Accord and banks' financial stability. For instance, Demirgüç-Kunt *et al.* (2010) examined Basel Accord and financial soundness for 86 countries between 2000 and 2008 using data envelope analysis, and found that there is no relationship between systemic risk and Basel Accord Principles.

However, Demirgüç-Kunt *et al.* 2011 are criticised for using z-scores and standard deviation from the return as a proxy to determine or measure bank soundness and financial stability. Heid (2007) constructed a model to ascertain the business cycle impact of bank's capital on the real sector, and found that bank regulation is significant in avoiding volatility or systemic risk. Cihak *et al.* (2013) updated the previous survey from the World Bank by looking at 143 countries between 2008 and 2012. They found that countries with better monitoring and imposed capital regulation have fewer banking crises compared to countries with more complex but less rigorous capital regulation. Their result shows the complexity in the definition and implementation of capital regulation and its implication on most developing countries that have less developed financial intermediaries. Kim *et al.* (2013) examined the role of financial regulation and innovation in the financial crises using a financial and macroeconomic dataset of 132 countries between 2005 and 2009. The study concluded that mismanagement of the escalating financial innovation caused the recent global financial crisis of 2007. A study by Naceur and Kandil (2013) in the MENA region (Egypt, Jordan, Lebanon, Morocco and Tunisia) adopted a panel data model to examine the effect of Basel capital requirements on credit growth in these countries. They ascertained an interesting result that some macroeconomic fundamentals, such as exchange rate growth and GDP growth, have a significant effect on credit and asset growth in most of the MENA region. The Global Financial Stability Report (IMF, 2013) examined the emerging countries' credit market after the global financial crises and they found that constraints in credit markets are usually different from country to country, hence a country-specific analysis of the credit constraints is essential to be able to ascertain individual countries' credit situation.

This review of literature has established that banks tend to respond to changes in capital requirements by changing their portfolio of assets. During downturns in the business cycle, many banks stiffen their credit supply by changing their portfolio of assets. Basel II is seen in the literature to exacerbate procyclicality in the long run.

6.3 METHODOLOGY

This study adopted models by Watanabe (2005) and Seo (2013). Watanabe (2005) explained credit crunch in terms of the 'regulatory driven capital crunch hypothesis'. The RBC bank capital regulation played a predominant role in their framework. The regulations require that the ratio of capital to RWA should not be below the specified minimum threshold. Lending was assigned a 100 percent risk weight. Furthermore, the borrower's balance sheet theories by Bernanke (1993), Gertler and Gilchrist (1993), Kashyap and Stein (1994) and Bernanke *et al.* (1999) have shown that asymmetric information between banks and borrowers has made external financing premiums to borrowers more expensive, especially for borrowers with no option other than to obtain external funds.

On the other hand, the bank capital channel theory (Borio and Lowe, 2002, Griffith-Jones and Spratt, 2001; Griffith-Jones *et al.* (2003); Bailey (2005); Drumond, 2009) holds that the introduction of capital requirement would amplify the effect of the monetary shocks and business cycle in the real sector, since raising new capital can be very costly and tedious for most banks. Hence most undercapitalised banks who may not be able to reach the threshold of capital requirement may increase their capital to asset ratio by reducing lending rather than raising new equity. A troubled undercapitalised bank at this stage will switch some of its debt for capital (debt-equity swap[6]), and this usually increases the marginal cost of capital and hence reduces lending (Watanabe, 2005).

Credit crunch generally refers to the reduction in credit supply available to borrowers, particularly bank lending supply, for some lender-specific reasons or seen as a significant left-hand shift in the supply of banks' loans curve. The major explanation for the credit crunch phenomenon as investigated in this study is that it is regulatory driven.

In modelling a bank's profit maximisation, the RBC standard capital adequacy requirement is expressed as:

Equation 6.1

$$\frac{E_i}{B_i} \geq \delta \qquad \ldots 6.1$$

Where $\mathrm{E_i}$ is the equity capital of bank i, $\mathrm{B_i}$ is bank i's level of lending, and δ is the minimum requirement imposed by the regulator. The paper assumes a dynamic optimisation model of banking firm that only lending is assigned a 100 percent risk-- weight capital. Most times those banks at the lower threshold of 'risk based capital to asset ratio' are capital-constrained, which mainly occurs when banks are faced with a negative shock in the form of rigorous regulatory requirements, and NPLs resulting from a fall in house prices etc. Therefore, the partial adjustment specification of the growth rate of lending can be stated as:

Equation 6.2

$$\mathrm{InB_t} = \propto_{\mathrm{o}} + \propto_1 \mathrm{InB_{t-1}} + \beta\frac{\mathrm{E_t}}{\mathrm{A_t}} + \delta\mathrm{COIN_t} + \gamma\mathrm{X_t}\,\varepsilon_t \qquad \ldots 6.2$$

The dependent variable $(\mathrm{B_t})$ is credit to GDP at time t and the explanatory variables are the lagged dependent variable$(\mathrm{B_{t-1}})$, capital asset ratio measures $(\frac{\mathrm{E_t}}{\mathrm{A_t}})$, and business cycle coincident index $(\mathrm{COIN_t})$ and other control variables as $(\mathrm{X_t})$. $(\frac{\mathrm{E_t}}{\mathrm{A_t}})$ captured the regulatory element which will be

[6] A debt-equity swap is a transaction that usually occurs when a firm or corporation runs into a liquidity or financial predicament, such as when a corporation exchanges debt for a newly issued equity. It is usually one of the fundamental ways of concealing some outstanding debt. Debt-equity swap (also referred to as 'bondholder hair cut' was mainly used during the sub-prime mortgage problem in the US. There is debate between "shareholders versus taxpayers" paying for bank insolvency.

assessed in the model using any of the measures in the Basel accord. To analyse the procyclicality issue, the study aims to verify the sensitivity of credit growth to the issue of procyclicality of capital buffer over the years. The VAR model was adopted because of its flexibility, compactness and ability to capture contemporaneous relationships (Brooks, 2014: 335).

6.4 MODEL ESTIMATION AND DISCUSSION

6.4.1 Variable definition and data sources

The data set for the study covers 23 years from 1990Q1 to 2013Q4. We covered this period because at least two of the banking crises are included in the period (Asian crisis, 1997-1998 and Global Financial Crisis (2007–2009)) and also because the Base Accord (Basel I, II and III) were revised during this period. The financial variables and control variables were obtained from SARB.

Coincident Index: South Africa coincident index is the proxy adopted to capture the business cycle index. We believe that coincident index will accurately capture business cycle and the shocks that affect bank loans during recession and boom periods. SARB employs about 200 individual time series variables to capture the cyclical movement of the South African economy. These variables are used to examine the current and future economic situation. Business cycles are identified by comparing the turning points of the cyclical components of individual time series with the reference turning points. If the specific turning point tends to coincide with the reference turning point, the relevant variables are called ‘coincident indicators’. If the variables predate the reference point, they are called ‘leading indicators’ and if the variables takes place after the reference point they are called ‘lagging variables’. Real GDP is not a good measurement or proxy for business cycle because any aggregate changes in real GDP do not capture the invariable changes in other sectors of the economy. Also Real GDP is biased towards changes in agricultural production which might cause bias to economic activities. Therefore, the composite coincident index is a better indicator than real GDP or GDP growth (Mohr, 2012: 76). South Africa coincident index is adopted to capture business cycle index. We also believe that coincident index will accurately capture business cycle and the shocks that affect bank loans during recessions and boom periods.

Capital Adequacy Ratio: Regulatory capital consists of Tier1 and Tier 2 capital. Tier 1, which is usually called the bank’s strength, includes retained earnings or losses of banks, common equity capital, common shares issued by a bank, accumulated income and other reserves that meet additional Tier 1 (BCBS, 2010: 13). Tier 2 capital is composed of instruments issued by banks that are not included in the Tier 1 capital. This is capital that might temporarily rise and is volatile. These instruments usually have a maturity of five years during which time they can either be referred to as subordinated debt or categorised as provision for credit losses, such as debentures or changes in valuation of fixed capital (BCBS, 2010: 17-18)). In this study we concentrate on Tier

1 measurement of capital adequacy because it is more stable and reliable. According to Watanabe (2005: 11), Tier 1 capital is more reliable than Tier 2 capital because it vividly depicts the 'negative capital shock' response from the "capital constrained" banks.

Financial Conditions Index: The FCI is usually constructed as a weighted average of five time series indicators (real effective exchange rate, earning yield on shares, real interest rate, money supply growth and yield curve) for South Africa. It is used as a gauge to examine the financial system's health in South Africa, and is also employed as a proxy to measure financial stability.

Consumer price Inflation index (CPI): The CPI inflation index captures increases in general price level of goods and services in South Africa. Higher inflation usually retards economic activities and has an adverse effect on raising risk premiums in commercial banks. Higher inflation may amplify the business cycle and cause banks to restrict the supply of credit (Korkmaz, 2015: 60).

Crisis Dummy: A crisis dummy variable is meant to capture the period of global financial crisis (2008–2009), the South African banking crisis in 2001 and the Asian crisis (1997–1998). The period of global financial crisis in the world is equal to 1, and equal to 0 when there was no global financial crisis. It is a proxy to cater for periods of financial crisis in the world.

Private Credit to GDP: is the ratio of private credit provided by bank to GDP.

Table 6.1: Definition of Variables

VARIABLES	*A priori* Expectation	DEFINITIONS AND SOURCES
Business Cycle Proxies	(+): We expect business cycle to vary directly with credit from the perspective of the credit procyclicality theory.	The South Africa Composite coincident index that captures the current business cycle in South Africa (SARB).
Consumer Price Index (CPI)	(-): We expect inflation and credit to GDP to move in opposite direction.	CPI inflation index captures increase in general price level of goods and services in South Africa.
Capital adequacy (CAP_ADE)	(-): We expect the capital adequacy ratio and private credit to GDP to flow in the opposite direction.	CAR_t captured the regulatory element Book based ratio (Tier 1 measure in the Basel accord).
Crisis Dummy	(-): We expect the Crisis dummy ratio and private credit to GDP to flow in the opposite direction. Dummy variable is assumed an exogenous variable in the system.	A crisis dummy variable to capture period of Global financial crises (2007-2009) and Asian crisis of 1997.

Financial condition Index (FCI)	(+): We expect the FCI to move directly with private credit to GDP.	FCI is a composite of five time series: real effective exchange rate, earning yield on shares, real interest rate, money supply growth and yield curve) for South Africa.
Private sector credit to GDP	+/-: We are interested in the co-movement of credit growth and capital adequacy.	The ratio of private credit provided by bank to GDP. (SARB)

This study employed the VAR based co-integration and VEC models accompanied by impulse response and variance decomposition. In estimating the VAR, this study takes into account the fact that most macroeconomic variables are usually non-stationary at level, hence we employ the VAR-- based co-integration test using the methodology developed by Johansen (1995). Secondly, there are contemporaneous relationships between bank lending and business cycle. In other words, there are no unique dependent or independent variables. The model provides a way to incorporate such relationships (Sims, 1980; Bernanke, 1986).

The VECM has co-integration relations built into the specification so that it restricts the long-run behaviour of the endogenous variables to converge to their co-integrating relationships while allowing for short-run adjustment dynamics. Thus, the VECM specification will also be used to analyse the short-run relationships between the variables.

VECM will also enable us to derive information on both the long- and short-run dynamics of the model and to estimate the speed of adjustment. Seo (2013) employed the rolling VECM techniques to examine SMEs procyclicality relationship in banks' lending behaviour in Korea. Table 6.14 shows the summary statistics of our variable. The mean values vary between 3.57 and 11.3, indicating that there are no outliners in the variables. The standard deviations for the variables are also quite small, varying between 2.74 and 0.20. Table 6.2 shows the pair-wise contemporaneous correlation matrix for the residual of each variable. The largest observed correlation is (-0.39) between CPI and Coincidental Index. There is a negative relationship between the Credit to GDP variable and business cycle (-0.25) in Table 6.2. There is a positive correlation between capital adequacy and credit to GDP (0.29). The correlation matrix further strengthens the evidence that there is apparently a relationship between the private sector credit to GDP, business cycle, capital adequacy and financial crisis periods. This shows that there are some common trends driving these variables in the same direction, but generally correlation between the coincident index and capital adequacy ratio variables is low.

Table 6.2: Residual Correlation Matrix

Variables	CREDIT GDP	COIN_ INDEX	FCI	CAP_ADE	CPI	DUMMY1
CREDITGDP	1.000000	**-0.253388**	-0.038840	**0.289952**	**-0.195983**	-0.034936
COIN_INDEX	-0.253388	1.000000	-0.059275	-0.147872	-0.384514	-0.172331
INFCI	-0.038840	-0.059275	1.000000	-0.092015	-0.260029	0.058570
CAP_ADE	0.289952	-0.147872	-0.092015	1.000000	0.174036	-0.138983
CPI	-0.195983	**-0.384514**	-0.260029	0.174036	1.000000	0.336414
DUMMY1	-0.034936	-0.172331	0.058570	-0.138983	0.336414	1.000000

Source: Author's computation

6.4.2 Tests for unit roots

We carried out unit root tests in order to avoid spurious regression that might occur when running a regression with non-stationary variables. A spurious regression will indicate a statistically significant relationship between variables in the model, when it is just a contemporaneous correlation (Enders, 2004; Brooks, 2008). A stationary series can be defined as one with a constant mean, constant variances and constant auto covariance for each given lag. If a series is non-stationary it will be differenced d times before it becomes stationary, then it is said to be integrated of order d. A non-stationary time series will have a time varying mean and variance or both (Brooks, 2008: 319).

This study uses four types of tests to examine the univariate properties of the variables in this model: ADF, PP, KPSS and Ng Perron tests. Maddala and Kim (1998) suggested that an important way of overcoming the problem of failing to reject a null hypothesis when it is false is to use different tests and compare them.

The ADF and PP test results are given in Tables 6.16 and 6.17 respectively. The tests are applied to the data under two different deterministic trend assumptions: a constant and no trend, and both constant and trend. The ADF test helps determine whether each variable in the model has an intercept, stochastic trend or deterministic trend (Seddighi *et al.*, 2000).

KPSS test results are presented in Table 6.4. The KPSS test and Ng-Perron stationary test are improved versions of the unit root test, and are more powerful tools in testing for unit roots. However under KPSS test, the data usually appears stationary by default if there is little information in the sample (Brook, 2008: 331). The KPSS approach is based on a Lagrange Multiplier score testing principle and assumes the univariate series can be decomposed into a deterministic trend, a random walk and a stationary error. The KPSS test statistic is computed based on residuals from a regression with an intercept but no time trend (Kwiatkowski *et al.,* 1992: 160). We tried to compare ADF/PP tests with KPSS test to ensure the same conclusion is found as suggested by Brooks (2008). The result of KPSS and NG Perron unit root tests are given in Tables 6.3 and 6.4.

Table 6.3: KPSS stationarity test result

Variable	Model	Order of integration		
		Level	**1st diff.**	
CREDIT_GDP	Intercept	1.249349	0.392759**	I(1)
	Intercept & Trend	0.2767	0.085023**	
COINCIDENT_ INDEX	Intercept	1.128096	0.241803***	I(1)
	Intercept &Trend	0.201531	0.052158***	
CAP_ADE	Intercept	0.674726**	0.113248	I(1)
	Intercept & Trend	0.195646**	0.071354	
CPI	Intercept	0.728035	0.088266***	I(1)
	Intercept & Trend	0.198394*	0.025776***	
FCI	Intercept	0.814908	0.039611***	1(0)
	Intercept & Trend	0.034554**		

For **KPSS:** Null hypothesis is stationary (*, **, *** is not significant at 1%, 5% and 10% respectively)

Source: Author's computation

Table 6.4: NG Perron stationarity test

Model	**Variables**			
		Ng-Perron Level	**1st diff**	**DECISION**
Intercept	**CREDIT_GDP**	1.9733	-28.4117***	I(1)
Intercept & Trend		-2.59876	-32.7172***	
Intercept	**CAP_ADE**	-0.96209	-37.8720***	I(1)
Intercept & Trend		-5.89478	-37.7116***	
Intercept	**CPI**	-2.14865	-17.6831***	I(1)
Intercept & Trend		-26.2613***		
Intercept	**FCI**	-7.37848*		I(0)
Intercept & Trend		-160.084***		
Intercept	**COINCIDENT_INDEX**	-0.47803	-21.9067***	I(1)
Intercept & Trend		-9.90424	-26.1548***	

Note: *, **, *** implies significance at 10%, 5% and 1% level

Source: Author's computation

The unit root tests conducted revealed that some variables (Credit to GDP, capital adequacy, CPI and coincidental index) have unit roots in their levels, thus have to be differenced in order to ensure stationarity. However, some variables are stationary at level. For instance, FCI and operation expenses variables are stationary at levels. The result is confirmed using KPSS and NG Perron tests. It is possible to combine I(0) variables with I(1) variables to obtain a long-run cointegrating relationship provided the order of the dependent variable is not higher than the order of the other variables in the system. If the linear combination of the I(0) and I (1) variables results in a residual that is I(0) then the variables are cointegrated.

