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THE DETERMINANTS OF BANK CREDIT GROWTH AND CREDIT AGGREGATE BEHAVIOR DURING ALTERNATE BUSINESS CYCLES IN SOUTH AFRICA

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THE DETERMINANTS OF BANK CREDIT GROWTH AND CREDIT AGGREGATE BEHAVIOR DURING ALTERNATE BUSINESS CYCLES IN SOUTH AFRICA

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Abstract

Purpose: The purpose of this study was to analyze of the relationship between business cycles and bank credit extension: evidence from South Africa. The study sought establish the determinants of bank credit growth in South Africa and how the different credit aggregates behave during alternate business cycles

Methodology: This study adopted qualitative and quantitative research. The qualitative research involved structured interviews with influential or well informed people on the subject matter. The study used interviews to understand the key determinants of bank credit in South Africa and to appreciate how each of the credit aggregates behaved during alternate business cycles. The qualitative results were used to formulate questions of the structured survey questionnaire. The ANOVA and Pearman's product correlation analysis techniques were used to assess relationship between variables.

Results: Results revealed that, key determinants of commercial bank credit in South Africa were economic growth, collateral value, bank competition, money supply, deposit liabilities, capital requirements, bank lending rates and inflation. The quantitative results showed that there was direct and positive relationship between bank lending behaviour and credit aggregates namely economic growth, collateral value, bank competition and money supply.

Unique contribution to theory, practice and policy: It proposes practical policy prescriptions to address challenges currently facing South Africa. The other major contribution of this study is that it shall open new avenues for further research on finding causality of the relationship between various proxies of economic growth and financial development adopting the VAR framework

Keywords: Bank Credit, Business Cycles, Credit Extension, Cointegration, Vector Error Correction Model.

1.0 INTRODUCTION

Almost all major landmark events in modern history have been associated with a financial crisis (Jorda, Schularich, & Taylor, 2011). Since the beginning of the global financial crisis in 20072009, there has been a renewed interest on the linkage of financial markets and real economy as well as

its implications towards the design of monetary and fiscal policies. In particular, there is a surge in macroeconomic literature relating to business cycles and the role of credit shocks on economic dynamics, both theoretical and empirical (Ramirez, 2013; Rannenberg, 2012). In its Global Financial Stability report, IMF (2010) argues that losses incurred by banks caused a contraction in credit supply which in turn contributed to the economic downturn in the United States and beyond. Economic boom and bust cycles are interestingly familiar to countries across the world and likely to persist into the foreseeable future (IMF, 2010).

What happens to bank lending behavior over these cycles? This study analyzed business cycle episodes in South Africa and attempted to establish the link between economic growth patterns and changes in bank lending behavior. The lending activity of commercial banks has long received considerable attention as an important contributor to the performance of the economy. This attention has perhaps, become sharper in the wake of the difficulties experienced by the banking industry in the 1980s and since 2008 (Berlin, 2009). According to Weinberg (1995), the public perception of bank lending seems to continuously have changed from one extreme to the other, that is, the credit markets either experiencing a credit boom or credit crunch. In the early 1990s, the predominant and prevailing view was that the bank loan market was 'short' experiencing a credit crunch in which banks set 'unreasonably' high credit standards denying credit to qualified borrowers (Owens & Schreff, 1995). With growth in bank loans picking up geometrically by late 2008, some expressed concerns that banks were possibly becoming 'too loose' in their standards for acceptable credit risk (The American Banker, 2009; SARB, 2010, FinWeek, 2008). Is there any good reason why "banks are at times too stringent and at other times too lax in their lending" asked Berlin (2009: 1)?

