DEPARTMENT OF ECONOMICS

THE IMPACT OF MONETARY POLICY ON PRIVATE SECTOR CREDIT AND PRIVATE INVESTMENT IN BOTSWANA

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MAY 2019

DECLARATION

I hereby declare that this dissertation titled: "***The Impact of Monetary Policy on Private Sector Credit and Private Investment in Botswana***" is my own work and sources that have been used are acknowledged by means of complete references. The work submitted is the result of my own investigation and is original.

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APPROVAL

This dissertation has been examined and approved as meeting the requirements for the partial fulfillment of the Master of Arts (Economics) degree.

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DEDICATION

I dedicate this study to my little brothers Tshepo Mbanjwa and Micheal Mbanjwa. To my beloved parents Patiko Mbanjwa and Mmeli Mbanjwa. May your souls rest in eternal peace. I love you all and you will always remain part of my life.

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ABSTRACT

The main objective of this study was to investigate the impact of monetary policy on private sector credit and private investment in Botswana. The study employed a vector error correction model on quarterly data for the period 1990Q1 to 2017Q4. The Phillips Perron (PP) test for stationarity shows that the series are stationary at first difference. The Johansen Cointegration test depicts a long run relationship of one cointegrating vectors. The vector error correction model indicated that the monetary policy instrument i.e. bank rate has a negative impact on gross fixed capital formation in a case when the bank rate rises. This means that in a case of contractionary monetary policy, the domestic investment would fall by a magnitude of 0.02 per cent and this impact is felt in a year's time. On the other hand, expansionary monetary policy would lead to an increase in domestic investment by 0.02 per cent. The study was able to establish that the impact of credit on private investment is not statistically significant. Economic policy recommendations such as, the use of monetary policy to boost domestic investment and monitoring and evaluation of all the investment projects funded by the Government, were made in consideration of these results.

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LIST OF ACROYNMS

ADF: Augmented Dickey-Fuller

BOB: Bank of Botswana

BoBCs: Bank of Botswana Certificates

GDP: Gross Domestic Product

OMOs: Open Market Operations

VAR: Vector Autoregressive

VECM: Vector Error Correction Model

CHAPTER 1: INTRODUCTION

1.0 Background of the study

Monetary policy interventions such as an increase in money supply indirectly affect aggregate demand and subsequently output and prices through their impact on investment spending. This indirect effect reveals that a change in money supply may have a more direct effect on investment. Furthermore, such monetary policy intervention leads to changes in bank deposits which ultimately alter the pool of loanable funds for investment. This effect is grounded in the Bernanke and Blinder (1988) model. Monetary policy thus affects credit availability as well as investment spending in the economy (Mishkin, 1995). The aim of this study is therefore to examine the impact of the central bank's monetary policy pursued under the regime of inflation focus on private sector credit and private investment in Botswana.

Bank of Botswana certificates (BoBCs) are used to provide considerable leverage over the amount of loanable funds that banks may retain (Bank of Botswana, 2018). This persuades banks to contract or expand lending which eventually alter the investment capacity. It is Bank of Botswana's responsibility and function to ensure that focus on monetary policy is placed on ensuring stable and low inflation rates (Bank of Botswana, 2018). Given this, Handa (2009) points out that inflation targeting monetary policy impacts the bank credit, which in turn affects investment.

During 1980's after the discovery of diamonds, Botswana recorded budget surpluses (UNCTAD, 2015). This led to high growth rates in aggregate demand and commercial bank credit to the private sector. To reduce the demand pressure emanating from credit expansion, the central bank used the bank rate and government bonds to tighten liquidity. Because of these measures, growth in private sector credit decreased leading to decline in inflation. A weakness of the inflation focus monetary policy is that it overlooks the effects of contractionary monetary policy on the supply side of the economy (Handa, 2009). A shortage of credit constitutes a constraint on investment, and employment in the business sector. These potential supply side effects of monetary policy call for careful examination of the impact of contractionary monetary policy on investment through credit.

Consequently, monetary policy which enables credit to private sector boosts the growth of private investment whereas contractionary monetary policy which limits credit to businesses discourages

investment. Evidence that private investment is positively related with expansionary monetary policy can be given from countries like Ethiopia, where Demilie & Fikru (2015) points that private investment is positively and significantly influenced by money supply in the short-run. Thus monetary policy is a major anchor for the growth of private investment in an accommodating environment. Private investment has become a progressively more significant objective for the government of Botswana (Malema, 2012).

Examining the connections between private investment and monetary policy especially through bank credit is important for several reasons because firms in Botswana rely greatly on bank credit to fund capital accumulation. Secondly, this study will provide guidance for the development and formulation of appropriate policy.

1.1 Problem Statement

The investment trend in Botswana has been showing alternating fluctuations between 22% and 36% range as a share of GDP from 1976 to 2014 (UNCTAD, 2015). This shows that domestic investment in Botswana is growing at a slow rate compared to other sub-Saharan countries. Private sector investment is also expected to decline, because of the narrow economic base. Given this, domestic investment in Botswana is still in its infancy stage (UNCTAD, 2015).Therefore it is important to know whether monetary policy can be held accountable for domestic investment performance or the lack of it.

There is no evidence of how monetary policy has affected investment in that case given the medium term inflation focus which is set at 3 – 6 percent as the overriding goal. It is important to study the impact of monetary policy on investment through bank credit because it attain a genuine and precise understanding of how it affects the pool of loanable funds and investment under the medium term inflation focus regime. Understanding on how contractionary and accommodating policy actions carried out by the central bank impact private investment through credit availability is crucial since there has not been a study on the subject matter. Therefore, there is insufficient information on how monetary policy affect private investment while it's trying to attain its inflation and output objectives. Examining the connections between private investment and monetary policy especially through the bank credit is important for the case of Botswana because local firms rely greatly on bank credit to fund capital accumulation (Okurut & Mangadi, 2011) . A

comprehensive understanding of these questions is essential for policy making and hence the transformation of the private sector development model towards a sustainable pattern.

1.2 Significance of the Study

Understanding the effect of monetary policy on domestic investment is useful in Botswana as it determines the effects of monetary policy in pursuit of the medium term inflation objective which is set at 3 – 6 percent. Policy makers are able to know whether to use monetary policy to boost investment while focusing on inflation (depending on the magnitude of the relationship). The study is also motivated by the absence of literature on the impact of monetary policy on investment in Botswana because literatures either deal with the determinants of private investment and monetary policy mechanism separately but have not linked the two. This study expands the existing literature by focusing on the impact of monetary policy on private sector investment and therefore, this study adds to the limited literature in Botswana. It is therefore important to see how monetary policy has translated into private investment and if such translation comes through bank lending.

1.3 Objectives of the Study

1.3.1 Main Objective

To evaluate the impact of monetary policy on private investment through bank credit.

1.3.2 Specific Objectives

i. Determine the impact of the bank rate on private investment.
ii. Determine the impact of the bank rate on credit to the private sector.
iii. Determine the influence of the bank credit on private investment.
iv. Make policy recommendations based on the findings.

1.3.3 Hypothesis of the Study

H_O : Changes in the bank rate do not significantly affect firms' investment opportunities.

H_O : Changes in the bank rate do not significantly affect credit to the private sector.

H_0 : Changes in the bank credit do not significantly affect private investment

1.4 Organisation of the dissertation

The rest of the study is organised as follows; Chapter Two entails a brief monetary policy framework, credit to the private sector and private investment in Botswana: Chapter Three review theoretical and empirical literature: Chapter Four provides the model to be estimated and the estimation techniques while Chapter Five entails the results analysis and their interpretation. Lastly Chapter Six presents conclusion, policy implications and recommendations from the findings.

CHAPTER 2: OVERVIEW OF MONETARY POLICY, PRIVATE SECTOR CREDIT AND PRIVATE INVESTMENT IN BOTSWANA

2.0 Introduction

This chapter presents an outline of the monetary policy framework, private sector credit as well as the private investment in Botswana.