6.4.3 Optimal lag length selection

Table 6.5: VAR lag length selection criteria result

VAR Lag Order Selection Criteria

Endogenous variables: CREDITGDP INCOIN_INDEX INFCI CPI CAP_ADE

Exogenous variables: DUMMY1

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-446.2340	NA	0.160927	12.36258	12.51946	12.42509
1	435.5930	1618.696	1.03e-11	-11.11214	-**10.17085***	-10.73702
2	477.7440	71.59897	6.50e-12	-11.58203	-9.856338	-**10.89431***
3	502.2729	38.30547	6.74e-12	-11.56912	-9.059029	-10.56881
4	524.6170	31.83263	7.61e-12	-11.49636	-8.201859	-10.18344
5	574.5903	**64.34924***	**4.15e-12***	**-12.18056***	-8.101657	-10.55504
6	590.3310	18.11259	6.06e-12	-11.92688	-7.063573	-9.988767
7	610.1865	20.12750	8.38e-12	-11.78593	-6.138224	-9.535223

* indicates lag order selected by the criterion
Source: Author's computation

The Johansen cointegration test requires that we first determine the optimal lag length for the VAR test. A fundamental requirement in conducting Johansen (1991, 1995) cointegration tests and estimation of a VAR system, especially in its restricted VEC forms, is the choice of an optimal lag length.

The choice was made by examining the lag structure in an unrestricted VAR originally specified using a maximum number of lags (8) and using VAR lag order selection criteria. This is important to avoid spurious rejection or acceptance of false estimated results. If there are n variables with lag length k, for example, it is necessary to estimate n (nk+I) coefficients. For instance, if k is too large, degrees of freedom may be wasted, and if the lag length is too small, important lag dependences maybe omitted from the VAR, and if serial correlation is present the estimated coefficients will be inconsistent. The widely used information criteria are the AIC, SIC, HQIC, FPE and LR test. More fundamental is the fact that the lag length selected must conserve degrees of freedom. Table 6.5 shows that HQ choose lag 2, SC choose lag 1 while LR, AIC, and FPE choose lag 5. In this study the optimal lag length 5 was selected after checking each lag length for the model that minimises AIC and SBC. The stability test was also checked for the optimal lag length that meets all the criteria. Table 6.6 summarises the stability test for VAR residual test for the model when lag 5 was picked. The probability result for LM serial correlation test for lag 5 is 0.7776. The study cannot reject the null hypothesis that there is no serial correlation in the model since the probability value is less than 0.05. Similarly, in the case of the joint residual heteroskedasticity test, the result shows a probability of 0.1880. The study cannot also reject the null hypothesis that there is no heteroskedasticity in the model (in other words the residuals are jointly correlated). The model passed the normality test given the probability value of 0.1424.

Table 6.6: VAR Residual Stability test

Stability Test for VAR Residual	**Probability Result**
Residual Serial correlation LM Test	0.7776
Residual Joint Heteroskedasticity Test	0.1880
Residual Joint Normality Test	0.1424

Source: Author's computation

6.4.4 Cointegration test

We are interested in the apparent movement between capital regulation, business cycle and credit growth. We also want to ascertain whether there is a long-run relationship between financial regulation, financial crisis and the credit growth. This study employs Johansen and Juselius's (1990) cointegration approach to examine the long-run relationship taking into consideration intercepts and trends. The results are reported in Table 6.16. The results of the Trace and Max-Eigenvalue statistics showing the number of cointegrating equations (CE) are reported in Tables 6.7 and 6.8.

Table 6.7: Johansen Cointegration Trace Test results

Hypothesised No CE(S)	Trace Statistics	Critical values (5%) Trace
None**	81.89168	69.81889
At most 1**	44.73927	47.85613
At most 2	19.21424	29.79707

*(**) denotes rejection of the hypothesis at the 5% level.

Trace test indicates 1 cointegrating equation at 5% level.

Table 6.8: Johansen Cointegration Max-Eigenvalue Test results

Hypothesised No CE(S)	Max-Eigen Statistics	Critical values (5%) Max-Eigen
None**	37.15241	33.87687
At most 1**	25.52503	27.58434
At most 2	13.95600	21.13162

*(**) denotes rejection of the hypothesis at the 5% level

Max_Eigenvalues test indicates 1 cointegrating equation at 5% level

Source: Author's computation

Trace value: Using a sequential testing procedure in Table 6.8, r=0 (no cointegrating vector) against the alternative of at most one cointegration vector (r≤1), the trace test statistic is 81.891, which is greater than the 95% critical value of 69.819, thus the null hypothesis of no cointegrating vectors is rejected. In the next row, the trace test statistic (44.739) is less than the critical value of (47.856), so that the null hypothesis of at most one cointegrating vector is not also rejected.

Eigen value: Using a sequential testing procedure in Table 6.9, r=0 against the alternative of at most one cointegration, the test statistic 37.1524 is greater than 33.877 at 95% critical value, thus we reject the null hypothesis of no cointegrating vectors. The null hypothesis of at most one cointegrating vector is now tested, where eigenvalues test statistics (25.525) is greater than (27.5843). The null hypothesis of at most one cointegrating vector is accepted. The result shows

that at least one cointegrating equation was reported by both trace test and maximum eigenvalues statistics. This result further supports that there is a long-run relationship among the variables and also suggests the suitability of using the VECM. A stability test is required to ensure that the residuals of the model are not serially correlated in the long run. We further conducted a robustness test to avoid spurious regression in the model. We test the VAR for heteroskedasticity and serial correlation. Tables 6.10 and 6.11 depict the various tests below. Table 6.9 summaries the stability test for VEC residual test. The probability result for LM serial correlation test is 0.6651. We cannot reject the null hypothesis that there is no serial correlation in the model since the probability values are less than 0.05. Similarly, in the case of joint residual heteroskedasticity test, the result shows a probability of 0.3210. We cannot also reject the null hypothesis that there is no heteroskedasticity in the model (in other words the residuals are jointly correlated). The model also passed the normality test given the probability value of 0.1057.

Table 6.9: VEC residual stability test

Stability Test for VEC Residual	**Probability Result**
Residual Serial correlation LM Test	0.6651
Residual Joint Heteroskedasticity Test	0.3210
Residual Normality Test	0.1057

Source: Author's computation

Table 6.10: VEC Residual serial Correlation LM Test

VEC Residual Serial Correlation LM Tests		
Null Hypothesis: no serial correlation at lag order h		
Lags	**LM-Stat**	**Prob**
1	24.46871	0.4924
2	18.87194	0.8032
3	28.97683	0.2649
4	31.13196	0.1847
5	21.48815	0.6651

Source: Author's computation

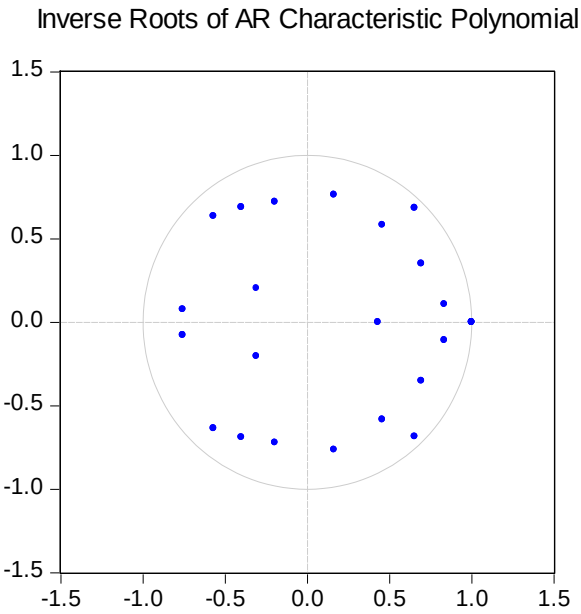

Figure 6.2:Inverse Root of Autoregressive Regressive Characteristics

Source: Author's computation

Table 6.11: VEC residual heteroskedasticity test

VEC Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares) **Sample: 1990Q1 2013Q4**					
Joint test:					
Chi-sq	df	Prob.			
661.1654	645	**0.3210**			
Individual components:					
Dependent	R-squared	F(43,31)	Prob.	Chi-sq(43)	Prob.
res1*res1	0.642959	1.298253	0.2256	48.22196	0.2699
res2*res2	0.523363	0.791606	0.7637	39.25225	0.6346
res3*res3	0.574270	0.972467	0.5404	43.07024	0.4683
res4*res4	0.603528	1.097435	0.3981	45.26463	0.3776
res5*res5	0.412394	0.505964	0.9806	30.92956	0.9154
res2*res1	0.721329	1.866101	0.0361	54.09968	0.1195
res3*res1	0.513922	0.762228	0.7973	38.54417	0.6648
res3*res2	0.431837	0.547950	0.9662	32.38781	0.8813
res4*res1	0.687735	1.587786	0.0905	51.58016	0.1734
res4*res2	0.601134	1.086518	0.4096	45.08503	0.3848
res4*res3	0.693795	1.633471	0.0780	52.03459	0.1625
res5*res1	0.425100	0.533079	0.9719	31.88247	0.8939
res5*res2	0.503129	0.730010	0.8320	37.73468	0.6985
res5*res3	0.564889	0.935956	0.5854	42.36664	0.4986
res5*res4	0.667248	1.445636	0.1430	50.04357	0.2140

Source: Author's computation

The VAR for heteroskedasticity, normality and serial correlation was tested to ensure that the model is stable and the residuals of the model are not serially correlated in the long run. Tables 6.10 and 6.11 depict that there are no serial correlation, normality or heteroskedasticity problems.

6.4.5 Vector Error Correction Model

The VECM was estimated and normalised on credit to GDP. The result shows that business cycle and capital adequacy have a significant long-run impact on private credit to GDP. Similarly, the FCI representing the global financial crisis is also found to be significant in influencing credit to GDP equation in the long run.

Table 6.12: Vector error correction estimate

Vector Error Correction Estimates Standard errors in ( ) & t-statistics in [ ]					
Cointegrating Eq:	**CointEq1**				
CREDITGDP(-1)	1.000000				
INCOIN_INDEX(-1)	-2.355358				
	(0.31622)				
	[-7.44847]				
INFCI(-1)	3.321525				
	(0.75448)				
	[4.40238]				
CPI(-1)	0.128168				
	(0.01960)				
	[6.53811]				
CAP_ADE(-1)	0.091495				
	(0.02950)				
	[3.10176]				
C	-10.94319				
Error Correction:	**D(CREDITGDP)**	**D(INCOIN_INDEX)**	**D(INFCI)**	**D(CPI)**	**D(CAP_ADE)**
CointEq1	-0.029964	-0.026181	0.000781	0.462784	0.026425
	(0.00754)	(0.00940)	(0.02368)	(0.67260)	(0.50054)
	[-3.97584]	[-2.78505]	[0.03296]	[0.68806]	[0.05279]

Equation 6.3

The long run regression is provided in Equation 6.3:

$$\text{CREDITGDP}_t = 10.94 + 2.356INCOIN\_INDEX_t\ [7.45] - 1.46\ \text{DUM}[0.00] - 3.321\text{INFCI}_t[4.40] - 0.128\text{CPI}_t[6.538] - 0.091\text{CAP\_ADE}_t \quad \ldots 6.3$$

Note: t values in [ ] square brackets

The indication from Equation 6.3 is that business cycle and capital adequacy have a significant long-run impact on private credit to GDP. This is indicated by the reported coefficient 2.35 and the t statistics test of (7.44) for the business cycle. There is a negative relationship between capital adequacy and credit to GDP where the t-statistics shows (-3.10). The equation also supports the relationship between credit to GDP, FCI and capital adequacy showing a long-run bidirectional relationship between these variables.

The coefficient of the error correction terms is interpreted as the speed of adjustment to the long-run equilibrium. The coefficient of the error correction term of credit to GDP is negative and significant and the coefficient is less than unity, which implies that any disequilibrium to the private credit to GDP might be persistent but will revert back to equilibrium. The speed of adjustment of credit to GDP to its own long-run equilibrium is slow as shown by the adjustment coefficient. Every quarter just over 3% of the disequilibrium in credit to GDP is adjusted back to equilibrium.

Our main concern is to ascertain the co-movement of private credit to GDP business cycle and financial regulation in South Africa. The result shows that capital adequacy and business cycle have a positive and significant long-run impact on credit to GDP. The coefficient of capital adequacy and business cycle are also positive and significant in the short run. Tables 6.17 and 6.18 show the dynamic causal interaction among the variables in the credit growth model in a VEC form. This allows us to access the causality from one variable to the other using the chi-square test of the lagged first differenced terms. The weak exogeneity test allows us to ascertain the direction of causality in the VECM framework. The weak exogeneity test was carried out following Demetriades and Hussein (1996) and Arestis and Demetriades (1997), where restrictions are placed on each variable within the system to determine which is endogenous. In the credit growth model, the causality between credit GDP and capital adequacy was assessed and established. There is a bidirectional relationship between credit to GDP and business cycle in South Africa. These further establish the procyclicality of capital adequacy and credit to GDP in South Africa.

6.4.6 Impulse response analysis

Impulse response analysis traces out the responsiveness of the dependent variable in the VAR to shocks to each of the other variables. It shows the sign, magnitude and persistence of real and

nominal shocks to the dependent variable. The generalised impulse response analysis delineates the reaction of dependent variables in the VAR model to shocks. Doan (1992) captured the factorisation of the variance-covariance matrix of the VAR using the decomposition method by ascertaining the 'orthagonalised innovations' in each innovation. This method is appropriate since our objective is to trace the link between bank regulation and credit growth in South Africa. The response of the dependent variable is identified.

Impulse response functions show the dynamic responses of a dependent variable, in this case credit to GDP to a one-period standard deviation shock, to the innovations of each variable determinant, in particular, the business cycle and capital adequacy. To investigate the potential impact of the capital regulation shock, impulse response analysis is conducted. These impulse response functions show the dynamic response of the credit to GDP ratio to a one-period standard deviation shock to the innovations of the system and also indicate the directions and persistence of the response to each of the shocks over a 40 quarter period. Figure 6.2A shows the effect of capital adequacy shock on credit growth in South Africa. The results of the impulse response test shows that the impact of capital adequacy shock is very persistent and lasting. This result further confirms the assertion in theory that capital adequacy amplifies business cycle and can further magnify the credit crunch.

Our foremost concern is the response of credit/GDP to a one time standard deviation shock to our measure of financial regulation, in this case capital adequacy. In chapter five, the response of coincidental index (which is our measure of business cycle) was tested to shocks to capital adequacy. As an addition to this chapter, we also tested the response of financial conditions to capital adequacy and the response of credit/GDP ratio to financial conditions. Figure 6.3A shows that the response of credit to GDP to one standard deviation shock of business cycle is positive and persistent for over 20 quarters before stabilising. This vividly shows the procyclicality effect of business cycle. Figure 6.3B further shows that the response of credit to GDP to one standard deviation shock of FCI is negative and persistent for over 25 quarters before steadying. The impulse analysis also buttresses the volatility in the financial system in South Africa when there is global financial shock.

Figure 6.3D shows that the response of credit to GDP to one standard deviation shock of capital adequacy is also negative and tenacious, although capital adequacy shock went up for five quarters before steadying. The effect of the response of capital adequacy to one standard deviation shock of FCI is also negative and persistent for 15 quarters which is depicted in Figure 6.3C. Credit to GDP is consistently negatively affected by shocks in the financial conditions, capital adequacy but positively affected by business cycle shock. A positive shock to business cycle has an initial impact on bank lending and later a rising positive and persistence effect on lending.

Intuitively, the procyclicality of the banking sector contributes to the fluctuation in economic activities and amplifies the recession period. Capital adequacy exacerbates the cyclical fluctuation, adversely affecting the efficient allocation of resources to the real sector and hindering credit growth and financial stability.