1.1 Problem Statement

The speed, severity and geographic reach of the credit crisis of 2007-2009 have renewed the prominence of credit in the rhythm of business cycles (BIS, 2011; Fourie et al., 2011; Rose & Spiegel, 2009). Before the credit crisis, the role of credit had largely been neglected in monetary policy making (Xu, 2012; Rannenberg, 2012). But crises also offer opportunities. According to Rannenberg (2012), it is now well understood that the interactions between the financial system and the real economy are a weak spot of modern macroeconomics. The ultimate outcome from empirical literature on bank credit channel is clearly articulated in a recent study of the Basel Committee on Bank Supervision. After reviewing the literature, the Committee concluded as follows: A key gap in our knowledge is on the influence of lending on real economic activity [and vice versa]. Specifically, while there is a sizeable body of research on the question of how bank balance sheet positions influence lending, there is significantly less research on the question of how lending affects real activity (BIS, 2011: 39). Researchers and policymakers alike have been left searching for clearer insights (Jorda et al., 2011). In its Global Financial Stability Report, the International Monetary Fund (IMF) argues that the losses incurred by banks caused a contraction in credit supply which in turn contributed to the economic downturn in the United States and beyond (IMF, 2010). These developments have revitalized investigations into the possibility that

changes in the supply of credit can amplify the macroeconomic cycle and potentially increases systemic risk.

In response to the global crisis, there have been worldwide calls for appropriate policy interventions (Aikman, Haldane & Nelson, 2011). Evaluating advantages and justifications of these proposals requires full comprehension of causes of and the link between business cycles and credit cycles, which as yet, appear not to having been thoroughly investigated, especially in the developing world. The question of the direction of causality between economic growth and credit extension "has not been adequately addressed" (Basurto, Goodhurt & Hofman, 2006: 476). Several studies have examined the linkages between bank credit and economic growth (for example, Rannenberg, 2012; Fourie et al., 2011; Armistead, 2009; Dell' Ariccia, Igan, & Laeven, 2009, Bordo & Haubrich, 2009; Kiyotaki & Moore, 1997; Bernanke & Lown, 1991). The results have been mixed and conflicting. Moreover, most of these studies have been done in developed countries such as the United States, Canada and Australia. Studies on developing countries like South Africa are limited and fragmented (Fourie et al., 2011; Akinboade & Makina, 2009; Dlamini, 2008; Khomo & Aziakpono, 2007). Researches carried out by Fourie et al., (2011) and Odhiambo (2004) suggest further research is required on this topical issue and further to compare South African situation to global business cycles.

Clearly, there is theoretical and empirical curiosity in terms of finding the exact nature of the relationship between the financial sector and real economy. Based on the abovementioned, the problem statement of this study was given in the form of a research question as follows: "What is the nature and causal relationship between business cycles and bank credit extension?" In other words, the crucial question, therefore, is whether bank credit market development precedes or follows economic growth in both good and crisis times? In order to answer this question, responses to the following sub-question was required; What are the key determinants of bank credit growth in South Africa and how do the different credit aggregates behave during alternate business cycles?

1.2 Research Objective

    i.   To determine the key credit extension drivers in South Africa.

2.0 LITERATURE REVIEW

2.1 Theoretical Review

2.1.1 Business Cycle Framework

Generally, business cycle has come to be understood as a sequence of economic activity and is typically characterized by the following patterns; recession, fiscal recovery, growth and finally fiscal decline (Khomo & Aziakpono, 2007). Akinboade and Makina (2009: 478) define business cycles as "recurring patterns of recession (economic decline) and recovery (economic growth)." According to Negro (2001: 18), "the business cycle consists of expansion occurring at about the same time in many economic activities followed by a similar general contraction.

Claessens, Kose and Terrones (2011) argue that a complete business cycle has two phases; the recession phase (from peak to trough) and the expansion phase (from trough to the next peak). In addition to these two phases, recoveries from recession have also been widely studied. As shown in Figure 2.1 below, the recovery phase is the early part of the expansion phase and is usually defined as the time it takes output to return from its low point to the level it reached just before the decline began. Decline phase is the late part of the recession phase (Claessens et al., 2011). According to SARB (2012: 18), the recoveries, expansions and contractions of the national economy are usually measured by real Gross Domestic Product.