2.1 Monetary policy outline in Botswana

After Botswana attained its independence in 1966, Botswana remained part of the Rand Monetary Area up until in 1976 when it set up its central bank and its currency. The execution of the central bank was a result of the requirement for management of exchange rate controls, credit and interest rates. The key goals of the central bank after attainment of monetary independence was supporting the balance of payments, circumventing spikes in aggregate demand and keeping liberal exchange regime.

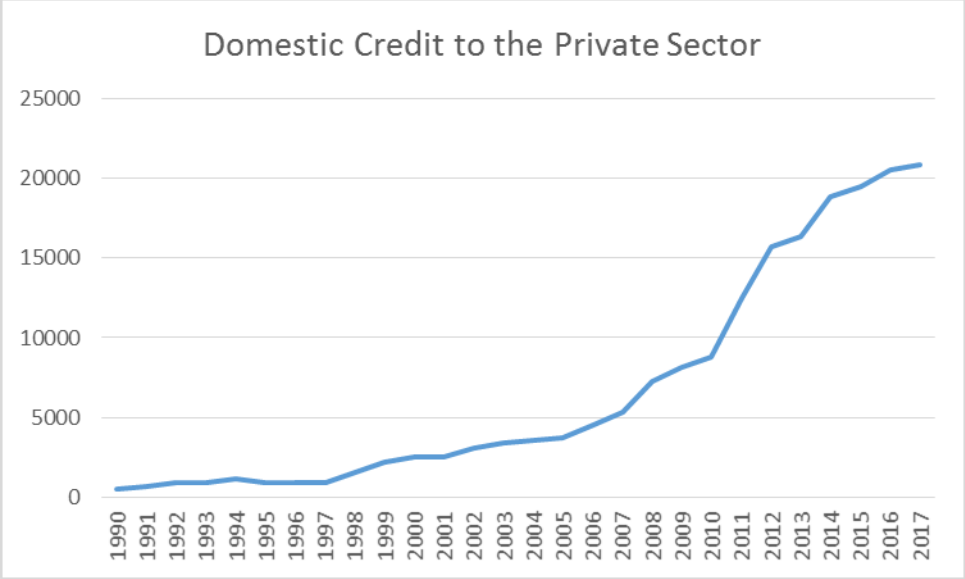
The central bank used open market operations (OMOs) and the bank reserve requirement as monetary policy instruments to control liquidity. It was found out later that these instruments were not effective in an environment of excess liquidity hence the central bank introduced the interest rate as the monetary policy instrument (Tsheole, 2006). Therefore, the interest rates were set low so as to reduce the cost of borrowing and to stimulate investment in the economy. Low interest rates lead to undesirable low and negative real interest rates in 1993. The foreign portfolio investment was restricted to 70 per cent of funds while capital movement was flexible (Tsheole, 2006). The exchange rate was fixed to a basket of currencies which comprises the Rand and the Special Drawing Rights (SDR).

The present objective in the monetary policy framework in Botswana is to ensure stability of prices and this is reflected by stable and low inflation rate. The auctions of the Bank of Botswana Certificates (BoBCs) and the bank rate are currently the key monetary policy instruments. Bank of Botswana uses open market operations (OMOs) through the use of Bank of Botswana Certificates (BoBCs) to regulate liquidity and in the course defining the bank rate which in turn

define market interest rates (Masalila, 2001). The bank rate is used to signal the direction of market interest rates and this is done through short term (overnight) financing of commercial banks liquidity needs. The reserve requirement is also used to enhance the efficiency of open market operations (OMOs) but when there is excess liquidity in the financial sector it does not have much impact (Masalila, 2001). Exchange rates policies are principally utilized to promote export competitiveness so as to enhance diversification of the economy. The crawling band exchange rate outline permits an automatic nominal adjustment of the pula exchange rate and it also stabilizes the real effective exchange rate (REER).

2.2 Overview of Private sector credit in Botswana

Figure 2.1: The Trend of Domestic Credit in Botswana



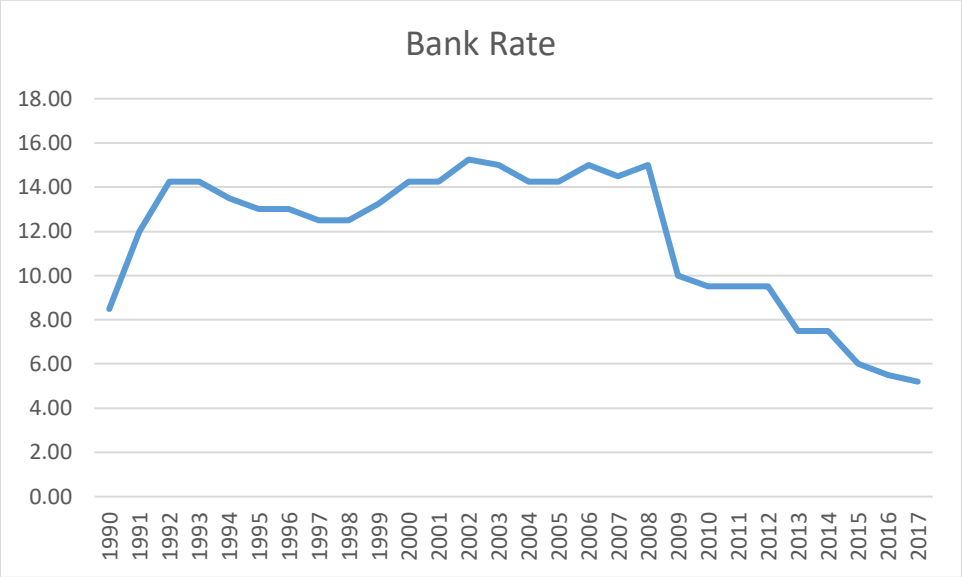
Source: Bank of Botswana reports

Private sector credit is one of the financial stability indicators in Botswana. In regulating inflation, the Bank of Botswana uses the rate of commercial bank credit as an intermediate target. Since inflationary pressures are easing, monetary policy has been accommodating so as to fuel economic activity. The Bank of Botswana reduced its policy rate by 200 basis points in December 2013 reducing it down to 7.5%. Accordingly, credit to the private sector continued to rise at a high rate of about 14% at the end of June 2014. The growth was driven by sustained expansion in borrowing

from the private sector. The credit growth is considered to support economic activity and does not pose any major risks to the stability of Botswana's financial system (UNDP, 2015).

2.3 Overview of the Bank Rate in Botswana

Figure 2.2: The Behaviour of the Bank Rate from 1990 to 2017

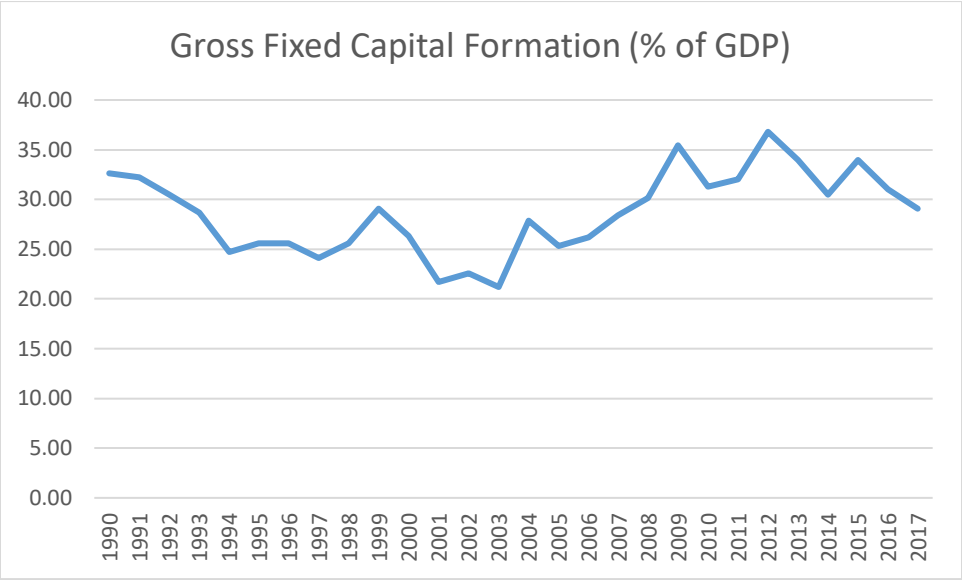


Source: Bank of Botswana reports

From Figure 2.2 it is worth noting that changes in the Bank rate depend on the monetary policy regime of the central bank. Therefore, contractionary monetary policy will lead to an increase in the Bank rate while expansionary monetary policy will lead to a decline in the bank rate. From Figure 2.2, before the 2008 financial crisis the bank rate was high while after the 2009 financial crisis the monetary policy regime was accommodating.