Figure 6.3A: Response of CREDITGDP to Cholesky
One S.D. INCOIN_INDEX Innovation

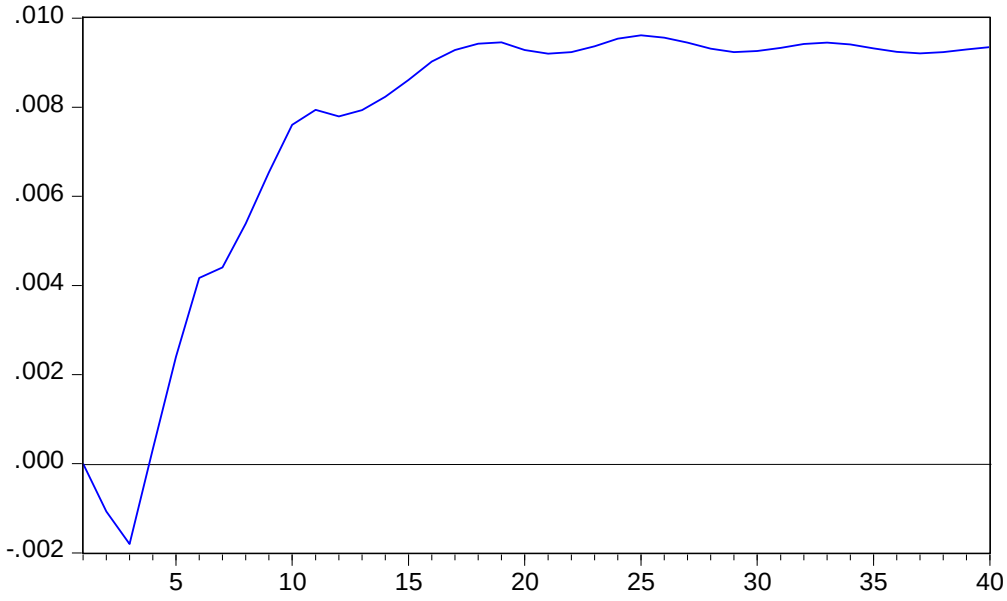

Figure 6.3B: Response of CREDITGDP to Cholesky
One S.D. INFCI Innovation

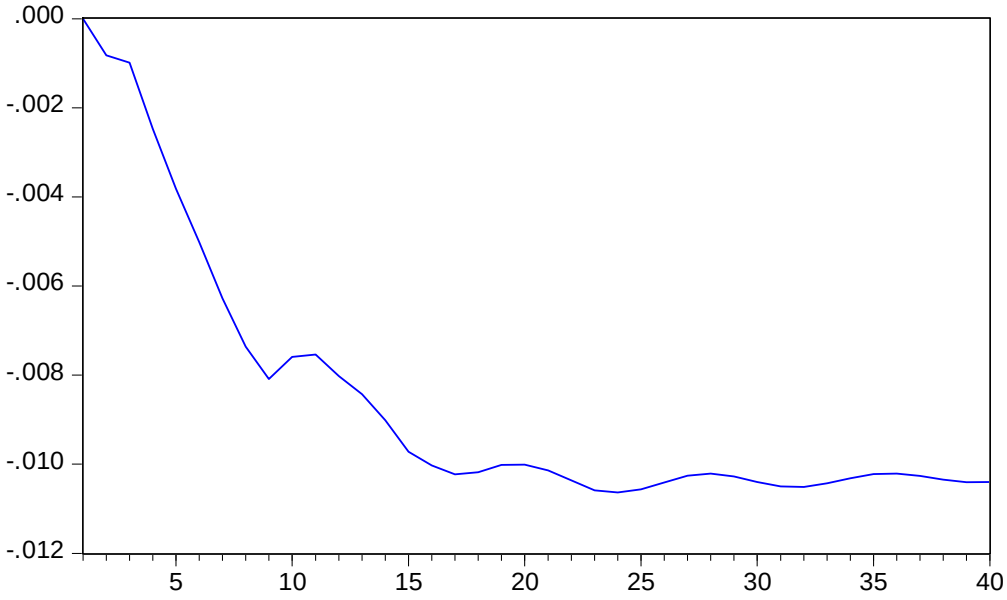

Figure 6.3C: Response of INFCI to Cholesky
One S.D. CAP_ADE Innovation

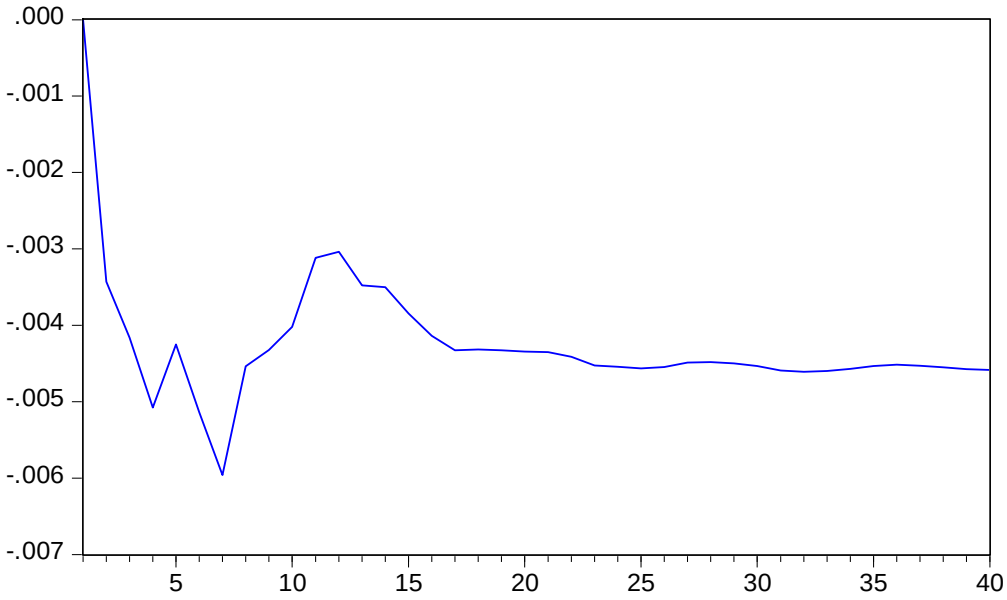

Figure 6.3D: Response of CREDITGDP to Cholesky
One S.D. CAP_ADE Innovation

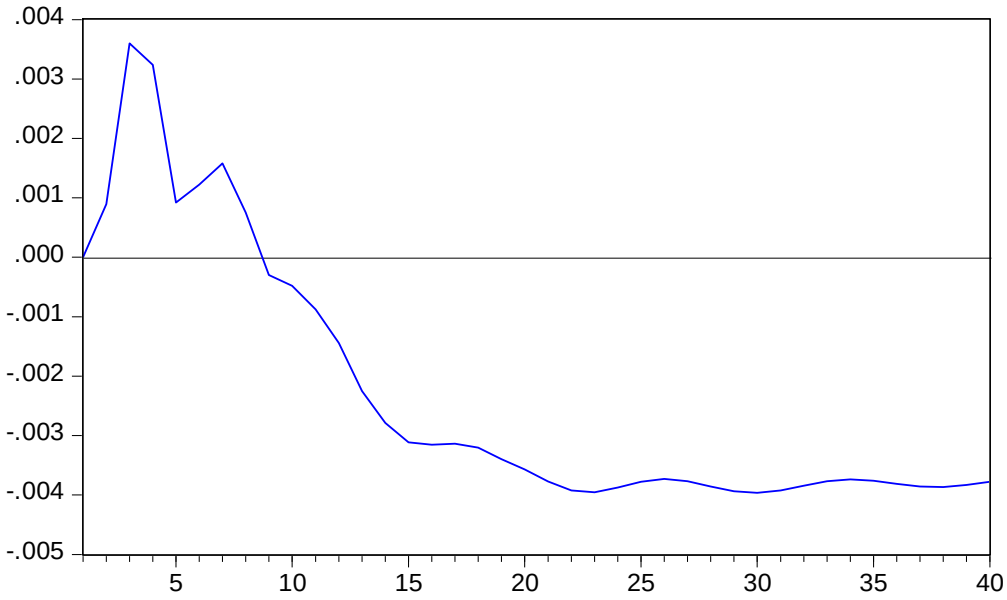

Figure 6.3: Response of credit to GDP to a one period shock to other variables

Source: Author's computation

6.4.7 Variance decomposition

Variance decomposition measures the forecast error variance of any variable, which is explained by innovations to each explanatory variable over a series of time horizons to a system when a shock is applied. In summary, this technique shows the relative importance of each random innovation to each explanatory variable over a series of time horizons. Variance decompositions performed on the VECM may provide some information on the relative importance of shocks to the independent variables in explaining variations in the dependent variable. In the context of this study, it therefore provides a way of determining the relative importance of shocks in explaining variations in credit to GDP and business cycle. The results of the variance decomposition analysis presented in Table 6.14 show the proportion of the forecast error variance in the credit to GDP explained by its own innovations and innovations in its determinants.

Table 6.13: Variance Decomposition analysis for Credit to GDP

Variance Decomposition of CREDITGDP:						
Period	**S.E.**	**CREDITGDP**	**INCOIN_INDEX**	**INFCI**	**CPI**	**CAP_ADE**
1	0.008988	**100.0000**	**0.000000**	**0.000000**	**0.000000**	**0.000000**
2	0.013266	98.19594	0.655032	0.385483	0.309948	0.453594
3	0.016425	92.38807	1.628484	0.611045	0.275785	5.096614
4	0.019107	89.78374	1.232149	2.127327	0.217260	6.639525
5	0.021503	86.54112	2.218950	4.830088	0.983571	5.426276
6	0.024512	**77.71827**	**4.599166**	**7.906096**	**5.352496**	**4.423971**
7	0.028089	**66.40345**	**5.958273**	**11.01623**	**12.93685**	**3.685198**
8	0.032316	**53.25204**	**7.279171**	**13.51487**	**23.11523**	**2.838687**
9	0.036988	41.39548	8.681418	15.09496	32.65490	2.173248
10	0.041314	33.28967	10.34879	15.47593	39.13011	1.755501

Source: Author's computation

In the first quarter, all of the variance in the credit to GDP is explained by its own innovations (shocks). Coincident index explains about 100 per cent of its variation, however, after a period of 7

quarters, the credit to GDP only explains about 66 per cent of its own variation, while its determinants explain the remaining 34 per cent. The influence of the business cycle, financial stability and capital adequacy increased gradually to about 16 per cent. By the 9th quarter, there has been a dramatic change in the influence of business cycle and financial condition index: they both explained 23 percent of the variation of credit to GDP. The result shows the influence of business cycle, financial condition index and bank capital adequacy on credit to GDP. South African banks tend to change their behaviour during upturns and during downturns.

6.5 CONCLUSION AND POLICY RECOMMENDATION

We showed earlier how bank regulation affects business cycle. Our goal here was to show how regulatory driven capital regulation affects credit growth. This chapter examines the procyclicality of capital regulation and how it might deepen business cycle and accentuate credit crunch in South Africa using Vector Autoregressive modelling from 1990 to 2013. We adopted the regulatory driven capital crunch hypothesis employing data from SARB. The results for credit growth procyclicality show a high and long-lasting effect from a shock to bank regulation and the business cycle variable.

Appendix C

Table 6.14: Summary statistics of data employed, 1990q1 to 2013q4

Variables	CREDITGDP	INCOIN_INDEX	CAP_ADE	INFCI	CPI
Mean	0.679558	4.398048	11.31400	5.686373	6.391250
Median	0.564970	4.326337	10.10000	5.693362	6.116667
Maximum	1.276104	4.766155	15.33000	5.799658	13.40000
Minimum	0.214119	4.097672	8.500000	5.549805	0.433333
Std. Dev.	0.345984	0.200489	2.199777	0.066020	2.747303
Skewness	0.344381	0.374059	0.553668	-0.293830	0.155635
Kurtosis	1.594592	1.747824	1.812468	2.016208	2.873911
Jarque-Bera	8.165210	8.510509	8.788083	4.377303	0.375959
Probability	0.016863	0.014189	0.012351	0.112068	0.828632
Sum	54.36466	422.2126	905.1200	454.9098	511.3000
Sum Sq. Dev.	9.456715	3.818615	382.2823	0.344337	596.2661
Observations	80	80	80	80	80

Table 6.15: Summary of Augmented Dicker Fuller Test

		Augmented Dicker Fuller Test both at level and difference				
Variable	**Model**	**Level**	**1st difference**	**intercept**	**trend**	**I(1)**
COINCIDENT_INDEX	**Intercept**	-0.156992	-3.937238***	0.6803		I(1)
	intercept and trend	-2.79038	-4.102787***	2.605910	3.02686	
CREDIT_GDP	**Intercept**	1.076334	-4.844006***	1.590996		I(1)
	intercept and trend	-1.751784	-5.129619***	0.792817	2.100016	
CAP_ADE	**Intercept**	-0.982545	-10.52827***	1.155627		
	intercept and trend	-1.721493	-10.49419***	1.500646	1.472606	I(1)
FCI	**Intercept**	-2.250425	-5.260572**	2.204027		I(0) with intercept
	intercept and trend	-4.696183**		4.653973***	-3.269192	
CPI	**Intercept**	-2.693706*	-4.462004***	2.175291		I(1)
	intercept and trend	-2.863446	-4.515538***	2.145765	-1.236042	

Source: Author's computation

Table 6.16: Summary of Philips-Perron Test

Philips-Perron Test both at level and difference				
Variable	**Model**	**Level**	**1st difference**	**I(1)**
COINCIDENT_INDEX	**Intercept**	0.314058	-4.043937***	I(1)
	intercept and trend	-2.246476	-4.102787***	
CREDIT_GDP	**Intercept**	1.367715	-4.710233***	I(1)
	intercept and trend	-1.637558	-5.038340***	
CAP_ADE	**Intercept**	-0.922641	-10.50067	I(1)
	intercept and trend	-1.721493	-10.46776	
FCI	**Intercept**	-2.190943	-9.326491***	1(0)
	intercept and trend	-3.303273**		
CPI	**Intercept**	-2.359046*	-5.994950***	1(1)
	intercept and trend	-2.850068	-5.968672***	

Source: Author's computation

Table 6.17: Weak Exogeneity test

Variables	**Chi-square**	**Probability**	**Outcome of the Variables**
Coincident index	6.269637	0.012282	Endogenous
Credit GDP	3.709370	0.054108	Endogenous
Capital adequacy	0.629009	0.427719	Exogenous
Financial Condition Index	0.000342	0.985251	Exogenous
Consumer price index	0.002892	0.957116	Exogenous

NB: we imposed restriction on α (alpha restriction of the VECM) to be able to identify the endogenous variables and ascertain the robustness of our model.

Source: Author's computation

Table 6.18: Block Exogeneity Granger causality Results based on VECM

	Independent Variables				
Dependent Variable	**χ-Statistics of lagged 1st differenced term (p-value)**				
	Δ Credit_GDP	**Δ ln_Coin**	**ΔFin_index**	**Δ cap_ade**	**Δ CPI**
Δ Credit_GDP	--	11.3973** [0.0224]	3.6417** [0.1754]	16.3663** [0.0026]	18.6913** [0.0009]
Δ ln_Coin	6.6339** [0.1565]	--	1.8259** [0.7677]	4.4077 ** [0.3536]	2.1686** [0.7048]
ΔFin_index	3.1249 [0.5371]	4.3291 [0.3633]	--	1.0713 [0.8988]	2.4629** [0.6513]
Δ cap_ade	2.806049 ** [0.5908]	3.0087 [0.5564]	16.1248 ** [0.0029]	--	2.9981** [0.5581]
Δ CPI	9.2297** [0.0556]	8.9856 ** [0.0615]	15.33127** [0.0041]	5.2897 ** [0.2588]	--
Note that ** denotes 5 % significant level and […] represents p-value.					

Source: Author's computation

Chapter 7

BANK LENDING TO SMALL AND MEDIUM SCALE ENTERPRISES (SMES) AND BUSINESS CYCLE IN SOUTH AFRICA AFTER THE GLOBAL FINANCIAL CRISIS

7.1 INTRODUCTION

What have we done so far? In Chapter 4, we examined the demand side of credit procyclicality as occasioned by the activities of non-financial firms during a business cycle. In Chapter 5, we investigated the supply-side phenomenon of credit procyclicality. We tackled questions on how increase in bank regulation during financial crisis amplifies business cycle in South Africa. Chapter 6 was an extension of Chapter 5 where we examined how bank regulation-triggered financial crisis affects credit growth. We ascertained how bank regulation can lead to a decline in credit supply in South African commercial banks. In this chapter, our major focus is on lending to Small and Medium-scale enterprises (SMEs) during a financial crisis.

Most of the studies that have been done on SME lending during the global financial crisis in South Africa are mainly qualitative (Coetzee, 2009; Fatoki and Garwe, 2010; Abor and Quartey, 2010; Fuchs *et al.*, 2011). Hence this chapter will be a major contribution to the quantitative literature on SME lending in South Africa. We also expect that our result will give some guidance to policy makers and researchers on how to create economic policies that will boost bank lending during crises given SMEs' contribution to output and employment creation. SMEs have been established as the pillars of economic growth, income and employment generation in most developed and developing countries. For instance, Abor and Quartey (2010) and National Credit Regulator (NCR, 2011) assert that 91% of formal enterprises in South Africa are SMEs, contributing between 52% to 57% to GDP and 61% to employment. According to United Nations Industrial Development Organisation (UNIDO)'s projections, SMEs represent over 90% of private enterprise and contribute to more than 50% of employment and of GDP in most African countries (UNIDO, 1999).

Literature has also shown that SMEs account for more than half of the developed countries labour force, and close to 60% of total employment in the manufacturing sector in developed countries (Ayyagari *et al.*, 2007; OECD, 2009).

However, SMEs are still more vulnerable than large corporations during the times of recession. Most SMEs are intemperately dependent on banks for external finance, especially for working capital. Moreover, banks' operations have become very complex and onerous for most SMEs to access finance due to higher demand for collateral to mitigate risk during a crisis (World Bank, 2009). Concern has also been raised about the prudential regulations mandate in Basel II and

Basel III that it would “accentuate the pro-cyclicality of bank lending and amplify business cycle” causing credit crunch especially in the SME sub-sector (Griffith-Jones (2005:4); Gottschalk (2010).

The goal of this chapter is to investigate the impact of the global financial crisis of 2008 on bank lending to SMEs in South Africa using VAR modelling. We want to ascertain if bank lending to SMEs responded positively or negatively to the business cycle. What are the major links and determinants of this response? In Section 7.2, we review the trends in SME lending in South Africa especially since 2007. Section 7.3 offers a theoretical framework and reviews some pertinent literature on SME lending and business cycle. We discussed the methodology to this paper in section 7.4 while Section 7.5 explicates on the results. Section 7.6 provides a brief conclusion and attempts some preliminary policy recommendations

7.2 SME LENDING IN SOUTH AFRICA

The Banks Association of South Africa (BASA) suggests that SMEs are the major drivers of inclusive growth and development in South Africa (BASA, 2014. SMEs makeup 91% of formalised businesses, providing employment to about 60 per cent of the labour force and total economic output of the sector accounts for roughly 30 per cent of GDP and 25% of fixed gross capital formation. SMEs also promote the development of new industries in a country’s economy. For instance, it is suggested that SMEs in the BRICS (Brazil, Russia, India, China, and South Africa) countries are able to develop a platform for local, regional and international growth (BASA, 2014). Rhyne (2008: 57) stated that most SME development is fundamental to any economy because of the crucial role that SMEs play in developing the private sector. SMEs are also usually seen to bridge the gap between the informal economy and corporate sector of any economy. One should not overlook the doggedness and ability of most SMEs to survive and promote innovation in developed countries.