Nouriel Roubini, cited in Monro (2010), argues that the recession phase can take the following forms: U-shaped, V-shaped, W-shaped, or L-shaped. Specifically, a U-shaped recovery represents the shape of the chart of certain economic measures, such as GDP and employment. A U-shaped recovery involves a gradual decline in these metrics followed by a gradual rise back to its previous peak (NBER, 2012). On the contrary, the V-shaped recovery involves a sharp decline in economic metrics and is followed by a sharp rise to its previous peak. Roubini notes that compared to the V-shaped recovery, the U-shaped recovery takes longer to reach levels seen prior to the recession.

According to NBER (2012), a W-shaped recession occurs when the recovery has a recession, emerges from recession with short period of growth, but quickly falls back into recession. The early 1980s recession in the US is cited as an example of a W-shaped recession (The Economist, 2009). Lastly, an L-shaped recession occurs when an economy has a severe recession and does not return to trend-line growth for many years, if ever. Many refer to the 1990s –era in Japan as an example of an L-shaped recession, where there was an economy that essentially flat lined for a decade (The Economist, 2009).

2.2 Empirical Review

The existence of a connection between business cycles and bank-granted credit seems indisputable judging by the numerous researchers who have positively proved and validated the relationship. What is arguable is the direction of causality between economic growth and credit extension (Oluitan, 2009). As discussed in literature, the relationship between these variables may be unidirectional, the reverse or bi-directional (Ramirez, 2013; Manikandan, Manivel, & Vettriselvan, 2012; Patrick, 1966).

Patrick (1966) describes the causality direction as demand-following and supply-leading hypotheses. When the relationship is from financial development to economic growth then this relationship is termed as supply-leading since it is believed that the financial institution's activities increases the supply of credit which as a result creates economic growth. Similarly, when growth within the economy results in increase in the demand for credit then this subsequently motivates financial development, which is then styled as demand-following hypothesis (Manikandan, et al., 2012; Oluitan, 2009; Patrick, 1966). Other scholars believe that this causality runs in both directions. This third postulate is related to bi-directional causality (Ramirez, 2013; Manikandan, et al., 2012). It means causality is mutual and reciprocal, that is, bank-granted credit to economic growth and economic growth to bank-granted credit.

3.0 RESEARCH METHODOLOGY

This study adopted qualitative and quantitative research. The qualitative research involves structured interviews with influential or well informed people on the subject matter. The study is used to understand the key determinants of bank credit in South Africa and to appreciate how each of the credit aggregates behaves during alternate business cycles. The qualitative results are used to formulate questions of the structured survey questionnaire. The ANOVA and Pearman's product correlation analysis techniques are used to assess relationship between variables.

4.0 RESULTS AND DISCUSSIONS

4.1 Response Rate

The targeted sample was 300 in size. Questionnaires were successfully circulated to 240 respondents. The respondents were drawn from top four banks in terms of loan market share, 163 returned and usable questionnaires out of 240. This response rate was considered adequate

Table 1: Response Rate

	Frequency	Percentage
Response	163	67.92
Non-Response	77	32.08
Total	**240**	**100**

4.2 Demographic Information of the Respondents

The study sought to establish the respondents' experience in the credit and risk management field. Figure 1 overleaf shows that 7% of the respondents indicated that they had less than 3 years' experience in the credit and risk management field, 19% indicated that they had 3 to 5 years' relevant experience, 46% for 6 to 10 years while 28% stated they had worked in the credit and risk space for more than 10 years. This illustrates that majority of the respondents (74%) had worked in the credit and risk management field for more than 5 years which suggests that they had been in the field long enough and could therefore offer reliable information as sought by the study.
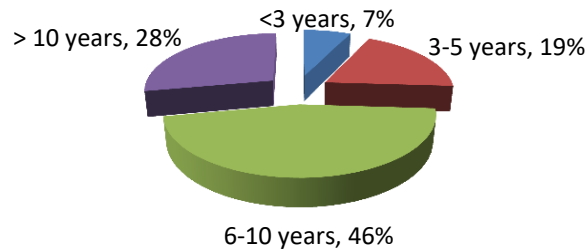
Figure 1: Years of Experience in Credit and Risk Field 4.3 Changes in Bank Lending Policies

Respondents were requested to state whether their banks change lending policies in line with developments in the macro-state environment. Majority (80%) agreed with the statement. Majority of those who disagreed with the statement commented that whilst their bank polices do not change, their underwriting criteria and standards change over alternate business cycles.