2.4 Overview of Private Investment in Botswana

Figure 2.3: The Behaviour of the Gross Fixed Capital Formation (% of GDP) in Botswana



Source: Bank of Botswana reports

The Government has done a number of measures and adopted several development Policies in Botswana to encourage private investment, employment formation and also to diversify the economy. From the early 1990s, the crucial strategy policy was preferment of tradable goods so as to stimulate the private industrial sector investment. Therefore, the Government focused on providing effective supportive services to export oriented private businesses.

Moreover, the policy realized the vital role played by Small, Medium and Micro Enterprises (SMMEs) in accelerating the industrialization process. Hence, the policy set out schemes to address the challenges delaying the expansion and development of these enterprises, through creation of business support institutions such as Local Enterprise Authority (LEA), Citizen Entrepreneurial Development Agency (CEDA) and Botswana Investment and Trade Centre (BITC). These policies nevertheless did not reach its anticipated level of private investment, economic diversification and employment creation, primarily on the justification of inefficient coordination of the policy initiatives, poor resource mobilization to the private sector and insufficient infrastructure (IDP, 2014).

The most recent focus for the Government of Botswana's fiscal policy strategy is to align public investment with the needs of the private sector through spending on businesses by supporting infrastructural development and provision of training towards the specific needs of the private business sector (National Development Plan 10, 2014). The Government clearly recognises the vital role played by private sector investment in economic progress and supports the idea of promoting private investment through the expansion of both the size and quality of public sector investment. Figure 2.3 shows the trend for private investment over the past 2 decades (1990 – 2017). The investment trend in Botswana has been showing alternating fluctuations between 22% and 36% range as a share of GDP from 1990 to 2017.

2.5 Factors Affecting Private Investment

GDP growth: Growth in GDP is expected to lead to higher investment rates (Mlambo & Oshikoya, 2001). The relationship between GDP growth and private investment is positive, suggesting that output will boost private investment in the long run (Ndikumana , 2000). Companies invest to meet upcoming demand and if demand is deteriorating, then corporations will reduce investment. If the economy grows, then companies will increase investment as they anticipate that demand will rise in future. There is strong empirical evidence that investment is cyclical, that is in a recession investment drops and improve with economic growth. Therefore, this indicates that real GDP growth is a determinant of private investment. Thus, given that investment is itself a key factor contributing to real GDP growth (Ghura and Goodwin, 2000), Botswana can indeed benefit from the virtuous cycle that links increased private investment and real GDP growth.

Access to credit**:** Economic theory has revealed that access to credit plays a significant role in stimulating investment. It was hypothesized that adequate credit have a positive impact on the growth of private investment. In the credit crunch of 2008, numerous banks were short of liquidity so had to reduce back lending. Banks were very hesitant to lend to companies for investment. Therefore, despite low interest rates, firms were incapable to borrow for investment even though firms had plans to invest.

Interest rate: This variable was hypothesized to have negative effect on private investment, in a case of contractionary monetary policy. Investment is financed either out of savings or by

borrowing. Therefore investment is strongly influenced by interest rates. High interest rates make it more expensive to borrow funds from commercial banks. The real interest rate can also have a positive impact on private investment according to the McKinnon-Shaw hypothesis. It posits that high interest rates on deposits attract more real balances, which allows the banking sector to finance more investments (Ndikumana, 2000).

CHAPTER 3: LITERATURE REVIEW

3.0 Introduction

This part of the study entails theoretical and empirical literature review on the relationship between monetary policy, domestic investment and private sector credit. Many studies have been carried out in different countries to determine the relationship among the variables. The results were similar but with different impact in terms of magnitude depending on the type of economy. The theoretical and empirical literature are discussed to provide a detailed picture of the existing knowledge in the area.

3.1 Theoretical Literature Review

The credit channel

The theoretical foundation of the credit channel works through the bank lending and balance sheet channels which are interlinked sub channels (Mishkin, 1995). The credit channel of monetary policy is supported by fundamental assumptions. The first assumption is that bank loans are a vital source of funds for investment, and that there is no perfect substitute. Furthermore, the central bank is in a position to limit bank's ability to loan, and bank dependent businesses are unable to substitute credit from other financing sources. The bank lending channel is based on the role that depository banks deal with borrowers, therefore there are asymmetric problems. A monetary policy contraction which is related with diminished level of reserves and hence deposits will lead to a decline in loanable funds. Ultimately this will decrease investment and later output will decrease.

Monetary policy impact on the balance sheet channel is felt through the firm's net worth. Increase in interest rates will lead to a decline in equity prices. Low equity prices lead to a decline in the net worth of firms, thus firms will have fewer collateral and the losses from adverse selection are consequently higher. Furthermore, firms with low equity lead to increased moral hazard problems. Adverse selection and moral hazard problems cause a decrease in lending and consequently a drop in investment. Monetary policy contraction will have a negative effect on firms' balance sheets

because of increased interest rate which will lead to reduction in cash flow. Reduced cash flow will increase asymmetric information problems thus lending will decline.

Bernanke & Gertler (1989) developed the external finance premium (EFP) concept. The EFP is the difference between the opportunity cost of spending internal funds and the cost of raising external finance to the borrower. Therefore, EFP signify the costs of monitoring and evaluation endured by the commercial banks which are passed on to borrowers. The EFP is inversely related to the strength of borrower's balance sheets. This means that borrowers with large amounts of collateral and healthy balance sheets pay a lower premium for external finance while borrowers with small amounts of collateral and relatively illiquid balance sheets pay high premium for external finance. The negative link between borrowers' firm net worth and the external finance premium generates a channel that magnifies slight shocks to the economy. A positive shock will lead to an upsurge in output, consequently increase cash flows and improve the borrower's firm balance sheet. This will reduce the banks' monitoring and evaluation costs therefore, lowers the external finance premium for these firms. Low external finance premium increases firm's investment spending, thus stimulating additional increase in output and increasing the firm s' net worth. This results in a further decrease of the external finance premium and eventually an amplified growth in investment then output. Increased interest rates would affect potential borrowers' balance sheets over alterations to asset values and cash flows, thus affecting their creditworthiness and the external finance premium. The increased interest rate will increase the cost of credit by more than the change in interest rates. Therefore, this will intensify the policy action.

Blinder (1987) s' theoretical framework

Blinder (1987) illustrate the theoretical framework that shows that the supply side effects of tight monetary policy through credit contraction may offset the demand effects on the price level. In Blinder's model, aggregate supply is determined by factor utilization, which in turn depends on real credit.

$c=C/P$ ….. (1)

Where; c- is real credit

C- is nominal credit

P- is the price level

Aggregate supply is determined by factor utilization, which in turn depends on real credit c.