The South African National Small Business Act of 1996 defines a ‘small business’ as “a separate and distinct business entity, including co-operative enterprises and nongovernmental organisations, managed by one owner or more which, including its branches or subsidiaries, if any, is predominantly carried on in a sector or subsector of the economy”. The Act divides small businesses into a number of categories as reflected in Table 7.1.

Table 7.1: Classification of SMEs in South Africa

Category of SME	Description
Survivalist enterprise	Operates in the informal sector of the economy Mainly undertaken by unemployed persons Income generated below the poverty line, providing minimum means to keep the unemployed and their families alive Little capital invested, not many assets Not much training Opportunities for growing the business very small
Micro enterprise	Between one to five employees, usually the owner and family Informal (no licence, formal business premises, labour legislation) Turnover below the VAT registration level of R300 000 per year Basic business skills and training Potential to make the transition to a viable formal small business
Very small enterprise	Part of the formal economy, use technology Less than 10 paid employees Include self-employed artisans (electricians, plumbers) and professionals
Small enterprise	Less than 100 employees More established than very small enterprises, formal and registered, fixed business premises Owner managed, but more complex management structure
Medium enterprise	Up to 200 employees Still mainly owner managed, but decentralised management structure with division of labour Operates from fixed premises with all formal requirements.

Source: National Small Business Act of 1996

In contrast to the definition of the National Small Business Act, the four biggest banks in South Africa do not use the same definition. They apply the annual turnover value to define SMEs in South Africa. ABSA, Standard Bank and FNB define SMEs as a business entity with a turnover of at least R10 million, while Nedbank defines SMEs as entities with a turnover of at least R7.5 million.

The Finscope Survey introduced the Business Segmentation Measure (BSM) which divides SMEs into eight distinct groupings/segments with clearly distinguishable characteristics. BSM 1 refers to very small, owner-operated, informal traders, trading largely on footpaths and pavements (the smallest of the SMEs), while BSM 8 refers to registered small businesses, trading out of fixed businesses premises, with up to 200 employees (the upper end of the SME scale).

For the purposes of this study three broad categories have been defined. The survivalist category groups BSM segments 1 to 3. Table 7.2 shows that this group incorporates 3.3 million entrepreneurs. The typical characteristics of this group include the following: Informal traders; monthly turnover of R4 000 or less; only 10% of the group employs anyone other than the entrepreneur; owners tend to be black females; 80% have not completed high school; and fewer than 1% of these businesses have ever taken a personal or business loan. The Finscope South

Africa Small Business Survey (Finscope, 2010) survey showed that over R7 billion was utilised in the starting up of these businesses which was almost exclusively raised from the individuals' own savings and from family and friends in 2010.

The mid-level category which incorporates BSM segments 4 to 6 includes 1.7m entrepreneurs with the following characteristics: the dominant activity is trading; 75% informal, 25% registered; 65% have monthly turnovers higher than R4 000 pm; 40% of these businesses have more than 1 employee (other than the owner); owners are largely black, and comprise 50% women and 50% men; 40% have completed high school; and fewer than 1% of these businesses have ever taken a personal or business loan; R13.7bn was utilised in the starting up of these businesses which was almost exclusively raised from the individuals' own savings and from family and friends.

The third category is made up of small businesses (the upper end of the micro enterprise market) and accounts for 554 751 businesses or 9.9% of the SMEs in the country.This group is dominated by service providers (services sector); 76% of the businesses are registered; 66% have one or more employees; the owners are equally split between men and women; 83% have completed high school; 30% are black entrepreneurs, the rest are white; 9% of these businesses have received a business loan; 40% use a credit card;16% have a bank overdraft; R12.8 bn was utilised in the starting up of these businesses for the period covered by the survey. Under 10% of the entrepreneurs in this category report having accessed their start-up capital from a bank, and 14% indicate that they have borrowed from a bank at some point in their lives. The balance was raised from personal savings, family and friends. A significant percentage of this group (30%) would not disclose where they sourced their start-up capital from. It is therefore conceivable that the figure of R12.8 bn could be a lot higher – perhaps closer to R15bn.

Table 7.2 shows the breakdown of the SMMEs with Survivalist (BSM 1-3) at 60%, Mid-level businesses (BSM 4-6) at 30% and Small businesses (BSM 7-8) at 10%. Thus a preponderance of SMEs' in South Africa are in the microenterprise category and are predominantly owned by women and blacks.

Table 7.2: Introduction to BSM Segments

Category	BSM segment	No of businesses	Percentage	Total per category	% per category
Survivalist Level	BSM 1	1 116 447	20.00%	**3 348 964**	**60.00%**
	BSM 2	1 121 429	20.10%		
	BSM 3	1 111 088	19.90%		
Mid-level Businesses	BSM 4	555 875	10.00%	**1 676 052**	**30.10%**
	BSM 5	557 651	10.00%		
	BSM 6	562 526	10.10%		
Small Businesses	BSM 7	275 873	4.90%	**554 751**	**9.90%**
	BSM 8	278 878	5.00%		
	Total	**5 579 767**	**100%**	**5 579 767**	**100%**

Source: Author's analysis: January 2013

South Africa's financial market lacks institutions catering for the lower end of the SME market. Limited access is due largely to the high administrative costs of small-scale lending, the perception that risk is high in lending to smaller enterprises, and small enterprises' lack of collateral and financial records. Access to finance by SMMEs is a major concern in South Africa. More than 41% of SMME do not have access to financial services (Finscope, 2010; Fuchs *et al.*, 2011). Many researchers support the view that lack of access to finance is the major hindrance to growth of SMEs in South Africa (Christianson, 2005). Financial Market Trust (2006) finds that only 2% of new SMMEs in South Africa have access to bank loans. Foxcroft *et al.* (2002) observed that 75% of bank credit applications by new SMEs in South Africa are rejected.

The National Credit Regulator report (NCR, 2011) was apprehensive that despite the various forms of funding programmes available to SMEs in South Africa, most SMEs are still inhibited by funding problems. The major funding programmes available are Khula Enterprise Development Fund (Khula), the National Youth Development Agency (NYDA), the Small Enterprise Development Agency (SEDA) and Tshumisano Trust.

NCR (2011: 11) discussed why bank lending to SMEs is still low despite all efforts made by the government to enhance lending to the sector. Firstly, banks are usually faced with information asymmetry problems because of information opacity of most SME borrowers in South Africa. Most banks complained that monitoring costs and evaluation of most projects are too high. Coetzee (2009: 449) also indicates that most SMEs lack "financial and business literacy and capability" to ascertain the financial products and services available to them. This was supported by NCR (2011) and Fuchs *et al.*, 2011). Beck and Cull (2013) examined bank lending to SMEs in Africa, and concluded that bank financing in Africa is less robust and significant than in other developing countries. While bank loans devoted to financing SMEs in Africa amount to only 5.4%, the figure

for bank loans from other developing countries is about 13.1%. Commercial banks approval for loan applications to SMEs is 81.4% in other non-African developing countries and only 68.7% in African developing countries. Beck and Cull (2013) believed the reason for this high disparity is the high cost and risk of bank financing to SMEs in Africa compared to the rest of the world, adding that macroeconomic volatility and business cycle also play a major role.

Despite the available credit guarantee schemes in South Africa, the level of “downscaling and financial inclusive” in South Africa commercial banks are still low. Most commercial banks still consider SMEs highly risky due to their lack of collateral and low capitalisation. In their bid to maximise profit banks cannot risk the moral hazard problems from SME borrowers. One should not overlook some regulatory and legal issues encountered by banks in enforcing pledged collateral and honouring business treaties. Fuchs *et al.* (2011) assert that commercial banks in South Africa prefer to invest in government securities which are safer rather than lending to small firms. They believe that SMEs are still vulnerable in South Africa due to high cost of doing business and lack of working capital problem faced by most small firms.

The global financial crisis of 2008 further impaired the access to finance by SMEs in South Africa. Most banks tightened their policies and processes of loan application resulting in fewer successful loans disbursed. SMEs are seen as risky and costly to finance. Fochs *et al.* (2011) believe that the sharp rise in interest rates in 2007 negatively affected consumption-led growth in South Africa which trickled down to affect bank profit from 2008 to 2009. Consequently, most commercial banks became stricter in monitoring risky loans. Most banks also experienced a reduction in loan application between 2007 and 2008. OECD (2009) also indicated that the global financial crisis affected SME financing through reduced demand for goods and services and through credit rationing from the commercial banks.

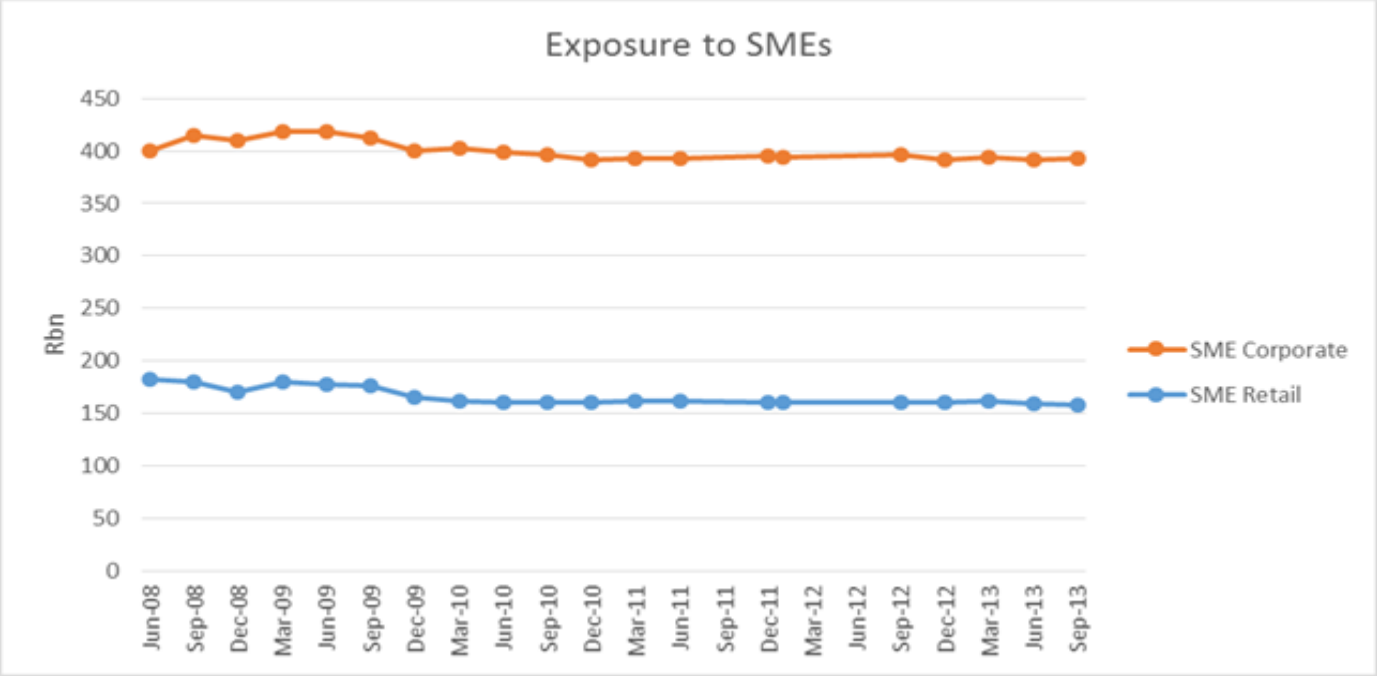

Figure 7.1: Trends in Bank lending to SMEs (2008-2013)

Source: SARB BA200 (2014)

Figure 7.1 depicts trends in bank lending to SMEs between 2008 and 2013. The graph shows that there was a reduction in lending during the global financial crisis of 2008 and 2009.

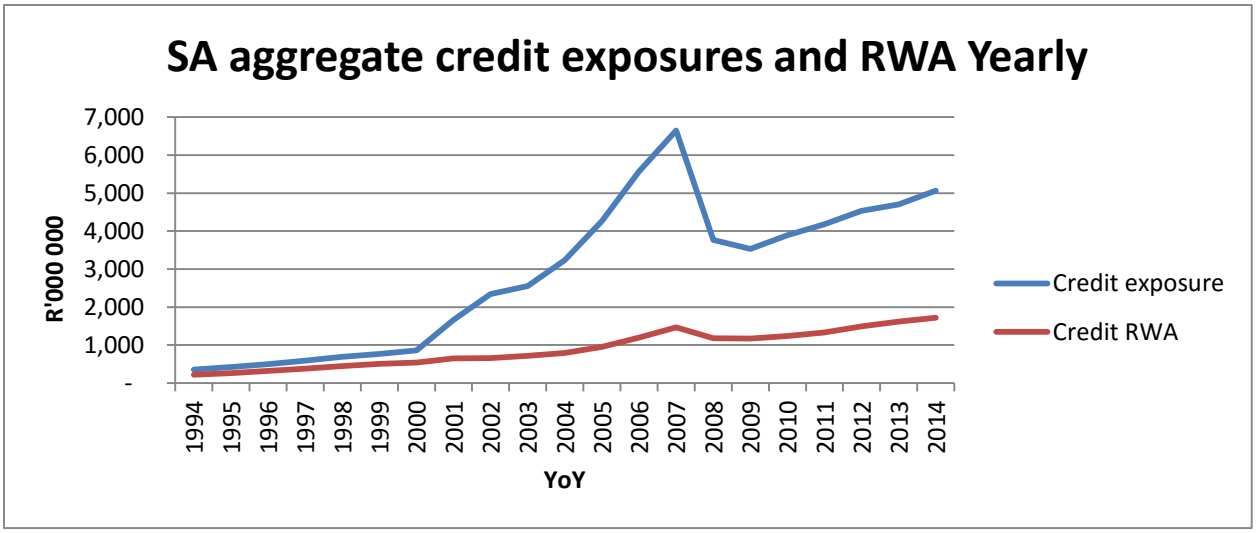

Figure 7.2: Aggregate credit exposures and RWA – Year on Year

Source: SARB BA200 and DI500 , (2014)

Figures 7.2 and 7.3 give a holistic picture of South African annual credit exposure and RWA(risk weighted asset) between 1994 and 2014. The figure also shows a drastic reduction in credit between 2007 and 2009. SMEGCE(Small medium enterprise gross credit exposure) and SMEGE(Small medium enterprise gross exposure) were also very gloomy during the global financil crisis of 2007 and 2009.

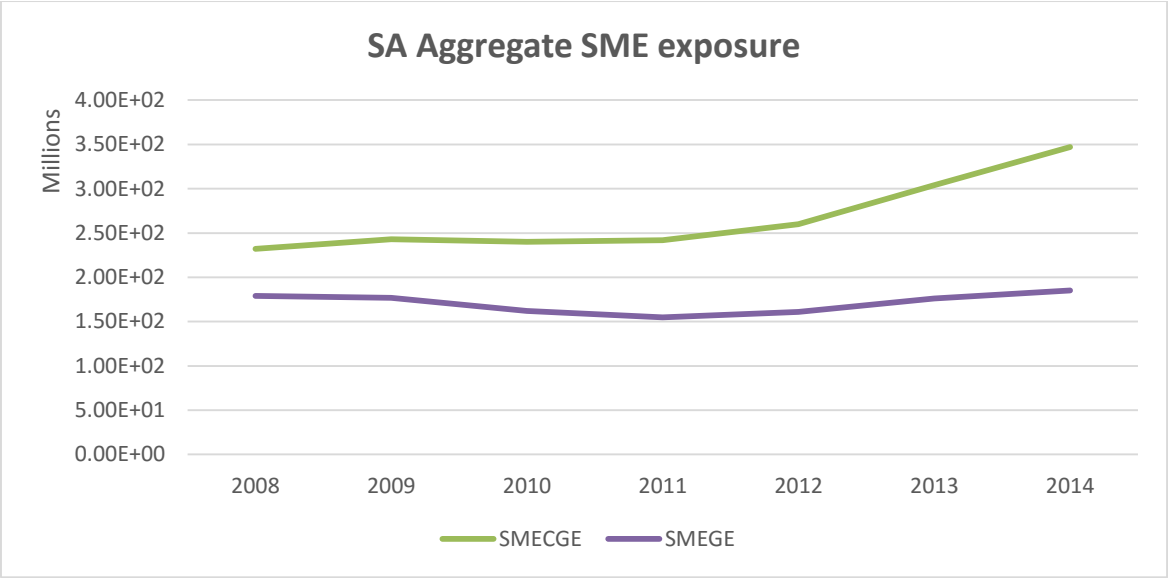

Figure 7.3: SME retail and corporate exposures

Source: SARB BA200, (2014)

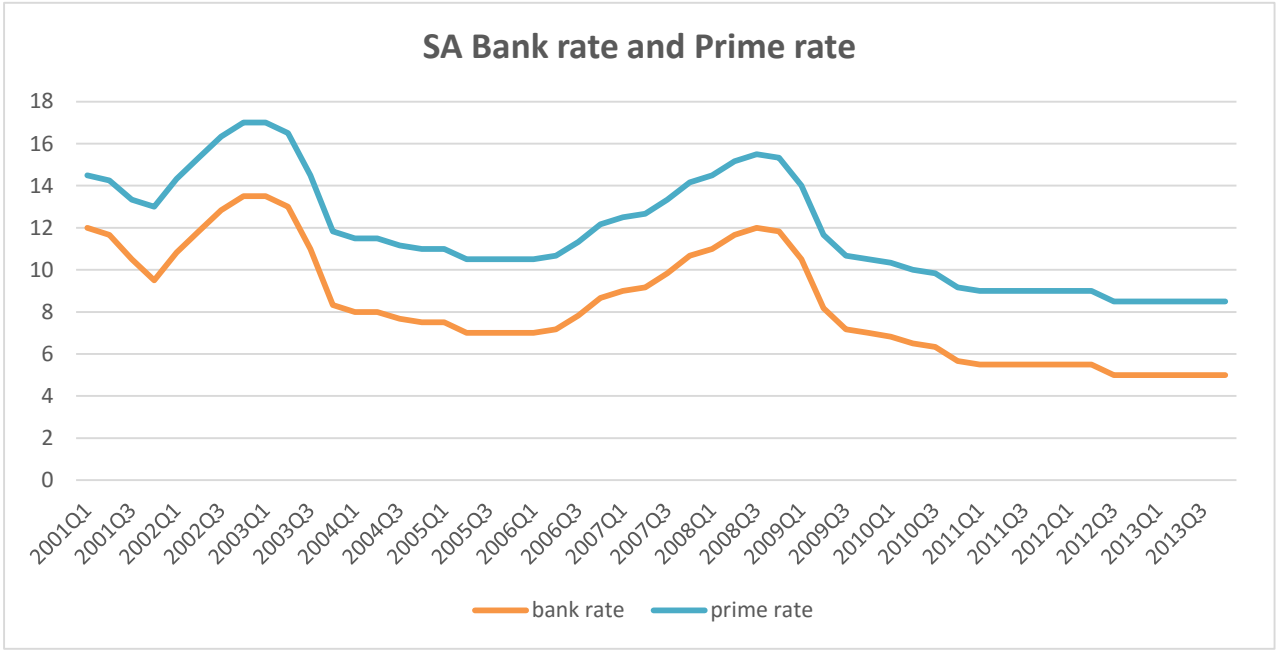

Figure 7.4: South African bank rate and prime overdraft rate

Source: SARB Database, (2014)

The lending behaviour and criteria of most commercial banks changed during business cycle. One will observe that the SARB policy rates in 2003 to 2005 were relaxed due to weak international demand before rising again in 2006. However, at the peak of the global financial crisis of 2008, bank lending rate fell generally during the financial crisis. Therefore it will be important to investigate the causal factors in SME loans demand due to the decrease in bank rate. This is shown in Figure 7.4.