Table 2: Changes in Lending Policies

Statement	Frequency	Percent
No	33	20
Yes	130	80
Total	163	100

The findings imply that banks in South Africa conduct environmental scanning and are therefore in a position to know what changes are taking place and how to strategically alter or change their lending policies and/or their underwriting standards in light of the macro-state environment.

4.3.1 Effect of Macroeconomic Environment on Credit Extension Drivers

The study sought to establish the extent of effect of fluctuations in economic environment on bank credit extension drivers.
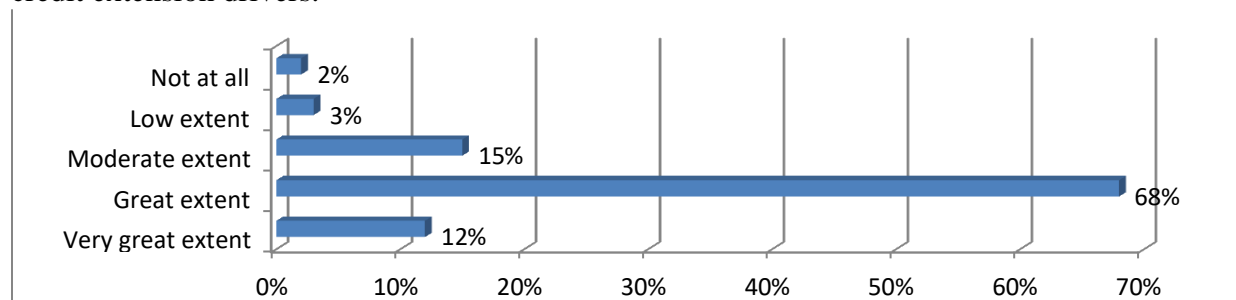

Figure 2: Effect of Macroeconomic Environment on Credit Extension Drivers

Results above shows that majority of the respondents (68%) indicated that credit extension are influenced by fluctuations in the economic environment to a great extent. About 5% of the

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respondents were of the view that the impact of macro-state on credit aggregates was very minimal, if any. The results show that economic conditions influence lending behavior of commercial banks to a large extent.

4.3.2 Reasons for Change in Bank Lending Policies

Majority of the respondents strongly agreed that banks change lending policies due to changes in the fundamental business conditions as indicated by a mean score of 4.62. The standard deviation ("σ") was 0.68 (below 1) indicating that answers received were closer to the mean thus they were similar. The respondents also agreed that banks change lending policies due to changes in the quality of borrowers as indicated by a mean score of 4.15 (σ<1). Respondents strongly agreed with the statement that banks change lending policies when the business cycle impacts the bank's profitability through decreased demand for credit (mean score = 4.66; σ<1)) and banks change lending policies when the economy goes into recession and the value of firms' collateral decreases making them ineligible for credit (mean score = 4.15; σ<1).

Table 3: Reason for changes in lending policies

Statement	Mean	Std Dev
My bank changes lending policies due to changes in the fundamental business conditions.	4.62	0.68
My bank changes lending policies due to changes in the quality of borrowers.	4.15	0.66
My bank changes lending policies when the business cycle impacts the bank's profitability through decreased demand for credit.	4.66	0.66
My bank changes lending policies when the economy goes into recession and the value of firms' collateral decreases making them ineligible for credit.	4.15	0.44
My bank changes lending policies due to other factors	3.00	1.31

However, majority of the respondents neither agreed or disagreed with the statement that banks change lending policies due to other factors (mean score = 3.0). The standard deviation of 1.31 (greater than 1) indicates that responses on this particular statement were not closer to the mean thus they were dissimilar.