$y_t = \gamma F_{t-1}$……. (2)

Where; y- is aggregate supply

F- is factor utilization

$F_t = \alpha(c)_t$……. (3)

The aggregate supply equation can then be stated as:

$y_t = \gamma\alpha(c)_{t-1}$…. (4)

Where $\gamma < 1$ and $\alpha < 1$

Aggregate demand (h) is a function of income:

$h_t = a + b\ y_t$…. (5)

Where $0 < b < 1$

Equations (4) and (5) can be joint to state aggregate demand as a function of real domestic credit and real factor utilization

$h_t = a + by\alpha c_{t-1}$….. (6)

The price adjustment process is given by the next equation:

$p_{t+1} = \lambda(h_t - y_t)$….. (7)

Where; p – is price level

The above equation shows relationship that credit tightening decreases demand, which leads to price level decrease, but it similarly decreases supply which causes the price level to increase. From equations (3) and (5), the impact of a one percent reduction in credit may have a larger impact on supply than on demand under reasonable assumptions about the values of the parameters b, γ, and α.as long as b, γ, $\alpha < 1$ it follows that

$b\gamma\alpha < \gamma\alpha$

So that $|dy / dc| > |dh/dc|$,

Implying that $p > 0$.

Under these circumstances, tight monetary policy leads to decline in output. Contractionary monetary policy reduces inflation by decreasing domestic aggregate demand. Nevertheless, low aggregate demand may be a restraint to output. Consequently, a contraction in bank credit to the private sector reduces production. In such conditions, even when price stability is attained, the economy may experience reduced investment and employment.

3.2 Empirical literature review

Empirical studies have examined the effect of alterations in monetary policy on investment. Traditionally, it has been argued that monetary policy has an influence on investment through the interest rate and credit channel transmission mechanisms (Bernanke & Blinder, 1988). Changes in monetary policy affect the amount of loanable funds and market interest rates. When the central bank tries to slow the economy, it would conduct policies that decrease reserves from the banking sector, which would lead to reduction of bank assets and liabilities. In doing so, the central bank reduces investment due to an increased cost of capital and reduced amount of credit to firms.

In Venezuela, Omar (2003) investigated the differential impact of real interest rates and credit availability on private investment using data for the period 1983 to 1999. The data provided evidence for an asymmetric response of real private investment spending to shocks in real stock of credit to the private sector for immediate periods after a negative shock to credit when the economy is already facing credit contractions, as was expected. On the other hand, the cumulative response of real private investment spending to positive shocks to real stock of credit to the private sector becomes bigger in later periods when the high credit regime prevails. The study pointed out that investment is more responsive to negative shocks to interest rates when facing credit contraction and more responsive to positive shocks to real stock of credit to the private.

Furthermore, Munir *et al* (2010) examined long and short run relationship between investment, savings, and real interest rate on bank deposits and bank credit to the private sector, together with the effect of financial liberalization on key macroeconomic variables in Pakistan for the period 1973 to 2007. ARDL Bounds Testing approach was applied for annual time series data. The study settled that private investment is positively affected by savings, real interest rate on bank deposits, bank credit to private sector and public investment in the long run, therefore supporting McKinnon (1973) hypothesis.

Correlation analysis was performed to assess the influence of monetary policy on private investment in Nigeria. Onouorah & Friday (2011) found that the empirical relationship between private investment and money supply, interest rate, credit was significant at 0.01. Money supply was found to be effective monetary policy instrument than the interest rate. This is based on the fact that private investment reacts more to changes in money supply than the interest rate in Nigeria; however the correlation result showed that private investment increase as money supply increase.

A study on monetary policy transmission in Botswana was conducted by Munyengwa (2012) and Kganetsano (2007). Both studies adopted the standard VAR approach using economic variables such as Bank of Botswana bank rate as the policy instrument. The credit channel was found to be active but not as strong as one would expect. The author pointed out that the policy rate does not always lead to a corresponding change in credit growth. The narrative approach identified two monetary episodes for closer investigation. In the first episode that credit growth declined as one would expect, while the second episode credit growth increased. The study explained that this could be due to the fact that the first episode was more severe than the second and may be an indication that a relatively large or sharp change in interest rates is required in order for policy to have the desired impact on credit.

Time series analysis and annual data from 1980 to 2010 was used to investigate the relationship between interest rates, private investment and economic growth in Pakistan (Naveed & Muhamad, 2015). The structural equation model was used to find out the relations of the variables with help of the regression equations. The empirical results indicated that private investment, government

expenditures and labor force have a significant positive impact on gross domestic product but foreign direct investment has a negative and statistically significant relation with gross domestic product. There also exists a unique long-run negative relationship between private investment and interest rate.

Olanrewaju (2015) examined the impact of monetary policy on private investment in Nigeria. The central focus of this study was to find out whether monetary policy in Nigeria has brought about significant capital for private investment that spurs economic growth. The study made use of secondary data sourced from the Central Bank of Nigeria statistical bulletin for the period 1986 to 2013. The Ordinary Least Square (OLS) multiple regression technique was employed and result showed that domestic credit from financial institutions to the private sector has made its own contribution to growth of private investment in the economy.

Emenike (2016) evaluated the relationship between monetary policy and private sector credit in Nigeria. The Error correction model was used for better understanding of the short run dynamics. Unit root tests results indicate that levels of the variables are not stationary but their first differences are stationary irrespective of structural breaks. Cointegrating regression results revealed evidence of long-run relationship between monetary policy and credit. The ECM results indicate that changes in credit have positive and significant short-term impact on alterations in monetary policy. The conclusion was that credit to the private sector is an effective channel for monetary policy transmission in Nigeria.

3.3 Conclusion

This chapter reviewed the literature on the relationship between monetary policy and investment. First the chapter reviewed the theories on which this study is build which are, the credit channel and Blinder s theoretical framework. From the literature review, it is evident that there exist different channels through which monetary policy activities are transmitted to output in the economy. Most of the literature on credit channel shows that an increase in credit will lead to an increase in domestic investment. In the empirical review, the study explored a study by Onouorah & Friday (2011), Olanrewaju (2015) and Munir *et al* (2010) discovered that there is relationship

between private investment and money supply. This was based on the fact that private investment reacts to changes in money supply and interest rates. The existing studies in this area have focused on other countries as opposed to Botswana. In Botswana Kganetsano (2007) and Munyengwa (2012) conducted a study on monetary policy transmission in Botswana with the aim of finding out how long does it take other for economic variables Their results indicated that the credit channel was found to be active . This study therefore seeks to provide knowledge on the interaction between monetary policy and investment. To achieve this goal, this study therefore confronts the effect of monetary policy on investment through the credit channel using vector error correction model. So far, there has been no empirical evidence on the effect of monetary policy on investment in Botswana. The study targets to bridge this gap.

CHAPTER 4: METHODOLOGY

4.0 Introduction

This chapter describes method of research which was applied to objectively establish the influence of monetary policy on private investment. It includes theoretical methodology, definition of terms, and research design.

4.1 Theoretical Methodology

Modelling the Effects of Bank Credit on Domestic Investment

Steven & Bruce (1988) provide theoretical motivation and empirical confirmation on the significance of credit constraints for investment. An empirical link between investment and monetary policy is derived to demonstrate the effects of monetary policy on private investment through bank credit to the private sector. In the case presented in this study the monetary policy standpoint affects domestic credit, which in turn affects the private investment. Furthermore, monetary policy affects investment through the quantity of credit and its overall effects on financial intermediation. By hindering financial intermediation, credit tightening is a constraint to business investment and the economy as a whole.

Keynes (1973) emphasized that banks hold the crucial position in the transition from a lower to a higher position of economic activity. When the domestic credit market is functioning well this will facilitate long term investment by pooling resources. The state of domestic credit is an ornamental factor in the capital buildup procedure.

The above mentioned discussion advocates that a good credit environment in the form of abundant and reasonable credit is likely to be linked with faster capital accumulation and hence higher capital stock (Keynes, 1973). This can be stated by the following equation:

$K_t^* = \alpha + bX_t + Z_t\theta$….. (8)

Where: K*- optimal capital stock

X- the state of credit

Z -is a vector of other determinants of investment demand.