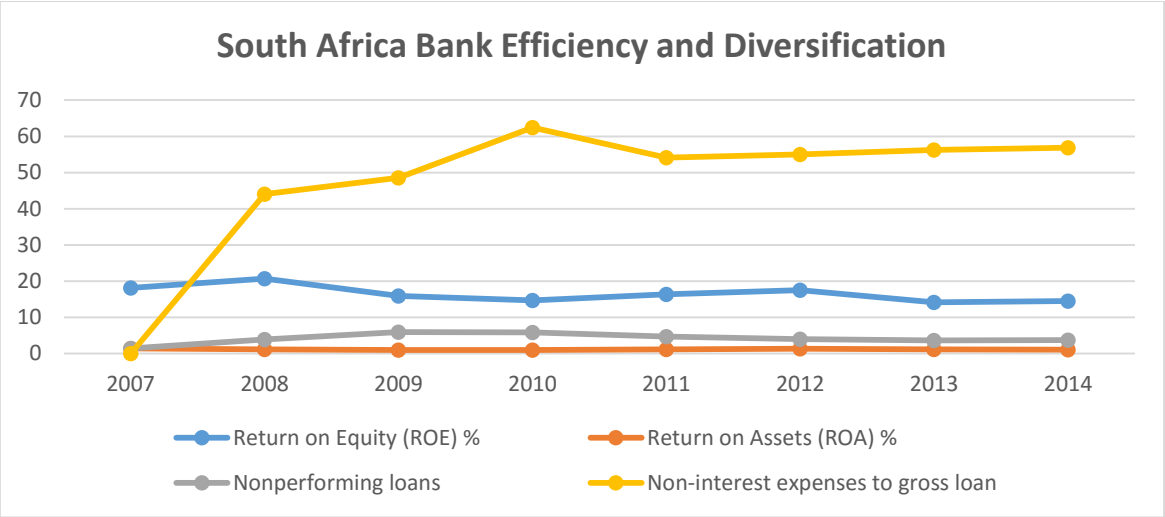

Figure 7.5: South African bank efficiency, profitability and diversification
Source: IMF Financial Soundness Indicators (FSI), (2015)and SARB, (2014)

Table 7.3: South African bank performance indicator (efficiency and diversification)

Variables	2007	2008	2009	2010	2011	2012	2013	2014
Return on Equity (ROE) %	18.1	20.65	15.9	14.64	16.39	17.50	14.18	14.47
Return on Assets (ROA) %	1.4	1.15	0.94	0.97	1.15	1.27	1.11	1.06
Nonperforming loans (NPL)	1.4	3.9	5.9	5.8	4.7	4.0	3.6	3.7
Non-interest expenses to gross loan	42.40	44.01	48.58	62.43	54.08	55.01	56.2	56.9

Source: IMF Financial Soundness Indicators (FSI), (2015) and SARB, (2014)

Non-performing loans (NPL) are a good measure of bank performance that captures the quality of bank loans or impaired loans. An increase in NPLs generally shows inefficiency in lending. In this study we want to ascertain if the NPLs will affect bank lending to SMEs after the global financial crisis. Table 7.3 shows that the NPL was at its highest point (5.9%) during the global financial crisis before falling to 3.7 in 2014. Business cycle has a huge effect on the quality of loans to SMEs given the fact that during period of recession, banks will have many defaulters which might affect the amount of loans given to enterprises.

Figure 7.5 also depicts the flow of ROA and ROE. ROA and ROE measure the level of efficiency of the banks. The ratio of ROA and ROE decreased during the period of crisis. ROE and ROA are used as a performance indicator to evaluate profitability. A non-interest expense to gross loan is another indicator that measures the level of diversification of the banks away from traditional lending activities.

ROA is found by expressing a bank's net income as a proportion of its total average assets in a given period. Both ROA and ROE went down in 2009, vividly indicating the impact of the financial crisis. The ROE continued to fall even in 2010 and rose in 2011 but went down again in 2013. Most of the performance indicators are sensitive to periods of crisis and might drastically affect and influence lending to SMEs in South Africa.

Issues arising from the implementation of Basel Accord in South Africa are relevant, especially its impact on bank lending to SMEs. Many studies have raised concern on the procyclicality nature of Basel II. Altman and Sabato (2005) affirmed that Basel II might affect bank lending to SMEs due to banks' perception of SMEs as being higher risk, hence a higher capital requirement is required to safeguard loan default. The study further indicated that most SMEs have raised concerns on the onerous effect of Basel II, especially in their ability to get loans from commercial banks.

According to Altman and Sabato (2005: 16), a "special discount in the asset calculation" is given to firms with under "$1 million for retail and $50 million" in sales for some countries. They accommodated this new change under the assumption that credit risks are less correlated to default risk and business cycle for large corporations. However, despite these reforms the rejection rate of new applications for many SME loans is still very high. Consequently, small firms tend to bear the brunt of credit constraint during this recessionary period.

PwC (2015: 19) also raised a major concern about the higher requirement and quality of capital in Basel III. In the case of Basel III, all banks must maintain a minimum common equity of 4.5% of risk-weighted assets, a conservative buffer of 2.5% above the minimum equity, and a countercyclical buffer of 2.5% of common equity. It also requires banks to maintain a net stable funding requirement (NSFR) and liquidity coverage ratio (LCR). In South Africa, the total tier 1 minimum capital requirement was about 12.5% to 12.8% in 2010, which increased to about 14% in 2014. According to PwC (2010: 21), most banks in South Africa are reliant on short-term wholesale funding from large corporations against the small deposits of SMEs. Most banks prefer large deposits from pension[7] funds and government securities rather than giving loans to SMEs.

The South African government has created the Business Development Support and Ministry of SME Development as strategic interventions aimed at encouraging bank lending in South Africa. However, there is still a special need to develop financial literacy training among owners of small firms in South Africa. It is also paramount that incentives are given to commercial banks to lend to SMEs to promote innovation and entrepreneurship.

[7] According to Regulation 28 of Pension Fund Act, Pension funds are currently restricted to a limited value of 20% of total assets to bank debt instrument.

7.3 THEORETICAL FRAMEWORK AND LITERATURE REVIEW

The relationship between economic activities and bank lending to SMEs became very topical for both policy makers and researcher after the global financial crisis. During economic downturns, when economic conditions are slow and daunting, it becomes very burdensome for banks to raise new capital, give out new loans and maintain appropriate levels of capital adequacy requirements stipulated (OECD, 2014; Hyun and Rhee, 2011; Seo, 2013). According to Hyun and Rhee (2011), banks will either reduce lending during economic downturns or raise new equity which is very expensive and burdensome. Most banks are usually forced to meet the binding prerequisite of capital requirement by reducing lending. Moreover, managers of banks are usually seen as custodians of banks' portfolios that maximise profit, meet the shareholders demands and adhere strictly to the binding capital requirement. Most banks will prefer to reduce lending rather than raise new equity that will reduce shareholders rights and privileges to avoid agency problem. Moreover, the pecking order theory suggests that most banks will not consider issuing equity as the first option in raising funds. SMEs usually face greater problems of external financing during financial crises than larger firms because of their opaqueness and cost of borrowing. Furthermore, the closure rates of SMEs tend to be higher than large firms, particularly for new entrants during financial crisis (OECD, 2015; ACCA, 2011; Wehinger, 2014).

During crisis, most banks opt to give loans to large corporations than to SMEs. Armstrong *et al.* 2013 found that tightening of credit to SMEs in the UK was persistent during the global financial crisis of 2008. The paper further found that the rejection rates for loans and overdraft to SMEs have increased since the 2008 crisis.

Macroeconomic shocks to the real sector can both impact banks and SMEs and ultimately affect the willingness and ability of banks to give out loans to SMEs. Shocks in the form of prudential regulatory shift (Basel III) can alter the lending rule of most banks and ultimately change their risky behaviour (Hancock and Wilcox, 1998; Peek and Rosengren, 1997). Hancock and Wilcox (1998) examined how SME lending and real sector activities responded to changes in banks' capital requirement in the United States between 1989 and 1992. They found that smaller banks reduced their loan portfolios and real activities during the recessionary period. Bernauer and Koubi (2002), using a federal deposit insurance database from 1990 to 1998, found that weak capitalised banks tend to increase their capital asset ratio during recessionary periods, hence most banks face the difficulty of choosing between credit crunch and increasing their asset ratio and net worth, which ultimately affects SME lending. Hale (2012) constructed a global network of 7,938 banking institutions from 141 countries to measure inter–bank lending between 1980 and 2009, and found that recession and banking crisis have negative effects on new connections. OECD (2015) found

that “access to finance” to SMEs is affected by macro-economic performance. They discovered a substantial decrease in the stock of SME loans in industrialised countries in 2013 (OECD, 2015).

Other studies (Ayuso et al., 2004; Micco and Panizza, 2006; Drumond, 2009; Seo, 2013) have also established that bank lending behaviour of most banks is mainly associated with business cycle. For instance, most banks usually redistribute their assets away from riskier borrowers during crisis. Lenders usually view SMEs as riskier than larger firms. This is likely to result in credit rationing for most SME borrowers. Most findings have established a ‘pro-cyclicality hypothesis’ which explains the relationship between bank lending conduct to SMEs and business cycle. The argument holds that banks’ lending behaviour especially during business cycle is usually different: during economic booms, most banks give out more loans to SMEs than during economic downturn.

It will be interesting to ascertain if large banks reduce lending to SMEs during a crisis. There is a new level of thinking which suggests that the reason why bank lending to SMEs suffered a shock after 2008 is because large private banks are now infiltrating the SME lending sector. For instance, Behr *et al.* (2013) provide an exciting evidence. Behr *et al.* (2013) examined 646 private firms in Germany and ascertained that an increase in borrowings from local public-owned banks significantly reduces firms’ financial constraints. SME loans might have also declined in South Africa because of the entry of large private banks such as Citi Bank and ABSA.

Why would bank lending to smaller enterprises decline sharply during a crisis? Seo (2013) looked at the case of Korea between 1999 to 2008 adopting a VECM, Panel GLS model and Clustering Fixed Effect model. He compared bank lending to SMEs with their loans to large corporates to ascertain whether there were noticeable differences during the crisis. He found that procyclicality existed between SME loans but not with large corporations.

Nier and Zicchino (2006) found that credit losses usually lead to a stronger reduction in credit supply when monetary policy is tight than when it is easy. That is, the bank lending channel of monetary policy is stronger when the banking system is weakened than when it is strong. In the face of credit losses, tight monetary policy leads to further reductions in credit supply. Fuch *et al.* (2011) studied 234 firms in South Africa and their survey shows that an economic downturn negatively affected SME finance in South Africa, and most banks perceive macroeconomic risk as a key obstacle to expanding SME finance, due to both the reduced demand for goods and services sold by SMEs and the tightened credit conditions. Fuchs *et al.* (2011) also mentioned that the interest rate rise in 2007 negatively affected bank profits from 2008. They asserted that about 70% of the banks change their SME credit management practices to include tighter origination standards and closer monitoring of high-risk loans.

According to Fuch *et al.* (2011), compared to 2007, more firms perceived access to finance as an obstacle to their business and growth in South Africa in 2010. SMEs are finding it difficult to obtain

longer term financing from commercial banks, while working capital loans provided by banks are easier to obtain (Fuch *et al.*, 2011).

As a response, the South African government promotes SME lending through a small finance agency called Khula Enterprise Finance. They provide credit guarantee for up to 50% to 90% of small business loans (USAID, 2008). They have further signed a credit guarantee agreement with the big four banks to ensure SME lending is not left out. But despite the system in place most of the commercial banks still find it difficult to give loans to SMEs during periods of crisis.

7.4 METHODOLOGY

In this section we attempt to model the relationship between bank lending to SMEs and the business cycle following the work of Berger and Udell (2004) and Cole (2012) who also build a model on small business lending: see Equation 7.1.

Equation 7.1

$$\ln B_t = \propto_o + \propto_1 \ln B_{t-1} + \delta COIN_{t-1} + \gamma BR_{t-1} + \rho NPL_{t-1} + \mu ROA_{t-1} + \pi NIE_{t-1} + \varepsilon_t \quad \ldots 7.1$$

The dependent variable (B_t) is Gross Credit Exposure lending for SME retail at time t and the explanatory variables are the lagged dependent variable(B_{t-1}). We exploit two different measures of small business lending: (1) the year over year change in the ratio of the gross exposure to total assets of commercial banks and mutual banks (SMEA); and (2) we also employ the natural logarithm of the rand value of small business loans (IN_SME) following Cole (2012: 14), who also examined the impact of financial crisis on small business lending in the United States. The first measurement enables us to ascertain if banks in South Africa increase or decrease their small business lending relative to their total assets. The second measurement allows us to ascertain the change in the amount of loans to SMEs. The study period (2008–2014) captures the period of the crisis including the post-crisis period (global economic recession brought about by the financial crisis).

We also added the business cycle coincident index $(COIN_t)$, lagged value of other control variables which are Bank rate (BR_{t-1}), Nonperforming loans (NPL_{t-1}), Return on Asset (ROA_{t-1}) and Non-interest expenses (NIE_{t-1}) in the model. To analyse the procyclicality issue, the VAR model was adopted because of its flexibility, compactness and ability to capture "contemporaneous" relationships in a model (Brooks, 2014: 335).

7.5 MODEL ESTIMATION AND DISCUSSION

7.5.1 Variable definition and data sources

The data set for the study covers 6 years from 2008M1 to 2014M12. This period covers the incidence of the global financial crisis (2008–09) and post crisis. The variables were obtained from

SARB. South African banks are required to submit banking financial and risk data to SARB at stipulated intervals: monthly, quarterly, half yearly and annually. SARB aggregates this data to reflect a country consolidated view and publishes it on their website. Aggregated bank lending was sourced from the SARB Database (BA200) for the period 2008 to 2014. Before the implementation of Basel II in South Africa, banking regulations did not stipulate risk weights for exposures to SMEs. Banks were not required to disclose their lending to SMEs on the forms they submitted to SARB. It is for this reason that the impact of financial crisis on bank lending to SMEs in South Africa was only assessed from the period when the country's banks started adopting Basel II, from 2008 onwards.

Definition of variables

SME Gross credit exposure (SMEA): SARB categorised credit risk exposures according to the different asset classes. Corporate exposures, public sector entities, local government and municipalities, sovereign, banks, securities firms and retail exposures are some examples of loans and advances exposures requiring disclosure on the credit risk form (SARB, 2014).

Coincident Index (COIN): The South African coincident index is the proxy that we adopted to capture business cycle index. We believe that coincident index will accurately capture business cycle and the shocks that will affect bank loans during recession and boom period. Seo (2013) used aggregate GDP as a measure of business cycle. However, the aggregate GDP may not be a very good measure or proxy for business cycle. Real GDP is usually biased towards changes in agricultural production which might cause bias to the economic activities. Therefore, the composite coincident index is a better indicator than real GDP or GDP growth (Mohr, 2012: 76). We also believe that coincident index will accurately capture business cycle and the shocks that will affect bank loans during recessions and boom periods.

Bank lending rate (BR): is employed in this study as a measure of the cost of funds to SMEs. Higher lending rates prevent excessive growth in bank lending and economic activities, amplify the business cycle and cause banks to reduce their supply of credit to SMEs.