4.3.3 Credit Rationing in the Bank

Respondents were asked to give reasons as to why their banks rationed credit in the previous business cycle (2007-2009 global financial crisis). Results in the table 4 reveal that majority of the respondents disagreed (mean score = 2.15) with the statement that banks rationed credit due to weak collateral value. They also strongly disagreed (mean score = 1.09) with the statement that banks rationed credit due to increased competition. Most respondents were indifferent on statements that banks rationed credit due erosion of deposits (mean score = 2.55) and weak capital position (mean score = 2.55). Respondents also agreed (mean score = 3.45) with the statement that

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banks rationed credit due to poor loan performance. They were further in disagreement (mean score = 1.45) with statement that tighter regulatory oversight adversely impact on bank lending. The standard deviations of responses on all statements were below one (1) indicating that the answers received were closer to the respective means thus they were similar.

Table 4: Attributes of Credit Rationing

Statement	Mean	Std Dev
Credit rationing attributed to weak collateral in my bank.	2.15	0.49
Credit rationing attributed to increased competition in my bank	1.09	0.39
Credit rationing attributed to erosion of deposit base in my bank.	2.55	0.50
Credit rationing attributed to weak capital position in my bank.	2.55	0.50
Credit rationing attributed to poor loan performance in my bank.	3.45	0.47
Credit rationing attributed to tighter regulatory oversight in my bank.	1.55	0.47
Credit rationing attributed to other factors in my bank.	1.0	0.40

4.3.4 Statements with Regard to Bank Lending

a) Collateral Value and Bank Lending

Respondents were asked to indicate whether the prices of assets used as collateral are directly linked to the state of the economy. A mean of 4.42 suggests that most respondents agreed on the statement while the standard deviation was 0.66 indicating that the answers received were closer to the mean thus they were similar. In addition, with regard to whether borrowers' credit limits are determined by the value of property offered as security, which affects investment and demand for assets in the economy, majority of the respondents neither agreed nor disagreed with the statement (mean score = 2.71). As depicted in Table 5 below, standard deviation was 1.18 indicating that the answers received were not closer to the mean thus they were dissimilar.

Table 5: Collateral Value and Bank Lending

Statement	Mean	Std. Dev
Prices of assets are directly linked to the state of the economy, leading to pro-cyclicality in lending.	4.42	0.66
Borrowers credit limits are determined by the value of property offered as security, which affects investment and demand for assets in the economy.	2.71	1.18

4.4 Competition and Bank Lending

Respondents were asked to give the extent to which they agree with the statement that banks are supposed to keep pace with the returns on equity offered by their rivals in the face of stiffening

competition. As shown in Table 6 a mean of 3.93 suggests that most respondents just agreed on the statement while standard deviation of 1.02 indicates that answers received were not closer to the mean thus they were dissimilar. In addition, respondents were asked to indicate whether competition drives lenders to cut their lending standards. A mean of 2.4 suggests that respondents disagreed on this particular statement while standard deviation of 1.37 ($\sigma>1$) indicates that answers received were not closer to the mean thus they were dissimilar. **Table 6: Competition and Bank Lending**

Statement	Mean	St. Dev
In the face of stiffening competition, banks are supposed to keep pace with the returns on equity offered by their rivals.	3.93	1.02
Competition drives lenders to cut lending standards	2.40	1.37

4.5 Market Share, Reputation, Shareholders' Expectation and Bank Lending

Respondents were asked to give the extent to which improvement in the macro-state increases the incentives for banks to liberalize their risk management policies. As indicated by a mean score of 3.71 majority of the respondents agreed with the statement. In addition, with regard to whether posting low returns in a boom is particularly damaging to the bank reputation as this constitutes a clear signal of low ability to lend, a majority of respondents agreed with the statement (mean score = 3.62). As depicted in Table 7 below the standard deviation was 1.42 ($\sigma>1$) which indicates that the answers received were not closer to the mean thus they were dissimilar.