The adjustment to optimal capital stock, K*, is as follows:

$\Delta K_t = \alpha(K_t^* - K_{t-1})$…… (9)

Where: α- is the flexible accelerator parameter $0 \leq \alpha \leq 1$.

Domestic investment, which is the sum of net capital stock, is given by:

$I_t = \Delta K_t + \beta K_{t-1}$…… (10)

Where: β- is the depreciation rate

Combining the above three equations yields investment as a function of the 'state of credit':

$I_t = \alpha\alpha + b\alpha X_t + \theta\alpha Z_t + (\beta - \alpha)K_{t-1}$…. (11)

Can be written as,

$I_t = \alpha[\alpha + bX_t + \theta Z_t - K_{t-1}] + \beta K_{t-1}$ …. (12)

Monetary policy also has direct effects on private investment. This proposition will be tested empirically in the next section. The empirical analysis also takes into account the effects of other determinants of private investment.

4.2 Model specification

The investigation of the impact of monetary policy on private investment was accomplished by estimating the following model:

GFCF =f (DCPS, BRATE, EXDEBT, TRADE, GDP, DUMMY)

Where;

GFCF - Gross fixed capital formation (% of GDP)

BRATE - Bank rate

DCPS - Domestic Credit to the private sector (current prices)

GDP- Real Gross Domestic Product (current prices)

TRADE - Trade (% of GDP)

EXDEBT- External debt (current prices)

DUMMY- Takes 0 for pre 2008 financial crisis and 1 for post 2008 financial crisis

4.3 Definition of variables

Gross fixed capital formation (GFCF): Domesti**c** investment is proxy for gross capital formation (Azlina Hanif, 2014). Gross capital formation is measured by the total worth of the gross fixed capital formation, inventories fluctuations and purchases minus disposals of valuables. Credit has a positive significant influence on the evolution of GDP but it depends on institutional structures. This is because credit allows risk sharing between firms and households and they will be motivated to invest (Duican, 2015). Monetary restraint is expected to reduce all forms of investment, this is because monetary contraction raises real interest rates, thus reducing consumption and investment spending.

Gross domestic product growth (GDP): the monetary worth of all the finished services and goods manufactured within a country in a year. One of the most important variables correlates with growth is investment which has been classified in both neoclassical and endogenous growth models. The supply leading hypothesis advocates believe that the banking activities aid as a useful instrument to increase the productivity of a country (Adeyeye, 2015).

Trade as % of GDP (TRADE): Trade as % of GDP is a measure of trade openness. Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product. Capital formations/investment have a link with the exports, since when the investment demand increases, the export demand also increases (Albiman, 2016). Therefore a positive relationship is expected between trade and domestic investment.

Domestic credit to the private sector (DCPS): credit is an amount lent to the borrower with an agreement of repayment. Monetary policy is expected to alter credit flows. The use of legal reserve requirements provide monetary authorities with sizeable leverage over the magnitude of funds that

banks may preserve, just as open market sales reduces the real size of deposits banks can issue (Emenike, 2016). This in turn prompts banks to contract or expand lending which ultimately constrain or increase the spending capacity of borrowers.

Bank rate (BRATE): This is the rate at which central banks lend money to banks. A negative relationship is expected between bank rate and domestic investment. This is because higher interest rates will decrease the investment's net present values. The bank rate is one of monetary policy instruments.

External debt (EXDEPT): This is the amount of a country's debt that was borrowed from foreign lenders including commercial banks, governments or international financial institutions. External debt is expected to be positively related to private investment. This is because the Government use funds generated through external borrowing to improve investment in the economy.

Dummy Variable (DUMMY): This variable is included in the model so as to control for outliers in the data. Inclusion of the dummy will also reveal how the 2008 financial crisis affected the gross fixed capital formation. The 2008 financial crisis has different impact on the gross fixed capital formation depending on the behaviour of the economy and its investors.

4.4 Estimation Procedure

The Vector Autoregressive (VAR) framework was used to empirically analyse and quantify the relationship between monetary policy and investment. The VAR methodology is a simultaneous equation modeling which considers endogenous variables but each endogenous variable is explained by its lagged or past values and the lagged values of all other endogenous variables in the model (Enders, 2014).

The VAR approach imposes little economic structure on the estimates. Therefore when restrictions are imposed, they are usually general and thus compatible with a wide range of alternative theories (Bagliano and Favero, 1998). Consequently, the approach has the advantage of avoiding issues about the underlying structure of the economy. This is even more appealing when dealing with developing economies given uncertainties about their structure such as Botswana. VAR assumes endogeneity of variables which is a feature of monetary transmission mechanism. This study

therefore employs the VAR technique to analyse the impact of monetary policy on investment in Botswana.

VAR model will be specified as follows:

$$\text{GFCF} = \alpha_0 + \sum_{i=1}^{n}\alpha_i GFCF_{t-i} + \sum_{i=1}^{n}\alpha_i\ BRATE_{t-i} + \sum_{i=1}^{n}\alpha_i DCPS_{t-} + \sum_{i=1}^{n}\alpha_i EXDEBT_{t-i} + \sum_{i=1}^{n}\alpha_i TRADE_{t-i} + \sum_{i=1}^{n}\alpha_i GDP_{t-i} + \mu_{1t} \quad (1)$$

$$\text{BRATE} = \alpha_0 + \sum_{i=1}^{n}\alpha_i BRATE_{t-i} + \sum_{i=1}^{n}\alpha_i GFCF_{t-i} + \sum_{i=1}^{n}\alpha_i BRATE_{t-i} + \sum_{i=1}^{n}\alpha_i EXDEBT_{t-i} + \sum_{i=1}^{n}\alpha_i TRADE_{t-i} + \sum_{i=1}^{n}\alpha_i GDP_{t-i} + \mu_{2t} \quad (2)$$

$$\text{DCPS} = \alpha_0 + \sum_{i=1}^{n}\alpha_i DCPS_{t-i} + \sum_{i=1}^{n}\alpha_i GFCF_{t-i} + \sum_{i=1}^{n}\alpha_i BRATE_{t-i} + \sum_{i=1}^{n}\alpha_i EXDEBT_{t-i} + \sum_{i=1}^{n}\alpha_i TRADE_{t-i} + \sum_{i=1}^{n}\alpha_i GDP_{t-i} + \mu_{3t} \quad (3)$$

$$\text{EXDEBT} = \alpha_0 + \sum_{i=1}^{n}\alpha_i EXDEBT_{t-i} + \sum_{i=1}^{n}\alpha_i GFCF_{t-i} + \sum_{i=1}^{n}\alpha_i BRATE_{t-i} + \sum_{i=1}^{n}\alpha_i DCPS_{t-i} + \sum_{i=1}^{n}\alpha_i EXDEBT_{t-i} + \sum_{i=1}^{n}\alpha_i TRADE_{t-i} + \sum_{i=1}^{n}\alpha_i GDP_{t-i} + \mu_{4t} \quad (4)$$

$$\text{TRADE} = \alpha_0 + \sum_{i=1}^{n}\alpha_i TRADE_{t-i} + \sum_{i=1}^{n}\alpha_i GFCF_{t-i} + \sum_{i=1}^{n}\alpha_i BRATE_{t-i} + \sum_{i=1}^{n}\alpha_i DCPS_{t-i} + \sum_{i=1}^{n}\alpha_i GDP_{t-i} + \sum_{i=1}^{n}\alpha_i EXDEBT_{t-i} + \mu_{5t} \quad (5)$$

$$\text{GDP} = \alpha_0 \sum_{i=1}^{n}\alpha_i GDP_{t-i} + \sum_{i=1}^{n}\alpha_i GFCF_{t-i} + \sum_{i=1}^{n}\alpha_i BRATE_{t-i} + \sum_{i=1}^{n}\alpha_i DCPS_{t-i} + \sum_{i=1}^{n}\alpha_i TRADE_{t-i} + \sum_{i=1}^{n}\alpha_i EXDEBT_{t-i} + \mu_{6t} \quad (6)$$

Or more compactly,

$$y_t = B_0 + B_1 y_{t-1} + \cdots + B_i y_{t-i} + \mu_{it} \quad \ldots. \ (7)$$

Where; y_t= (GFCF, DCPS, BRATE, EXDEBT, TRADE, GDP)

i - is the number of lags

y_t, y_{t-1} and y_{t-i} - are p ×1 vector of variables,

B_i - Are $p \times p$ matrices of autoregressive parameters to be estimated

μ_{it} - is p × 1vector of innovations.