Non-Performing Loan (NPL): NPLs are ratios that estimate the magnitude of loans that are in default. NPLs usually increase during financial crisis period sand will adversely affect SME lending.

Return on asset (ROA) and Return on Equity (ROE): these ratios are an indication of how profitable and efficient the commercial banks are in managing their asset allocation in South Africa. It will be interesting to examine the relationship between ROA, ROE and SME lending.

Non-interest expenses to gross income (NIE): measure the proportion of bank's total income that has been generated by non-traditional and non-lending activities. It is generally a good measure of diversification and efficiency of the banks away from lending activities. What we want

to measure is the extent to which the efficiency of the banking system affects the ability of banks to lend to SMEs after the crisis. SME loans are usually small but they involve the same administrative costs as loans to corporates or government securities. It might be interesting to ascertain whether banks are diversified from the sensitivity of interest income or are more inclined towards expanding more credit to SMEs.

Table 7.4: Definition of Variables

VARIABLES	*A priori* Expectation	DEFINITIONS AND SOURCES
SME Gross credit Exposure	Dependent variable	SMEA according to the South African Reserve Bank is the gross amount of credit extended before the application of credit risk to SMEs.
Business Cycle Proxies	(+): We expect business cycle to vary directly with SME credit from perspective of the credit procyclicality theory	The South Africa Composite coincident index captures the current business cycle in South Africa (SARB)
Bank lending rate	(-): we expect bank rate and SMEA to move in the opposite direction	Bank lending rate is the rediscounted prime rate for lending to the banks
Non-performing loans	(-): we expect NPLs and SMEA to move in the opposite direction	NPLs to net provision capital are ratio that estimates the number of loans that are in default.
Return on asset	(+): we expect return on asset and SMEA to move in the same direction	Return on asset is the ratio of net income over total assets in South Africa commercial banks
Non-interest expenses to gross income	(-): we expect Non-interest expenses and SMEA to move in the opposite direction	Non-interest income to gross income is usually used in empirical studies as a proxy for diversification.

7.5.2 Estimation method

This study employed the VAR based co-integration and VEC models accompanied by impulse response and variance decomposition. In estimating the VAR, this study took into account the fact that most macroeconomic variables are usually non-stationary at level, hence we employ VAR based co-integration tests using the methodology developed by Johansen (1995).

Contemporaneous relationships exist between SME lending and business cycle: in other words, there are no unique dependent or independent variables. The model provides a way to incorporate such relationships (Sim, 1980; Bernanke, 1986).

The purpose of cointegration tests is to test whether a long-run relationship exists between the variables. Co-integration will also be tested to determine the need of using a VEC model. Cointegration will help establish whether there is a long-run relationship between business cycle and SME gross credit exposure in South Africa.

The VECM has co-integration relations built into the specification so that it restricts the long-run behaviour of the endogenous variables to converge to their co-integrating relationships while allowing for short-run adjustment dynamics. Thus, the VECM specification will be used to analyse the short-run relationships between the variables. VECM will also enable us to derive information on both the short- and long-run dynamics of the model and estimate the speed of adjustment.

7.5.3 Summary statistics

Table 7.5 presents the correlation matrix. It shows the pair-wise contemporaneous correlation matrix for the residuals in the equation. The largest observed correlation is -0.51 between the non-interest expenses and bank rate variable. There is a positive relationship between the SMEA and business cycle showing 0.247 in Table 7.5. It is also worth noting there is a negative correlation between business cycle and return on equity (-0.008). The results suggest the evidence of procyclicality between credit to SMEs and the business cycle.

Table 7.5: Residual Correlation Matrix

	SMEA	IN_COIN	BANK RATE	RETURN_ON_ EQUITY	NON_INTEREST_EXPENSES_
SMEA	1.000000	0.246818	0.131160	0.017399	-0.046342
IN_COIN	**0.246818**	**1.000000**	**0.019564**	**-0.080298**	**0.208176**
BANKRATE	**0.131160**	**0.019564**	**1.000000**	**-0.087197**	**0.286118**
RETURN_ON_EQUITY	**0.017399**	**-0.080298**	**-0.087197**	**1.000000**	**-0.510643**
NON_INTEREST_EXPENSES_	**-0.046342**	**0.208176**	**0.286118**	**-0.510643**	**1.000000**

Source: Author's computation

Table 7.6: Covariance Analysis

Covariance Analysis: Ordinary					
Covariance					
Correlation					
t-Statistic	**SMEA**	**IN_COIN**	**BANKRATE**	**NON_ INTEREST_ EXPENSES_**	**RETURN_ON_ EQUITY**
SMEA	28.00870				
	1.000000				

IN_COIN	-0.263135	0.004867			
	-0.712719	1.000000			
	-8.561511	-----			
BANKRATE	8.952722	-0.065566	4.614187		
	0.787519	-0.437538	1.000000		
	10.76725	-4.100045	-----		
NON_INTEREST_ EXPENSES	-8.549399	0.062541	-4.143607	15.62213	
	-0.408714	0.226820	-0.488046	1.000000	
	-3.773444	1.962369	-4.711579	-----	
RETURN_ON_ EQUITY	7.814319	-0.025280	5.415702	-5.462332	8.705541
	0.500434	-0.122819	0.854494	-0.468393	1.000000
	4.870472	-1.042785	13.86072	-4.467070	-----

Source: Author's computation

Table 7.6 enhances the evidence of the relationship between SMEA and the business cycle. Table 7.6 depicts a very strong covariance between SMEA, bank rate and business cycle: SMEA and bank rate (0.78), SMEA and business cycle (-0.71), and bank rate and return on equity (0.50).

7.5.4 Unit root tests

We carried out unit root tests in order to avoid spurious regression that might occur when running a regression with non-stationary variables. A spurious regression will indicate a statistically significant relationship between variables in the model, when it is just a contemporaneous correlation (Enders, 2004; Brook, 2008). A stationary series can be defined as one with a constant mean, constant variances and constant auto covariance for each given lag. If a series is non-stationary it will be differenced d times before it becomes stationary, then it is said to be integrated of order d. A non-stationary time series will have a time varying mean and variance or both (Brooks, 2008: 319).

This study uses four types of tests to examine the univariate properties of the variables in this model: ADF, PP, KPSS and Ng Perron tests. Maddala and Kim (1998) suggested that an important

way of overcoming the problem of failing to reject a null hypothesis when it is false is to use different tests and compare them.

The ADF and PP test results are given in Tables 7.24 and 7.21 respectively. The tests are applied to the data under two different deterministic trend assumptions: a constant and no trend, and both constant and trend. The ADF test helps determine whether each variable in the model has an intercept, stochastic trend or deterministic trend (Seddighi *et al.*, 2000).

The results of the PP test are similar to those of ADF test. One advantage of the PP tests over the ADF tests is that the PP tests are robust to general forms of heteroskedasticity in the error term at levels. Another advantage is that the user does not have to specify a lag length for the test regression. The PP tests tend to be more powerful than ADF test but are subject to more severe size distortions. The size problem in PP test is more pronounced because the actual size of the variable is larger than the nominal one when autocorrelation exists in the model. Moreover, the unit root tests lead to false non-rejection of the null if we do not consider the structural breaks. KPSS test results are presented in Table 7.7. The KPSS test and Ng-Perron stationary test are improved versions of unit root test: they are more powerful tools in testing for unit roots. However under KPSS test, the data usually appears stationary by default if there is little information in the sample (Brook, 2008: 331). The KPSS approach is based on a Lagrange Multiplier score testing principle and assumes the univariate series can be decomposed into a deterministic trend, a random walk and a stationary error. The KPSS test statistic is computed based on residuals from a regression with an intercept but no time trend. (Kwiatkowski *et al.*, 1992: 160). We tried to compare ADF/PP test results with KPSS test results to ensure the same conclusion is found, as suggested by Brooks (2008). The result of KPSS and NG Perron unit root tests are given in Tables 7.7 and 7.8.

Table 7.7: KPSS stationarity test result

Variable	Model	Order of integration		
		Level	**1st diff.**	
SMEA	Intercept	1.104592***	0.145590	I(1)
	Intercept & Trend	0.226563***	0.082007	
COINCIDENT_ INDEX	Intercept	0.812440***	0.280316	I(1)
	Intercept &Trend	0.172740**	0.132994	
BANKRATE	Intercept	0.816248***	0.279886	I(1)
	Intercept & Trend	0.255255***	0.055400	
RETURN_ON_EQUITY	Intercept	0.640431**	0.343244	I(1)
	Intercept & Trend	0.210852**	0.162335	
RETURN_ON_ASSET	Intercept	0.174354		I(0)
	Intercept & Trend	0.178217		
NON_PERMONING LOANS	Intercept	0.529137*	0.663598**	I(1)
	Intercept & Trend	0.243387***	0.222511**	
NON_INTEREST_EXPENSES	Intercept	0.776896***	0.023264	I(1)
	Intercept & Trend	0.230732***	0.012378	

For **KPSS:** Null hypothesis is stationary. (*, **, *** is not significant at 1%, 5% and 10% respectively)

Source: Author's computation

Table 7.8: NG Perron stationarity test

Model	Variables			
		Ng-Perron Level	**1st diff**	**DECISION**
Intercept	**SMEA**	-2.44446	-38.4679***	I(1)
Intercept & Trend		-2.88678	-39.0677***	
Intercept	**COINCIDENT_ INDEX**	-3.83335	-10.5005**	I(1)
Intercept & Trend		-7.18684	-12.5650**	
Intercept	**BANKRATE**	-2.10790	0.26967***	I(1)
Intercept & Trend		-13.9989	0.26225***	
Intercept	**RETURN_ON_EQUITY**	0.57674	1.09026***	I(1)
Intercept & Trend		-1.03211	0.41472***	
Intercept	**RETURN_ON_ASSET**	0.87972***		I(0)
Intercept & Trend		0.63298***		
Intercept	**NON_PERFORMING**	-3.45682	8.02284***	I(1)
Intercept & Trend		-5.34737	-15.2782*	
Intercept	**NON_INTEREST_EXPENSES**	-0.21419	3.44957***	I(1)
Intercept & Trend		-1.82885	2.12575***	

Note: *, **, *** implies significance at 10%, 5% and 1% level

Source: Author's computation

The unit root tests conducted revealed that all the variables have unit root in their levels except ROA which is stationary at levels, thus other variables have to be differenced in order to ensure stationarity. The result is confirmed using KPSS and NG Perron tests.

7.5.5 Optimal lag length selection

Table 7.9: VAR lag length selection criteria results

VAR Lag Order Selection Criteria Endogenous variables: SMEA IN_COIN BANKRATE RETURN_ON_EQUITY NON_INTEREST_EXPENSES						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-419.2357	NA	0.263489	12.85563	13.02151	12.92118
1	-49.72888	671.8307	7.73e-06*	2.416027	3.411324*	2.809316*
2	-25.13312	40.99293	7.93e-06	2.428276	4.252989	3.149307
3	-9.889148	23.09692	1.10e-05	2.723914	5.378041	3.772685
4	17.98447	38.00948	1.08e-05	2.636834	6.120376	4.013347
5	46.59143	34.67510	1.08e-05	2.527533	6.840489	4.231787
6	71.04109	25.93146	1.31e-05	2.544209	7.686580	4.576205
7	115.0998	40.05337*	9.56e-06	1.966673*	7.938458	4.326409

* indicates lag order selected by the criterion

Source: Author's computation

Having tested for unit roots, the next step is to conduct the cointegration test in order to establish whether a long-term relationship exists among the variables of interest. However, the Johansen cointegration test requires that we first determine the optimal lag length for the VAR test. A fundamental requirement in conducting Johansen (1991, 1995) cointegration tests and estimation of a VAR system, especially in its restricted VEC forms, is the choice of an optimal lag length.

The choice was made by examining the lag structure in an unrestricted VAR originally specified using the maximum number of lags (7) and VAR lag order selection criteria. This is important to avoid spurious rejection or acceptance of estimated results. If there are n variables with lag length k, for example, it is necessary to estimate n (nk+I) coefficients. The lag length also influences the power of rejecting hypothesis. For instance, if k is too large, degrees of freedom may be wasted. Moreover, if the lag length is too small, important lag dependences maybe omitted from the VAR and if serial correlation is present the estimated coefficients will be inconsistent. The widely used information criteria are AIC, SIC, HQIC, FPE and the LR test. More fundamental is the fact that the lag length selected must conserve degrees of freedom. Table 7.9 shows that LR chooses lag 5 while the others choose lag 1. We choose the optimal lag length 5 after checking lag lengths from lag 2 to lag 7 for stability test. Lag length 1 is not appropriate for a long-run VECM equation.

The fundamental rule is that the null hypothesis is always rejected if the p-value is less than 0.05. The null hypothesis for residual-based diagnostic tests is that:

Serial Correlation test:

H_0: there is no serial correlation

H_1: there is serial correlation

Heteroskedasticity test

H_0: there is no heteroskedasticity

H_1: there is heteroskedasticity

Normality test

H_0: residuals follow a normal distribution

H_1: residuals are not normally distributed.

Table 7.10 summaries the stability test for VAR residual test for the model when lag 5 was picked. The probability result for LM serial correlation test for lag 5 is 0.6467. We cannot reject the null hypothesis that there is no serial correlation in the model since the probability value is greater than 0.05. Similarly, in the case of the joint residual heteroskedasticity test. The result shows a probability of 0.3790. We also cannot reject the null hypothesis that there is no heteroskedasticity in the model. The probability result for normality test shows a probability of 0.4460. We cannot reject the null hypothesis that the residuals follow a normal distribution.

Table 7.10: VAR Residual Stability Test

Stability Test for VAR Residual	Probability Result
Residual Serial correlation LM Test	0.6467
Residual Joint Heteroskedasticity Test	0.3790
Residual Normality Test	0.4460

Source: Author's computation

7.5.6 Cointegration Test

We are interested in the apparent movement between business cycle, capital requirement and SME credit growth during the financial crisis period. We also want to ascertain whether there is a long run relationship between financial regulation, financial crisis and the SME credit growth. This study employs Johansen and Juselius's (1990) cointegration approach to examine the long-run relationship taking into account intercept and trend. This result is reported in Appendix 2. The result of the Trace and Max-Eigenvalue statistics showing the numbers of cointegrating equations (CE) are reported in Tables 7.11 and 7.12.

Table 7.11: Johansen Cointegration test results

Hypothesised No CE(S)	Trace Statistics	Critical values (5%) Trace
None**	114.8251	69.81889
At most 1**	58.25919	47.8561
At most 2**	26.94787	29.7970

*(**) denotes rejection of the hypothesis at the 5% level

Trace test indicates 2 cointegrating equation at 5% level

Source: Author's computation

Table 7.12: Johansen Cointegration Max-Eigenvalue test results

Hypothesised No CE(S)	Max-Eigen Statistics	Critical values (5%) Max-Eigen
None**	56.56586	33.8769
At most 1**	31.31132	27.5843
At most 2**	15.91310	21.1316

*(**) denotes rejection of the hypothesis at the 5% level

Max_Eigenvalues test indicates 2 cointegrating equation at 5% level

Source: Author's computation

Trace value: Using a sequential testing procedure in Table 7.11, r=0 (no cointegrating vector) against the alternative of at most one cointegration vector (r≤1), the trace test statistic is 114.82, which is greater than the 95% critical value of 69.819, thus we reject the null hypothesis of no cointegrating vectors. We now move on to the next row, the trace test statistic (58.26) is more than the critical value of (47.856), thus we reject the null hypothesis of one cointegrating vectors. In the last row, since the trace statistic (26.947) is less than the critical values of (29.797) the null hypothesis of at most two cointegrating vectors is accepted.

Eigen value: Using a sequential testing procedure in Table 7.12, r=0 against the alternative of at most one cointegration, the test statistic 56.57 is greater than 33.877 at 95% critical value, thus we reject the null hypothesis of no cointegrating vectors. We now test the null hypothesis of at most one cointegrating vector, where the eigenvalues test statistics (31.31) is greater than (27.5843). The null hypothesis of at most one cointegrating vector is rejected. In the last row, since the eigenvalues statistics (15.91) is less than the critical values of (21.131), the null hypothesis of at most two cointegrating vector is accepted. Both Trace test and Maximum Eigenvalues statistics showed that there are at most two cointegrating vectors.

This result further supports that the variables have a long-run relationship, suggesting the suitability of using the VECM. A stability test is required to ensure that the residuals of the model are not serially correlated in the long run. We further conducted a robustness test to avoid spurious regression in the model. We tested the VAR for heteroskedasticity and serial correlation. Table 7.13 depicts the various tests below. Table 7.14 summaries the stability test for VEC residual test. The probability result for LM serial correlation test is 0.1754. We cannot reject the null hypothesis that there is no serial correlation in the model since the probability values are greater than 0.05. Similarly, in the case of joint residual heteroskedasticity test, the result shows a probability of 0.1007. We also cannot reject the null hypothesis that there is no heteroskedasticity in the model.

Table 7.13: VEC Residual Stability Test

Stability Test for VEC Residual	**Probability Result**
Residual Serial correlation LM Test	0.1754
Residual Joint Heteroskedasticity Test	0.1007
Residual Normality Test	0.4376

Source: Author’s computation

Table 7.14: VEC Residual serial Correlation LM Test

VEC Residual Serial Correlation LM Tests		
Null Hypothesis: no serial correlation at lag order h		
Lags	LM-Stat	Prob
1	35.51626	0.0793
2	31.80679	0.1637
3	32.51175	0.1437
4	31.42156	0.1754
Probs from chi-square with 25 df.		