Table 7: Market Share, Reputation, Shareholders' Expectation and Bank Lending

Statement	Mean	Std. Dev
Improvement in the macro-state increases the incentives for banks to liberalize their risk management policies.	3.71	1.01
Posting low returns in a boom is particularly damaging the bank reputation as this constitutes a clear signal of low ability to lend.	3.62	1.42

4.6 Liquidity, Capital, Regulatory Requirements and Bank Lending

Respondents were asked to give the extent to which in economic downturn, required regulatory capital is likely to increase as the credit risk of the loan portfolio increases. As shown in Table 8, a majority of the respondents agreed with the statement (mean score =4.42) while the standard deviation was 0.66 indicating that the answers received were closer to the mean thus they were similar. In addition, with regard to whether credit rationing may also result from banks weak balance sheet position (in terms of liquidity, capital and regulatory requirements), the mean of the responses indicated from the results was 3.98 which suggests that most of the respondents were

agreeing with the statement while the standard deviation was 1.22 which indicates that the answers received were not closer to the mean thus they were dissimilar.

Table 8: Liquidity, Capital, Regulatory Requirements and Bank Lending

Statement	Mean	Std. Dev
In economic downturn, required regulatory capital is likely to increase as the credit risk of the loan portfolio increases	4.42	0.66
Credit rationing may also result from banks weak balance sheet position.	3.98	1.22

4.7 Inferential Statistics

The study used the Analysis of Variance (ANOVA) and Pearson's product moment correlation to test the relationship between variables of interest.

4.7.1 ANOVA Analysis

ANOVA statistics indicate that the overall model was significant. This was supported by an F statistic of 98.79 and *p-value* of 0.000, as shown in Table 9. The reported probability was less than the conventional probability of 0.05 (5%) significance level. The ANOVA results imply that the independent variables are good joint predictors of credit extension. The ANOVA results also indicate that predicting credit extension through independent variables yields better results than predicting credit extension through the mean.

Table 9: Analysis of Variance (ANOVA)

Indicator	Sum of Squares	Df	Mean Square	F	pvalue
Regression	12.842	6	2.14	98.79	0.000
Residual	1.04	236	0.022		
Total	13.882	240			

Results of Correlation Analysis

The study also estimated the relationship between variables in the following multivariate correlation equation:

Credit Extension=b1Economic Growth+b2Collateral Value+ b3Competition+b4Real Money

supply+b5 capital requirements +b6Lending Rates+ W1

The results of the correlation analysis are presented in Table 10.

The data presented above reflect the effects of economic growth, collateral value, bank competition, money supply, bank capital requirements and bank lending rates on bank lending behavior in South Africa. Pearson analysis was then conducted at 95% confidence interval and 5% confidence 2-tailed. Table 4.15 above indicates the correlation matrix between the selected determinants of credit extension and commercial banks' lending behavior in South Africa. The results indicate that there is a positive relationship between lending by commercial banks and economic growth, collateral value, competition and money supply of magnitude 0.732, 0.921, 0.922 and 0.879 respectively. On the other hand, the results show a negative relationship between bank lending and bank capital requirements (-0.926) as well as bank lending rates (0.873). The positive correlations mean that a unit change in the predictor variable is associated with a positive change in credit extension and the reverse is true for negative correlations. This notwithstanding, all the factors had a significant p-value ($p < 0.05$) at 95% confidence level. This indicated that all the factors were significant with bank capital requirements being the most significant factor followed by bank competition and then collateral value. Surprisingly, fluctuation in economic activity was the least significant. On an overall basis it can be concluded that the variables of the study had strong correlations.