Equivalently the model can be written as

$$B(L)y_t = u_t \text{ …….. (8)}$$

Where:

B (L) = $B_0 - B_1L - B_2L^2 - \cdots - B_pL^p$, denotes the autoregressive lag order polynomial.

To permit estimation of the model the reduced-form have to be derived first. The VAR representation is then pre multiplied by $B_0^{-1}$to derive the reduced form:

$B_0^{-1}B_0y_t = B_0^{-1}B_1y_{t-1} + \cdots + B_0^{-1}B_py_{t-p} + B_0^{-1}u_t$

Henceforth, the model can be denoted as:

$y_t = A_1 y_{t-1} + \cdots + A_P y_{t-P} + \varepsilon_t$

Where: $A_i = B_0^{-1}B_i, i = 1, \ldots p, and\ \varepsilon_t = B_0^{-1}u_t$

Then the model can be represented as:

A (L) $y_t = \varepsilon_t$ ……. (9)

Where: A (L) $\equiv$ I $- A_1 L - A_2 L^2 - \cdots - A_P L^P$ …… (10)

A (L) −is the autoregressive lag order polynomial.

And ε_t= $B_0^{-1}u_t$ or $\mu_t = B_0\varepsilon_t$ ……. (11)

Therefore, linking the response of the vector y_t to reduced-form, shocks ε_t would not show the response of y_t to the structural shocks u_t. It is the responses that are of importance if we want to study about the structure of the economy. These structural responses depend on B_i , i = 0... p. To transform u_t from $u_t = B_0\varepsilon_t$ and B_i , i = 0,..,p from $B_i = B_0A_i$ we have to recover the elements of B_0^{-1} from consistent estimates of the reduced-form parameters. By construction $\varepsilon_t = B_0^{-1}u_t$. Therefore, the variance of ε_t is:

E ($\varepsilon_t\ \varepsilon'_t$) = B_0^{-1} E ($u_t\ u_t$) $B_0^{-1\prime}$

$\Sigma_\varepsilon = B_0^{-1}\Sigma_u B_0^{-1\prime}$

$\Sigma_\varepsilon = B_0^{-1}B_0^{-1\prime}$

4.5 VAR identification

Impulse response functions from the estimated VAR are used to trace the time path of the response of investment to shocks to monetary policy and bank credit as well as the response of bank credit to monetary policy shocks. The forecast error variance decomposition was used to measure the contribution of each shock to the variance of each endogenous variable (Sims, 1986). However, to get impulse response functions, we first need to identify primitive shocks from the reduced form residuals. There are several approaches that have been proposed to identify structural shocks from their reduced form counterparts. This study employs the generalized impulse response approach. The generalized impulse response approach does not entail orthogonalization of shocks and is invariant to the ordering of the variables in the VAR (Sims, 1980). In particular, for a non-diagonal error variance matrix the orthogonalized and the generalized impulse responses coincide only in the case of the impulse responses of the shocks to the first equation in the VAR. This approach can also be applied to cointegrated VAR models, and it is revealed that the maximum likelihood estimator of the generalized impulse responses is consistent and asymptotically normally distributed. Therefore, the generalized impulse responses are unique and completely take into account correlation among the different shocks (Pesaran & Shin, 1997).

4.6 Vector Error Correction Model

Following the above explanation, it is vital to specify that if contegration is found, the Vector Error Correction Model (VECM) will be conducted. VECM specification limits the long run behavior of endogenous variables to converge to their long run equilibrium relationships and allow for short run dynamics (Mkhalipi, 2012).

The generalized outline of the VECM is represented as;

$$\Delta y_t = B_0 + B_i \Delta y_{t-i} + \cdots + B_n \Delta y_{t-n} + \varphi ecm_{t-1} + \mu_t$$

Where; y_t= (GFCF, DCPS, BRATE, EXDEBT, TRADE, GDP)

p - is the number of lags

t – Represent time period

y_t, y_{t-i} and y_{t-i} - are p ×1 vector of variables,

B_n - Are $p \times p$ matrices of autoregressive parameters to be estimated

μ_t - is p × 1vector of innovations.

φecm_{t-1} – Error correction term

4.7 Estimation methods

Unit root test

The unit root test was used to test for stationarity of variables. It is important to test for stationarity and that is where the concept of cointegration plays part. A stochastic process is said to be covariance stationary if its mean, and variance are time invariant, and the auto covariance does not depend on time lag between the variables. If the variables are non-stationary, cointegration test is undertaken. The Augmented Dickey Fuller (ADF) and Phillips Perron (PP) tests are used to conduct the unit root test.

Cointegration

Time series variables are said to be cointegrated if they are non-stationary, but their linear combination is stationary. Those variables will be referred to as having a long term equilibrium relationship. The significance of testing for cointegration between variables comes from the notion that regressing non stationary series leads to spurious regression. The study, therefore, employs the Johansen cointegration test in order to test for cointegration.

4.8 Data sources

The study uses quarterly data from Bank of Botswana and World Development Indicators (WDI) publications for the period 1990 to 2017. The choice of period of the study is determined by the availability of data. The study uses E-views 7 statistical package to estimate the data.

CHAPTER 5: RESULTS ANAYSLIS AND THEIR INTERPRETATIONS

5.0 Introduction

This chapter presents the empirical estimation of the model, as well as presentation of the empirical results. The empirical results are analyzed for the period 1990 to 2017 using quarterly data. The Vector Error Correction Model was employed to determine the impact of monetary policy on private sector credit and private investment. The empirical results are accompanied by the interpretation of the results. The econometrics package E-views 7 was used to estimate the data.

5.1 Descriptive Statistics

Descriptive statistics offer a simple summary about the basic structures of the sample. The measures of central tendency are used to provide numerical information about the typical observation in the data (Hollingsworth, 2016). It also determines if the data has a tendency to center around some value. The results are summarized in Table 5.1:

Table 5.1: Descriptive Statistics

	BRATE	DCPS	EXDEPT	GDP	GFCF	TRADE
Mean	11.739	6705.711	6026.625	783655.9	28.661	95.865
Median	13.000	3523.109	2207.680	572784.0	28.897	93.988
Maximum	15.672	20888.67	17868.39	2260379	37.163	123.846
Minimum	5.1313	457.388	743.066	90727.73	20.468	65.199
Std. Dev	3.189	6909.388	6383.071	647451.1	4.103	10.504
Skewness	-0.751	1.000	0.878	0.864	0.031	0.508
Kurtosis	2.193	2.459	1.929	2.566	2.231	3.610