Source: Author's computation

Table 7.15: VEC Residual Heteroskedasticity Test

VEC Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares) Joint test:					
Chi-sq	**df**	**Prob.**			
722.3395	675	**0.1007**			
Individual components:					
Dependent	R-squared	F(45,21)	Prob.	Chi-sq(45)	Prob.
res1*res1	0.702660	1.155321	0.3655	47.78090	0.3604
res2*res2	0.676979	1.024598	0.4908	46.03454	0.4292
res3*res3	0.923103	5.868858	0.0000	62.77103	0.0410
res4*res4	0.766263	1.602732	0.1167	52.10589	0.2170
res5*res5	0.791587	1.856884	0.0594	53.82793	0.1723
res2*res1	0.769889	1.635686	0.1069	52.35242	0.2102
res3*res1	0.718182	1.245878	0.2937	48.83636	0.3216
res3*res2	0.731331	1.330782	0.2373	49.73052	0.2905
res4*res1	0.710050	1.197228	0.3307	48.28343	0.3417
res4*res2	0.690929	1.092912	0.4223	46.98317	0.3912
res4*res3	0.740844	1.397580	0.1999	50.37742	0.2692
res5*res1	0.678989	1.034078	0.4809	46.17126	0.4236
res5*res2	0.689149	1.083854	0.4310	46.86212	0.3960
res5*res3	0.835330	2.480015	0.0120	56.80245	0.1115
res5*res4	0.678763	1.033006	0.4820	46.15589	0.4243

Source: Author's computation

Table 7.16: VEC Residual Normality Test

VEC Residual Normality Tests Orthogonalization: Residual Correlation (Doornik-Hansen) Null Hypothesis: residuals are multivariate normal				
Component	**Kurtosis**	**Chi-sq**	**df**	**Prob.**
1	19.21682	0.493335	1	0.4824
2	2.632078	0.023175	1	0.8790
3	6.407786	2.718673	1	0.0992
4	2.292052	1.023766	1	0.3116
5	2.389294	0.566216	1	0.4518
Joint		4.825165	5	**0.4376**

Source: Author's computation

We test the VAR for heteroskedasticity, normality and serial correlation to ensure that our model is stable and the residual of the model are not serially correlated in the long run. Tables 7.14, 7.15 and 7.16 depict that there is no serial correlation, heteroskedasticity and normality problem.

7.5.7 Vector Error Correction Model

We estimated a VECM and normalised on both small medium scale retail gross exposure to total assets (SMEA) and bank rate. The result shows that business cycle and bank rate have a significant long-run impact on small and medium scale lending.

The long-run regression is provided in Equations 7.2 and 7.3.

Equation 7.2

$$SMEA = 669.6 - \ 130.04\ INCOIN_t[-10.34] + 2.46\ BR_t[\ 6.73] - 0.76 NIE_t[-5.77] \quad \ldots 7.2$$

Equation 7.3

$$\mathrm{BR_t} = -822.9 + \ 0.44 SMEA_{\mathrm{t}}[3.51] + \ 182.7\mathrm{INCOIN_t}[\ 8.76] - 1.09 ROE_{\mathrm{t}}\ [\text{-}4.11] \quad \ldots 7.3$$

Note: t values in [ ] square brackets.

Table 7.17: Vector Error Correction Estimates for SMEA

Vector Error Correction Estimates **Standard errors in ( ) & t-statistics in [ ]**					
Cointegration Restrictions: B(1,1)=1, B(2,3)=1, B(2,5)=0, A(5,2)=0, B(1,4)=0, A(4,1)=0 Maximum iterations (500) reached. Restrictions identify all cointegrating vectors LR test for binding restrictions (rank = 2): Chi-square(2) 2.675693 Probability 0.262410					
Cointegrating Eqn:	**CointEq1**	**CointEq2**			
SMEA(-1)	1.000000	-0.448979			
		(0.12768)			
		[-3.51649]			
IN_COIN(-1)	130.0435	-182.7734			
	(12.5771)	(20.8563)			
	[**10.3397**]	[-8.76346]			
BANKRATE(-1)	-2.464289	1.000000			
	(0.36606)				
	[-6.73196]				
RETURN_ON_EQUITY(-1)	0.000000	1.095034			
		(0.26606)			
		[4.11581]			
NON_INTEREST_EXPENSES_TO(-1)	0.761524	0.000000			
	(0.13177)				
	[5.77906]				
@TREND(08M01)	-0.346196	0.543367			
	(0.05408)	(0.07830)			
	[-6.40186]	[6.93912]			
C	-669.6887	822.8877			
Error Correction:	D(SMEA)	D(IN_COIN)	D(BANKRATE)	D(RETURN_ON_EQUITY)	D(NON_INTEREST_EXPENSES_TO)
CointEq1	-0.475847	0.001540	0.145580	0.000000	-0.903222
	(0.23716)	(0.00089)	(0.04058)	(0.00000)	(0.23112)
	[-2.00648]	[1.72429]	[3.58775]	[NA]	[-3.90797]
CointEq2	-0.502003	0.002591	0.067858	-0.027533	0.000000
	(0.20463)	(0.00077)	(0.03475)	(0.03021)	(0.00000)
	[-2.45327]	[3.37278]	[1.95303]	[-0.91138]	[NA]

Source: Author's Computation

The indication from Equation 7.2 is that business cycle and bank rate have a significant long-run impact on the "bank lending to SME" variable (SMEA). There is a strong and significant negative

long-run relationship between business cycle and SMEA where the t-statistics shows (-10.33). Similarly, there is also a strong and significant negative long-run relationship between SMEA and non-interest expenses where the t-statistics shows (-5.78). This result supports the evidence that South African commercial banks are sensitive and diversified from the sensitivity of interest income or are more likely to decrease their credit to SMEs. Similarly, the relationship between bank rate and SMEA is positive and significant as indicated by t-statistics of (6.73).

Table 7.17 describes the VEC estimate for SMEA. The coefficient of the error correction terms are interpreted as the speed of adjustment to the long-run equilibrium. This error correction term is valid as it is negative and significant and the coefficient is below unity. The first cointegrating equation is normalised on the SMEA variable which is the focus dependent variable of interest. Hence we will choose the Cointegrating Equation 1 in Table 7.17. The negative is to imply that if lending is above its equilibrium value then lending must fall to restore equilibrium. If lending is below its long-term value then lending must increase to reach back to equilibrium. 47.6% of the disequilibrium (gap between actual lending and its equilibrium value) in SMEA is eliminated every month. This means that for any disturbance in the system, 47.6% of the divergence from equilibrium will be restored in the next month. Full restoration takes place in about two months if there are no other shocks. This is similar to the findings of Seo (2013: 78) who established a high speed of adjustment of 0.66 in Korean banks. This result has an important policy implication because of the high sensitivity in the response of shock to the equilibrium. A business cycle will often constrain financial access for SMEs and usually will impact SMEs' creditworthiness in South Africa, especially after a global financial crisis. This study is similar to the conclusions and policy implications made by the IMF (2013) and OECD (2013) that banks typically tighten credit conditions which further deteriorates SMEs' access to finance after global financial crisis.

For Cointegrating Equation 2 in Table 7.17, this error correction term is also valid as it is negative, significant and below unity. This cointegration vector is not really the focus of our study because we do not wish to analyse the response or behaviour of bank rates following shocks to its regressors. The speed of adjustment shows that 50% of the deviation of the bank rate from its equilibrium is restored back to equilibrium within a month. If there are no other shocks to the system it takes 2 months to revert back to equilibrium.

The speed of adjustment of SMEA to its own long-run equilibrium is high as shown by the adjustment coefficient. The error correction model also describes the short-run dynamics or the adaptations of the cointegrated variables towards their equilibrium values. Our main concern is to ascertain the long-run co-movement of "bank lending to SME" variable (SMEA) and business cycle in South Africa. The result shows that business cycle has a negative and significant long-run impact on SMEA.

Robustness check for bank lending to SME model:

Table 7.18: Vector Error Correction Estimate for IN_SME

Vector Error Correction Estimates Standard errors in ( ) & t-statistics in [ ]					
Cointegration Restrictions: B(1,1)=1, B(2,3)=1, B(2,5)=0, A(5,2)=0, B(1,4)=0, A(4,1)=0 **Convergence achieved after 199 iterations.** **Restrictions identify all cointegrating vectors** **LR test for binding restrictions (rank = 2):** **Chi-square(2) 4.962235**					
Probability 0.083650					
Cointegrating Eq:	**CointEq1**	**CointEq2**			
IN_SME(-1)	1.000000	0.036396			
		(1.29275)			
		[0.02815]			
IN_COIN(-1)	-3.457472	28.93554			
	(0.60666)	(5.22124)			
	[-5.69918]	[5.54189]			
BANKRATE(-1)	-0.220543	1.000000			
	(0.01115)				
	[-19.7757]				
NON_PERFORMING_LOANS_NET(-1)	0.000000	0.122372			
		(0.03329)			
		[3.67626]			
RETURN_ON_ASSETS(-1)	0.304339	0.000000			
	(0.11752)				
	[2.58968]				
C	-1.852005	-146.0757			
Error Correction:	D(IN_SME)	D(IN_COIN)	D(BANKRATE)	D(NON_PERFORMING_LOANS_NET)	D(RETURN_ON_ASSETS)
CointEq1	-0.482855	0.017458	-1.808680	0.000000	-0.049978
	(0.12656)	(0.03019)	(1.56691)	(0.00000)	(0.03381)
	[-3.81521]	[0.57824]	[-1.15430]	[NA]	[-1.47802]
CointEq2	-0.104497	-0.001015	-0.462358	0.048881	0.000000
	(0.02753)	(0.00655)	(0.33997)	(0.15830)	(0.00000)
	[-3.79544]	[-0.15490]	[-1.35998]	[0.30879]	[NA]

We estimated a VECM and normalised on both natural logarithm of the rand value of small business loans and bank rate in the second model. We included NPLs and ROA financial variables in the model to check the model for robustness and stability. In this model we measure SMEs by using the natural logarithm of the rand value of small business loans (IN_SME). The result shows that business cycle has a significant long-run impact on SME lending.

The long-run regression is provided in Equations 7.4 and 7.5.

Equation 7.4

$$IN\_SME_t = 1.85 + 3.45\, INCOIN_t[5.47] + 0.22 BR_t[19.78] - 0.30 ROA_t[-2.59] - 0.022 DUM_t[-1.19] \quad \ldots 7.4$$

Equation 7.5

$$\mathrm{BR_t} = 146.07 + 0.03\mathrm{IN\,SME_t}[0.02] + 28.9\mathrm{INCOIN_t}[5.54] - 0.122 NPL_t\,[\text{-}3.68] + 0.009 DUM_t[2.08] \quad \ldots 7.5$$

Note: t values in [ ] square brackets

The indication from Equation 7.4 also supports the finding that business cycle and bank rate have a significant long-run impact on natural logarithm of “bank lending to SME” variable (IN_SME). There is a strong and significant positive long-run relationship between business cycle and IN_SME where the t-statistics shows (5.47). There is also a strong and significant negative long-run relationship between IN_SME and ROA where the t-statistics shows (-2.59). This result is in contrast with *a priori* expectations, since return on asset and bank lending to SMEs should be positively related. The positive relationship between bank lending (BR) and SME appears to be more of the policy rate) in Equation 7.5. An increase in SME loans would trigger an increase in the rediscounted prime rate if monetary authorities and bank perceive a possible overheating. And affecting the business cycle. Similarly, any case of asset price misalignment or excessive growth boom will ultimately amplifies the business cycle.

However, we observe that after the crisis there has been much volatility in the financial system. The model supports the evidence that South African commercial banks are sensitive and are more likely to decrease their credit to SMEs. Similarly, the relationship between bank rate and IN_SME is positive and very significant, revealed by a t-statistic of (19.78). Disproportionate development of formal financial market in South Africa thus could cause substantial decline in credit available to SME since a large proportion of the SMEs are completely excluded from the financial market.

Table 7.18 describes the VEC estimate for IN_SME. The coefficient of the error correction terms are interpreted as the speed of adjustment to the long-run equilibrium. This error correction term is valid as it is negative and significant and the coefficient is below unity. The first cointegrating equation is normalised on the IN_SME which is the focus dependent variable of interest. Hence we will choose this Cointegrating Equation 1 in Table 7.18. The negative is to imply that if lending is

above its equilibrium value then lending must fall to restore equilibrium. If lending is below its long-term value then lending must increase to reach back to equilibrium. 48.2% of the disequilibrium (gap between actual lending and its equilibrium value) in IN_SME is eliminated every month. This means that for any disturbance in the system, 48.2% of the divergence from equilibrium will be restored in the next month. Full restoration takes place in about two months if there are no other shocks. It is similar to the result of Seo (2013: 78) who established a high speed of adjustment of 0.66 in Korean banks. This result has an important policy implication because of the high sensitivity in the response of shock to the equilibrium.

For the Cointegrating Equation 2 in Table 7.18, this error correction term is also valid as it is negative, significant and below unity. This cointegration vector is not really the focus of our study because we do not wish to analyse the response or behaviour of the bank rate following shocks to its regressors. The speed of adjustment shows that 10.2% of the deviation of the bank rate from its equilibrium is restored back to equilibrium within a month. If there are no other shocks to the system it takes 2 months to revert back to equilibrium.

The speed of adjustment of IN_SME to its own long-run equilibrium is high as shown by the adjustment coefficient. Our main concern is to ascertain the long-run co-movement of natural logarithm of “bank lending to SME” variable (IN_SME) and business cycle in South Africa. The result shows that business cycle has a significant long-run impact on IN_SME.

Tables 7.22 and 7.23 show the dynamic causal interaction among the variables in the “bank lending to SME” model in a VEC form. This allows us to access the causality from one variable to the other using the chi-square test of the lagged first differenced terms. The weak exogeneity test allows us to ascertain the direction of causality in the VECM framework. The weak exogeneity test was carried out following Demetriades and Hussein (1996) and Arestis and Demetriades (1997), where restrictions are placed on each variable within the system to determine which is endogenous. In the “bank lending to SME” model, the causality between SMEA and business cycle was assessed and established. There is a bidirectional relationship between SMEA, bank capital adequacy and business cycle in South Africa.

7.5.8 Impulse analysis

Impulse response analysis traces out the responsiveness of the dependent variable in the VAR to shocks to each of the other variables. It shows the sign, magnitude and persistence of real and nominal shocks to the dependent variable. The generalised impulse response analysis delineates the reaction of dependent variables in the VAR model to shocks or restricts each of the other variables. Doan (1992) captured the factorisation of the variance-covariance matrix of the VAR using a decomposition method by ascertaining the ‘orthagonalised innovations’ in each innovation.

This method is appropriate since our objective is to trace the link between bank regulation and credit growth procyclicality in South Africa. The response of the dependent variable is identified.

Impulse response functions show the dynamic responses of a dependent variable, in this case SMEA to a one-period standard deviation shock, to the innovations of each variable determinant, in particular, the “bank lending to SME” (SMEA) and business cycle. To investigate the potential impact of the capital regulation shock, impulse response analysis was conducted. The impulse response functions show the dynamic response of the SMEA to a one-period standard deviation shock to the innovations of the system and also indicate the directions and persistence of the response to each of the shocks over a period of time.

Figure 7.6 shows that the response of SMEA to one standard deviation shock of itself is negative and persistent for over 10 months before it stabilises. Figure 7.6 part B further shows that the response of SMEA to one standard deviation shock of business cycle is positive and persistent for over 15 months before it steadies. Figure 7.6 also shows an immediate upward impact on SME lending when induced by a positively shock in the business cycle. Thereafter there a couple of swings in SME lending until about 5 and half years before SME lending stabilises. But do note again the positive effect on SME lending persists. This result is particularly interesting since SME’s have low access to credit. This vividly shows the procyclicality effect of the business cycle. The impulse analysis also supports the volatility in the financial system in South Africa when there is global financial shock.