Table 10: Pearson Correlation

(p) 2-tailed	Credit Extension	Economic Growth	Collateral Value	Comp.	Money Supply	Capital Req.	Lending Rates
Credit Ext	1.000						
Eco. Growth	0.732 (0.000)	1.000					
Coll. Value	0.921 (0.000)	0.801 (0.000)	1.000				
Comp.	0.922 (0.000)	0.789 (0.000)	0.968 (0.000)	1.000			
Money Supply	0.879 (0.000)	0.824 (0.000)	0.935 (0.000)	0.896 (0.000)	1.000		
Cap. Req	-0.926 (0.000)	-0.649 (0.000)	0.893 (0.000)	0.932 (0.000)	0.837 (0.000)	1.000 (0.000)	
Lending Rates	-0.873 (0.000)	-0.806 (0.000)	0.920 (0.000)	0.930 (0.000)	0.953 (0.000)	0.902 (0.000)	1.000

4.8 Factors Determining Credit Growth in South Africa

Respondents were asked to indicate their opinion on factors significant in determining credit growth in South Africa. A majority (95%) of the participants stated that the performance of the

economy in general influences credit growth. The value of collateral offered by loan applicants was singled out to be the largest contributor. The key message from the participants was that asset values tend to rise during economic upswing and decline during a downswing or contraction. In the words of one participant "bank intermediation becomes riskier during downturns" through a reduction in the value of collateral assets attached to the outstanding loan. About 70% of the respondents observed that competition among banks drives lenders to cut lending standards and this is common during economic downswings. A respondent stated that business and consumer confidence levels are maintained at high levels when the economy is doing well and this creates sufficient demand for credit.

There was also consensus (100%) among participants that credit growth is affected by a number of macroeconomic variables. Common variables mentioned during the discussions include money supply growth (95%), deposit liabilities (80%), lending rates (85%) and inflation (65%). A respondent commented that "bank deposits are the lifeblood of banking and they represent the principal source of funds for lending." Some participants (80%) claimed that the expansion of money supply signify the availability of money and is also directly related to credit extension. Overall there was an agreement that low interest regime stimulates credit demand. A further observation was that inflation is detrimental to credit growth. A few respondents (35%) commented on bank capital positions and regulatory requirements as some possible key drivers of credit growth.

5.0 DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Findings

5.1.1 Objective One: To determine key credit extension drivers in South Africa.

Based on the study results, the researcher safely concluded that the major determinants of commercial bank credit in South Africa are economic growth, collateral value, bank competition, money supply, deposit liabilities, capital requirements, inflation, exchange rate and bank lending rates. However, the impact of inflation and exchange rate on credit to the private sector was considered minimal and insignificant. Therefore, monetary authorities are advised to be sensitive to the behavior of the aforementioned significant credit aggregates during alternate business cycles so as to ensure sustainable credit growth and economic development.

5.1.2 Objective Two: To determine the long-term relationship between business cycles and

bank credit extension in South Africa.

The results of the qualitative research suggest that there is a direct positive relationship between economic growth and credit extension in South Africa. The quantitative results showed that there is direct and positive relationship between credit and credit aggregates namely economic growth, collateral value, bank completion and money supply. On the other hand, the results show that there is a negative relationship between credit and bank capital and lending rates. The quantitative findings show that the selected credit aggregates behave differently during alternate business

cycles. The empirical results from the Johansen cointegration test suggest the existence of a stable long-run relationship between bank-granted credit and business cycles. Moreover, economic growth has a significant positive impact on credit growth in the long-run. However, the estimated coefficients are small in magnitude in the short-run, suggesting that the relationship between bank credit and business cycles is rather weak in the short run.

Overall, the results of the study provide evidence that there is long-term positive relationship between business cycles and bank credit extension in South Africa.

5.2 Areas of Further Study

Further research in this area may use a different econometric model, such as the Sim's test, and compare the results with the current study. Moreover, to test robustness of the study's findings, future research may employ variance decomposition for relative importance of explanatory variables and impulse-response function for impact analysis.

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