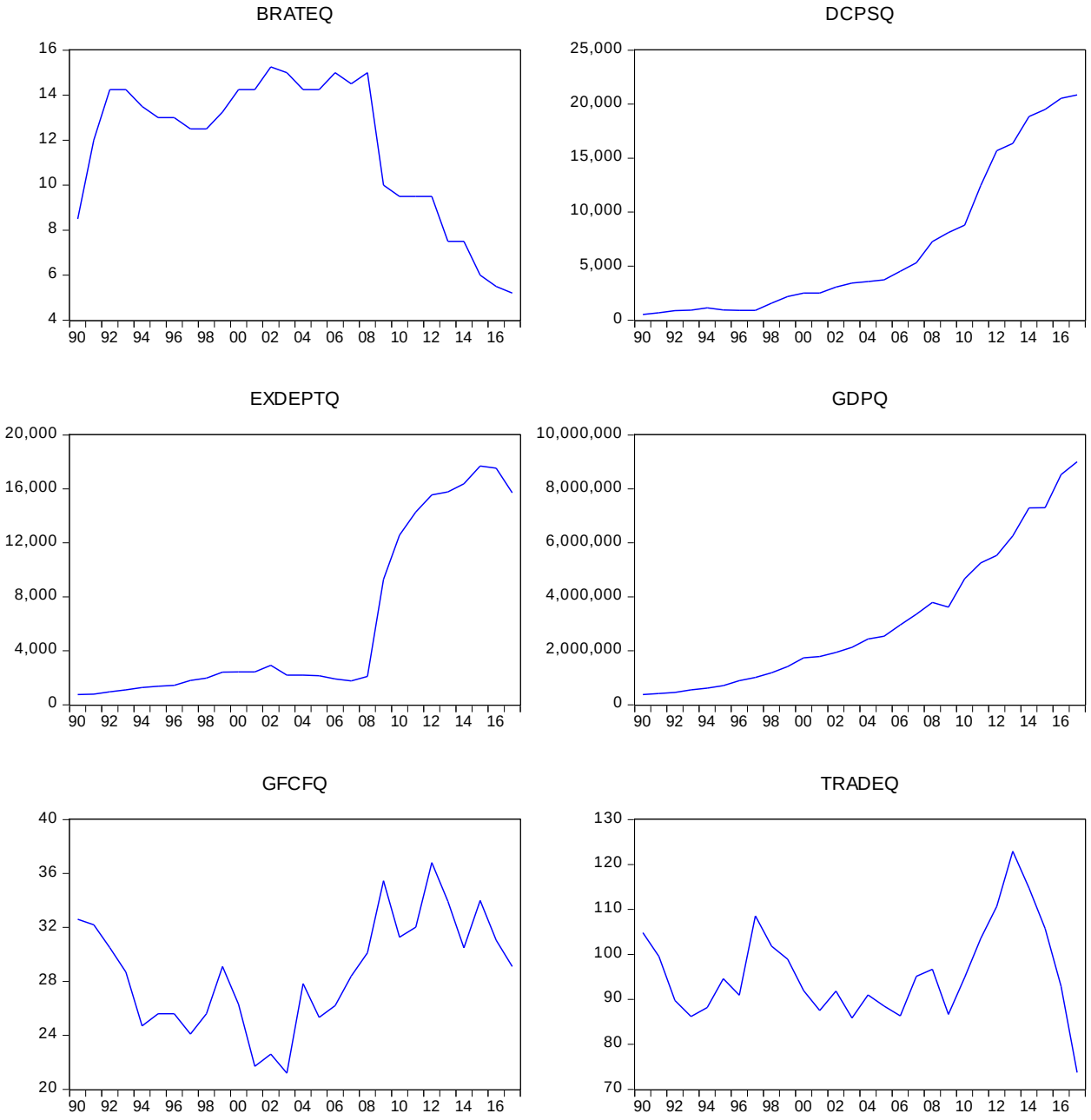
Source: Eviews Results

The behavior of the Bank rate over the period of the study has an average of 11.739 and the standard deviation of 3.189. The domestic credit to the private sector has an average of P6705.71 million and a standard deviation of P6809.388 million. External debt has an average of P6026.625 million and standard deviation of P6383.071 million. The gross domestic product has an average of P783655.9 million and a standard deviation of P647451.1 million. The gross fixed capital formation has an average of 28.66 per cent and a standard deviation of 4.10 percentage. Trade has an average of 95.865 percentage to gross domestic product (GDP) and a standard deviation of 10.504 per cent to GDP.

The negative value for skewness shows that the bank rate data is skewed left, meaning that the left tail is long relative to the right tail. Gross fixed capital formation has a normal distribution and this is indicated by a skewness near zero. Trade, domestic credit to the private sector, real GDP and external debt have data that is skewed to the right, which means the right tail is long relative to the left tail. Gross fixed capital formation, domestic credit to the private sector, real GDP and external debt have a fairly standard normal distribution and this is indicated by the kurtosis near the expected value of 3. Therefore, the data is fairly symmetric.

Graphical representation of the behavior of variables

Figure 5.1: Graphical representation



Source: Eviews Results

5.2 Unit Root Test

A stochastic time series is said to be stationary if its mean and variance are constant over time (Brooks, 2014). Stationarity or non-stationarity of a series can strongly influence its behavior and classical regression model properties. Non-stationary series can lead to spurious regressions, indicating significant relationship where there is none, ceteris paribus. The possibility of spurious regression is shown by very high coefficient of determination and a low Durbin Watson statistic. The Augmented Dickey Fuller (ADF) and Phillips Perron (PP) test were be used to examine whether the variables have unit root or not. The unit root test results are presented below:

Table 5.2: Unit Root Test of the Variables

VARIABLE	AUGMENTED DICKEY FULLER				PHILLIPS PERRON			
	LEVELS		FIRST DIFFERENCE		LEVELS		FIRST DIFFERENCE	
	Stat	Prob	Stat	Prob	Stat	Prob	Stat	Prob
GDP	-3.169	0.025**			-1.965	0.302	-5.617	0.0000***
BRATE	-0.554	0.875	-3.787	0.0041***	-0.968	0.763	-4.873	0.0001***
DCPRIV	-0.613	0.862	-3.363	0.014**	-0.986	0.756	-4.662	0.0002***
EXDEBT	-0.972	0.761	-7.154	0.000***	-0.821	0.809	-7.214	0.0000***
GFCF	-1.6617	0.448	-3.134	0.0272**	-1.979	0.296	-5.374	0.0000***
TRADE	-2.989	0.039**			-1.269	0.642	-4.657	0.0002***

**** Significant at 1%; ** Significant at 5%; * Significant at 10%*

Source: Eviews Results

Table 5.2 above shows that all variables except for GDP and TRADE, have a unit root or are non-stationary at levels. This is because they do not satisfy the decision rule for ADF test for stationarity, that the probability value should be less than 5%. For all the variables except for GDP and TRADE, the probability value is also more than 5%, which means we fail to reject the null hypothesis that the series in equation has a unit root and is non-stationary. Since the data is non-stationary data at levels hence, the data need to be converted to first difference. After converting the data to first difference then it became stationary.

From the results presented in the Table 5.2, ADF results show that all variables are stationary at first difference except for GDP and TRADE which is stationary at levels. Therefore, all variables are integrated of order one I (1) except for GDP and TRADE which is I (0). The Phillip's Perron results indicate that all variable are stationary at first difference. A great advantage of Philips-Perron test is that it is non-parametric, i.e. it does not require selection of the level of serial correlation as in ADF. It rather takes the same estimation scheme as in dickey fuller (DF) test, but corrects the statistic to conduct for autocorrelations and heteroscedasticity (Phillips & Perron, 1988).

Since all variables are stationary at first difference with PP test, the variables are integrated of order one I (1). Given the unit root properties of each of the series, the next step is to use Johansen and Juselius cointegration technique to establish if there is long run cointegrating relationship among variables.

5.3 Lag Length criterion

Table 5.3 VAR Lag Length Selection Criterion

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-640.7486	NA	0.010155	12.43747	12.59003	12.49928
1	455.2830	2044.520	1.43e-11	-7.947749	-6.879822	-7.515101
2	572.3430	204.8550	3.02e-12	-9.506595	-7.523302*	-8.703105*
3	587.9120	25.44933	4.55e-12	-9.113692	-6.215032	-7.939360
4	600.0873	18.49708	7.43e-12	-8.655524	-4.841499	-7.110350
5	714.1115	160.0725	1.75e-12	-10.15599	-5.426599	-8.239975
6	781.3089	86.58135*	1.04e-12*	-10.75594*	-5.111184	-8.469084
7	791.9768	12.51424	1.92e-12	-10.26879	-3.708661	-7.611086
8	801.8947	10.49001	3.75e-12	-9.767205	-2.291715	-6.738664

* indicates lag order selected by the criterion

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

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Source: Eviews Results

The optimal lag selection result as shown by LR, FPE and AIC indicate the inclusion of six lags in the cointegration test for long run relationship. The Lag of six is preferred over lag of two which was indicated by SC and HQ criterion. This is because during preliminary estimation, the variables of interest i.e. bank rate, was only significant after four lags. The optimal lag will be 6 and will be used in the Johansen Cointegration test and the Vector Error Correction Model (VECM). The order of the corresponding VECM is always one less than the VAR (Sharp, 2010). Therefore, lag five will be used in estimating the VECM.