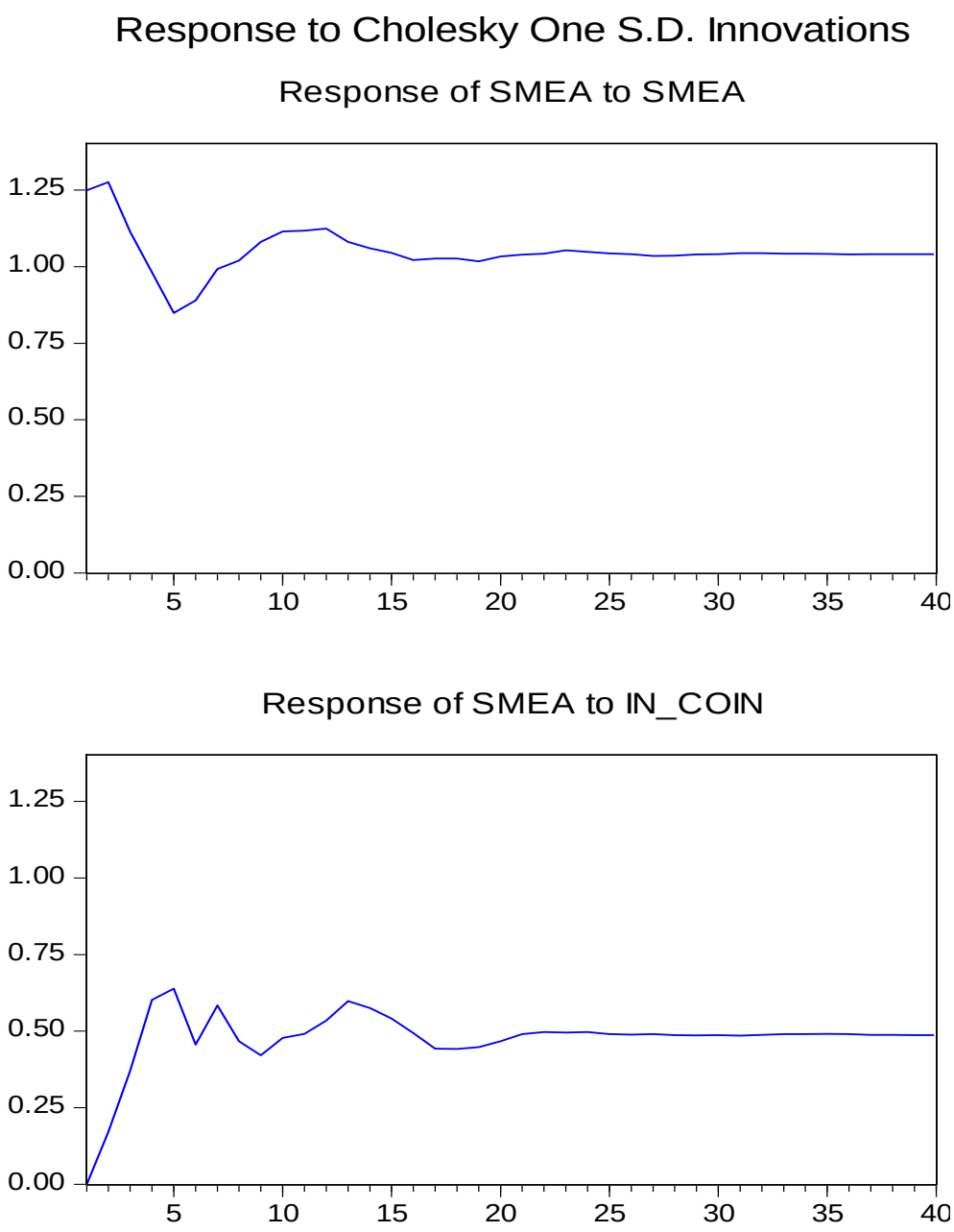

Figure 7.6: Response of SMEA to a one period shock to other variables
Source: Author's computation

7.5.9 Variance decomposition

Variance decomposition measures the forecast error variance of any variable, which is explained by innovations to each explanatory variable over a series of time horizons to a system when a shock is applied. In summary, this technique shows the relative importance of each random innovation to each explanatory variable over a series of time horizons. Variance decompositions performed on the VECM may provide some information on the relative importance of shocks to the independent variables in explaining variations in the dependent variable.

In the context of this study, it therefore provides a way of determining the relative importance of shocks in explaining variations in SMEA and business cycle. The results of the variance decomposition analysis are presented in Table 7.19, and show the proportion of the forecast error variance in the SMEA explained by its own innovations in its determinants.

Table 7.19: Variance Decomposition Analysis for SMEA

Variance Decomposition of SMEA:						
Period	S.E.	SMEA	IN_COIN	BANK RATE	RETURN_ ON_ EQUITY	NON_ INTEREST_E XPENSES
1	1.249218	100.0000	0.000000	0.000000	0.000000	0.000000
2	1.817336	96.58635	0.884282	0.070501	2.426630	0.032237
3	2.195736	91.91703	3.448628	0.286517	3.166413	1.181417
4	2.489225	87.07075	8.537837	0.282274	2.957759	1.151377
5	2.737549	81.60027	12.50717	0.396853	2.515173	2.980534
6	2.944144	79.68167	13.21155	0.771163	2.248737	4.086872
7	3.194363	77.33335	14.56438	1.141876	2.563293	4.397108
8	3.410498	76.79136	14.65245	1.861517	2.766033	3.928642
9	3.624991	76.85774	14.31556	2.263370	3.048427	3.514902
10	3.837393	77.02279	14.32490	2.538709	2.915733	3.197866
11	4.035156	77.32614	14.43564	2.603322	2.716298	2.918592
12	4.227020	77.53706	14.75280	2.538648	2.511833	2.659657
13	4.410463	77.22361	15.38624	2.559064	2.366475	2.464609
14	4.578939	77.00588	15.85316	2.569585	2.256751	2.314625
15	4.736044	76.85200	16.12265	2.636676	2.186254	2.202413
16	4.878587	76.80914	16.21751	2.753045	2.113131	2.107174
17	5.011483	76.98424	16.14958	2.811406	2.033597	2.021173
18	5.140586	77.15124	16.08653	2.858414	1.960755	1.943061
19	5.264975	77.28533	16.05898	2.888383	1.896133	1.871173
20	5.390624	77.39808	16.06976	2.888376	1.845334	1.798458

Source: Author's computation

In the first month, all of the variance in the SMEA is explained by its own innovations (shocks), however, after a period of 7 months, the SMEA only explains about 77.33 per cent of its own variation, while its determinants explain the remaining 22.66 per cent. The influence of the business cycle and bank rate increased gradually to about 15.6 per cent. By the 13th month, there has been a dramatic change in the influence of business cycle and bank rate: together they explain 18 percent of the variation of SMEA. The result vividly shows the influence of business cycle and bank rate on SMEA. South African banks tend to change their behaviour during upturns and during downturns, especially during financial crisis.

7.6 CONCLUSION AND POLICY RECOMMENDATION

In this chapter, the major focus was on lending to SMEs and how financial crises can affect SME lending in South Africa. This chapter analysed the procyclicality of SME lending in South Africa using VAR modelling from 2008 to 2014. Most of the variables display a very sensitive reaction to

the coincident index and global financial crisis. This vividly indicates some strong evidence of a long-run relationship between business cycle and SME lending in South Africa. We recommend that government should play a more pivotal role promoting expansion of bank lending to SMEs, especially during recessionary periods.

Appendix D

Table 7.20: Summary statistics of data employed, 2008M1 TO 2014m12

Variables	SMEA	IN_COIN	BANK RATE	NON_ INTEREST_ EXPENSES	RETURN_ON_ EQUITY
Mean	50.93727	4.666102	6.575342	56.80635	20.70920
Median	48.21903	4.678421	5.500000	56.88729	19.54443
Maximum	63.52765	4.766438	12.00000	63.71683	30.10476
Minimum	44.78063	4.537961	5.000000	44.01275	17.42737
Std. Dev.	5.328950	0.070244	2.162931	3.979837	2.970934
Skewness	0.726754	-0.293564	1.668120	-0.749605	1.720360
Kurtosis	2.093113	1.828958	4.441994	3.634852	5.115436
Jarque-Bera	8.927684	5.219682	40.17993	8.062443	49.62061
Probability	0.011518	0.073546	0.000000	0.017753	0.000000
Sum	3718.421	340.6255	480.0000	4146.863	1511.772
Sum Sq. Dev.	2044.635	0.355264	336.8356	1140.415	635.5045
Observations	73	73	73	73	73

Source: Author's computation

Table 7.21: Summary of Philips-Perron Test

Philips-Perron Test both at level and difference				
Variable	**Model**	**Level**	**1st difference**	**I(1)**
COINCIDENT_INDEX	**Intercept**	-0.518171	-4.272890***	I(1)
	intercept and trend	-2.237117	-4.565096***	
SMEA	**Intercept**	-1.776440	-7.785314***	I(1)
	intercept and trend	-2.691462	-7.824758***	
BANKRATE	**Intercept**	-1.828066	-8.979483***	I(1)
	intercept and trend	-1.068716	-9.126555***	
RETURN_ON_EQUITY	**Intercept**	-3.099396**	-12.18224***	I(1)
	intercept and trend	-2.428141	-12.37489***	
NON_INTEREST_EXPENSES	**Intercept**	-7.616624***		I(0)
	intercept and trend	-8.535541***		

Source: Author's computation

Table 7.22: Weak Exogeneity test

Variables	Chi-square	Probability	Outcome of the Variables
SMEA	5.89	0.0533	Endogenous
Coincident index	13.054	0.001463	Endogenous
Bank rate	13.7188	0.001463	Endogenous
Return on asset	1.470	0.478	Weakly endogenous
Non-Interest expenses	16.892	0.000215	Endogenous

Note: We imposed a restriction on α (alpha restriction of the VECM) to be able to identify the endogenous variables and ascertain the robustness of the model.

Source: Author's computation

Table 7.23: Block Exogeneity Granger causality results based on VECM

	Independent Variables				
Dependent Variable	**χ-Statistics of lagged 1st differenced term (p-value)**				
	Δ SMEA	**Δ IN_COIN**	**Δ br**	**Δ ROA**	**ΔNIE**
Δ SMEA	--	**3.800139** [0.4337]	**0.492906** [0.9742]	**4.482280** [0.3447]	**0.8370** [1.4410]
Δ IN_COIN	1.084127 [0.8968]	--	**3.849438** [0.4268]	**14.67166** [0.0054]	**4.933079** [0.2942]
Note that ** denotes 5 % significant level and […] represents p-value.					

Source: Author's Computation

Table 7.24: Augmented Dickey-Fuller Test both at level and difference

Augmented Dickey-Fuller Test both at level and difference						
Variable	**Model**	**Level**	**1st difference**	**Intercept(I)**	**Trend(T)**	**I(1)**
COINCIDENT_INDEX	**Intercept**	-1.147799	-4.355712***	1.151532		I(1) with T and I
	intercept and trend	-3.667621*		3.646635**	3.686943**	
SMEA	**Intercept**	-1.851087	-7.638724***	1.677542		I(1)
	intercept and trend	-2.773595	-7.630427***	2.637498	-2.109049	
BANKRATE	**Intercept**	-2.837809*	-2.656127**	2.351705		I(1)
	intercept and trend	-2.484287	-3.589975**	1.791188	-0.904698	
RETURN_ON_EQUITY	**Intercept**	-1.788748	-13.72142***	1.429271		
	intercept and trend	-1.243008	-13.78421***	0.763008	0.134728	I(1)
NON_INTEREST_EXPENSES	**Intercept**	-7.319732***		7.319847***	3.349195***	I(1) with T and I
	intercept and trend	-8.483621***		8.463059***		

Source: Author's Computation

Chapter 8

SUMMARY, CONCLUSIONS AND POLICY RECOMMENDATIONS

8.1 INTRODUCTION

This study contains research which examined the link between financial crisis, financial regulation and credit crunch in South Africa. This was done by assessing how periods of credit growth or crunch are associated with recession periods in South Africa. We examined the demand by non-financial firms for credit and how this varied with the business cycle. We also investigated the supply-side phenomenon of credit procyclicality. We tackled questions on how increases in bank regulation during financial crisis amplifies the business cycle in South Africa. The thesis also examined the co-movement between the business cycle and bank capital adequacy requirement in South Africa. We investigated the role financial regulation plays in promoting financial crisis and accentuating the business cycle in South Africa. Finally, we tested how financial crisis and business cycle can affect bank lending to SMEs in South Africa.

The data set for the study covers 21 years from 1990Q1 to 2013Q4. The financial variables and control variables were obtained from SARB and the IMF's International Financial statistics (IFS). This study employed VEC models accompanied by impulse response and variance decomposition. The VECM is a predominant approach in studies analysing credit crunch and bank lending. This method was employed by Seo (2013), Sun *et al.* (2010) and Calza *et al.* (2003) in examining the relationship between credit crunch and bank lending. The VECM can accommodate contemporaneous relationships among the variables in the model. If variables are found to be cointegrated, we can indeed take advantage of VECM. VECM enabled us to derive information on both the short- and long-run dynamics of the model and estimate the speed of adjustment.

For this study, we adopted the models by Watanabe (2005) and Seo (2013). Watanabe (2005) explained credit crunch in terms of the 'regulatory driven capital crunch hypothesis'. The 'risk based capital standard (RBC)' bank capital regulation played a predominant role in their framework. The regulations require that the ratio of capital to RWA should not be below the specified minimum threshold.

According to Gottschalk (2010), there has been a lack of debate about the impact of the Basel Capital Accord in developing countries. Basel II has been criticised for being very complex so that it takes up most of the resources of the banks in developing countries, forcing them to increase the cost of transactions and leaving them little capacity for development-related issues (Gottschalk, 2010; Cukierman, 2011; Bernanke, 2007; Giovanoli, 2009).

First, this study makes an important contribution to the discussion on credit crunch and financial regulations and their implication on development finance in South Africa. Second, the study results

in a better understanding of the macroeconomic impact of Basel II and Basel III in sub-Saharan Africa. Third, most studies are focused on either supply-side or demand-side credit procyclicality. However, this study has gone further to build an econometric model that links business downturn and credit downturn (procyclicality) and to establish the link between prudential regulatory and credit downturn in South Africa. The study further shed some light on the role that credit markets play in business cycles and their implications for SMEs in South Africa.

Finally, there is no quantitative analysis undertaken in the area of bank lending to SMEs, hence this study is one of the pioneer studies using quantitative techniques in South Africa. We expect that our results will give guidance to policy makers and researchers on how to create economic policies that will boost banking lending during crises given SMEs' contribution to GDP and employment creation.

8.2 SUMMARY OF FINDINGS

We investigated how periods of credit growth or crunch are associated with recession periods in South Africa. We examined the role that shocks to the real sector play in amplifying financial imbalance through the credit market in South Africa. The empirical evidence from the VEC model shows that there are significant linkages between credit to GDP and business cycle. The result shows that in the long-run fluctuations in the business cycle can influence credit growth in South Africa from both demand and supply side. The results for credit growth procyclicality show a high and long-lasting effect from a shock to bank regulation to the business cycle variable.

We assessed the extent to which the imposition of capital adequacy can accentuate and deepen the business cycle in the South African financial system. Results from the test and VEC model show that there are significant linkages between capital adequacy and business cycle, and that the imposition of capital adequacy requirement can amplify the business cycle in South Africa.

This result of this study confirms the result of Makwiramiti (2008), Akinboade and Makina (2010), Liu and Seeiso (2011) and Jacobs et al. (2012) who show that there is a strong relationship between bank capital regulation and business cycle in South African banking.

Finally, the study examined procyclicality of bank regulation and how it might deepen business cycle and accentuate credit crunch, especially to the SME sector in South Africa. Most of the variables display a very sensitive reaction to the coincident index and capital adequacy shock. This indicates strong evidence of credit procyclicality between business cycle and SME lending in South Africa during the global financial crisis.

8.3 POLICY RECOMMENDATION

The combined evidence shows that there is strong evidence of credit procyclicality, financial regulation procyclicality and SME lending procyclicality in South Africa, especially during the global financial crises. The procyclical behaviour of bank lending reveals that prudential regulation affects banks' behaviour and operations and also has serious consequences on the real sector of any economy. The cyclical behaviour of bank lending can retard the flow of credit which can implicitly affect the potential growth of any economy.

The phenomenon of credit and bank regulation procyclicality requires very careful examination for both regulatory bodies and supervisory authorities given the salient role of the financial sector as an engine of growth to the real sector. Consequently, policies and regulations should be formulated in a way that will not hinder the financial deepening of the markets. Regulatory measures that promote excessive risk-taking during a crisis could have severe implications for the procyclical behaviour by most banks. We suggest that the South African economy needs forward-looking policies that will mitigate the flow of credit to the real sector and at the same time ensure financial stability.

Our results have several implications. Firstly, the results for credit growth procyclicality show a high and long-lasting shock effect from bank regulation to the business cycle. These may lead to many banks decreasing lending in bad times when they encounter loan losses and their capitalisation drops. This may affect the real economy as SMEs which need to finance their small enterprises will be cut off from credit. There is therefore an urgent need to boost support to SMEs credit, especially during recessionary periods. There is also a need to promote diversification of financing options for small firms and SMEs by providing various credit supporting policies in South Africa.

Prudential regulation in their aim to safeguard banks have established measures to increase bank capital and restrict bank balance sheet that has ultimately made most banks unwilling to give out new loans to SMEs. There is a need to assess prudential requirements as contained in Basel II and Basel III on a country case-by-case basis. For instance Basel III provides for a relaxation of capital requirement for certain sectors based on country context. The present method, whereby countries engage in wholesale application of the Accords without enough concern for peculiar country characteristics, should be revisited especially in a country such as South Africa caught in the throes of unemployment and income inequality. Implementation of Basel III could lead banks to reduce their lending to small firms and SMEs. This difficulty is likely to be more prevalent in developing countries that have a bank-based financial system.

For financial policies to be effective and efficient, timing and sequencing of the various prudential policies are required. It would be prudent to identify major factors that affect credit demand and

credit supply in South Africa. Policies should be made depending on how these factors will influence the flow of credit in the long run.

8.4 LIMITATIONS OF THE STUDY AND AREAS OF FURTHER RESEARCH

One major limitation of the study is the unavailability of aggregated bank lending data for SMEs from the SARB Database before the 2008. This is the case because before the implementation of Basel II in South Africa, banking regulations did not stipulate risk weights for exposures to SMEs. Banks were not required to disclose their lending to SMEs on the forms they submitted to SARB. It is for this reason that the impact of financial crisis on bank lending to SMEs in South Africa was only assessed from the period when the country's banks started adopting Basel II, from 2008 onwards.

This study has focused on credit procyclicality and bank lending. Further studies may need to focus on liquidity risk, trade credit, bank exposure to real estate, and how these affect bank lending. It would be interesting for future researchers to explore bank-specific factors that influence credit crunch and bank lending in South Africa. It would also be interesting to duplicate this study for bank specific data using a different methodology such as dynamic stochastic general equilibrium (DSGE) model or panel regression.

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