5.4 Cointegration

Cointegration refers to the presence of a long run association between variables. Cointegration tests were taken based on the Johansen 1990 maximum likelihood framework. Since the five variables are all integrated of order one, there may be a long-run equilibrium relationship amongst the variables and there is a necessity to carry out the cointegration test. The results for the cointegration test are shown below:

Table 5.4: Cointegration trace test

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.351350	96.67193	95.75366	0.0432
At most 1	0.147543	49.49001	69.81889	0.6598
At most 2	0.117050	32.09013	47.85613	0.6072
At most 3	0.094361	18.52107	29.79707	0.5277
At most 4	0.048280	7.717585	15.49471	0.4961
At most 5	0.021094	2.323800	3.841466	0.1274

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 No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.351350	47.18192	40.07757	0.0067
At most 1	0.147543	17.39988	33.87687	0.9055
At most 2	0.117050	13.56906	27.58434	0.8512
At most 3	0.094361	10.80348	21.13162	0.6669
At most 4	0.048280	5.393785	14.26460	0.6915
At most 5	0.021094	2.323800	3.841466	0.1274

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: Eviews Results

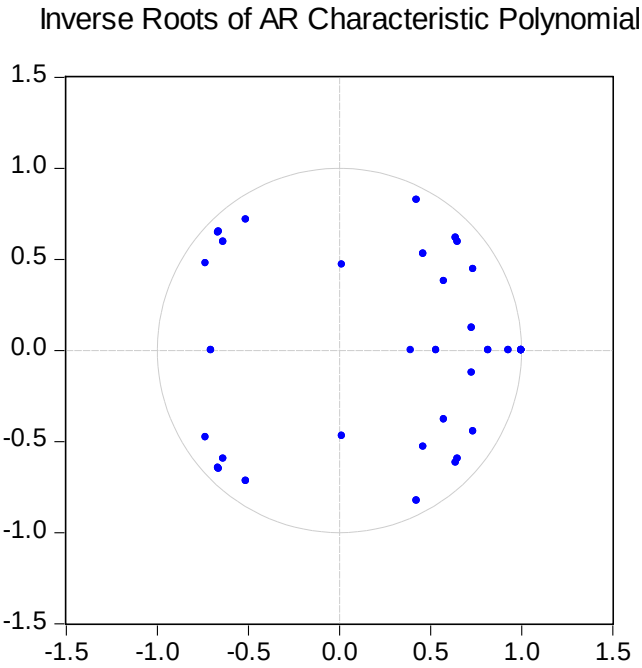
The trace statistics are presented in Table 5.4. The trace test is carried out to obtain the number of most likely cointegrating equations and the maximum Eigen value test is done to determine the exact number of cointegrating vectors. Both the Trace and the Maximum Eigenvalue test indicate that there is one cointegrating equation. Thus, it is necessary to estimate the Vector Error Correction Model (VECM) to indicate the nature of long run relationship among series.

5.5 Diagnostic Tests

5.5.1 Stability Test

The AR roots graph, is used to check the stability of the model. Below are the AR Roots results:

Figure 5.2: AR Roots Graph



Source: Eviews Results

All the AR roots lie within the unit circle except for only one root that lies on the circumference of the circle. This stability results show that the null hypothesis of stability is not rejected, thus the model is stable. Therefore, the model is appropriate for further analysis and will be good for policy recommendations.

5.5.2 Serial Correlation and Heteroscedasticity

Autocorrelation is defined as correlation between series of observations ordered in time series or cross sectional data (Gujarati, 2009). Classical linear regression models assume that there is no autocorrelation among the disturbances. Autocorrelation of the disturbances usually happens when a series is non-stationary. Autocorrelation may also arise when wrong functional forms are used in estimating the model. Testing for autocorrelation helps identify any relationship existing between residual values (u_i) and any lagged values. The LM test is used to test for autocorrelation under the null hypothesis of no serial correlation.

According to Gujarati (2011), the presence of heteroscedasticity implies that the variance of the model's errors is not constant. This problem arises when the variances of the errors are assumed to be homoscedastic while in actual fact their variance is not constant (heteroscedastic). Heteroscedasticity results in standard errors that are highly likely to be incorrect. The null hypothesis is that there is no heteroscedasticity in the model.

Table 5.5: Serial Correlation LM and Heteroscedasticity Tests

	Autocorrelation LM Tests	White Heteroscedasticity test
	LM statistic	Chi- square
Test Statistic	14.05669	1356.336
Probability	0.9996	0.2560
Conclusion	Fail to reject the null hypothesis	Fail to reject the null hypothesis

Source: Eviews Results

As the p-value is greater than 10 per cent at the lag of 5, we fail to reject the null hypothesis and conclude that there is no serial correlation. The White Heteroscedasticity p-value results prove that we fail to reject the null hypothesis therefore, that there is no problem of heteroscedasticity in the

model. The results in Table 5.5 above indicate that the estimated parameters in the model are precise therefore can be used for economic analysis.

5.6 VECM Estimation

Since the variables are I (1) and cointegrated, the study adopts the Vector Error Correction Model (VECM). The VECM is used to estimate the impact of the bank rate on gross fixed capital formation and domestic credit to the private sector. Other variables included in the model are external debt (EXDEBT), trade (TRADE) and gross domestic product (GDP). The VECM allows for estimation of the short run dynamics within the model and captures the speed of adjustment to equilibrium from independent variable shocks.

Table 5.6: VECM GFCF Equation Results

	Equation 1 **GFCF**
ECT	-0.095463 [-3.47623]
D(GFCF(-1))	0.545220 [5.21851]
D(GFCF(-4))	- 0.584225 [-7.05532]
D(GFCF(-5))	0.291042 [3.15006]
D(BRATEQ(-4))	0.021394 [1.69094]
D(BRATEQ(-5))	-0.023538 [-2.09902]
D(DCPS(-4))	0.144832 [1.62711]
D(EXDEPT(-3))	-0.069577

	[-2.21947]
D(GDP(-4))	-0.475759 [-3.07833]
D(GDP(-5))	0.357898 [2.32158]
DUMMY	0.125077 [3.23960]

Source: Eviews Results

Adjusted R-squared value of 0.65 implies that the VECM fits the data reasonably (see appendices). From the dynamics of the GFCF (equation 1), gross fixed capital formation is explained by lagged values of gross fixed capital formation (GFCF), domestic credit to the private sector (DCPS), bank rate (BRATE), external debt (EXDEBT), trade (TRADE) and gross domestic product (GDP). From the results in Table 5.6, the error correction term coefficients of the GFCF equation has the correct negative sign and is statistically significant. A significant error correction term provides further confirmation of existence of long run relationship between the variables and speed of adjustment is 0.1 percent.

The lagged GFCF carries a positive and negative signs which are significant at lag 1, 4 and 5.The lagged values of GFCF portray different adjustment pattern with strong effects working during the first, forth and firth lag. The positive and negative signs show that the lags in GFCF have different effects at different lags. The coefficients for the bank rate are correctly signed, that is negative for all lags except for lag 4. However, they are not statistically significant, indicating that bank rate does not influence domestic investment the first four quarters. The significance of the bank rate is at lag 5 only, which means the impact of the bank rate on gross fixed capital formation is felt at 5. This indicates that all other things held constant the level of gross fixed capital formation will decrease by 0.02 percent at lag 5 when BRATE increases by 1 percent. Economic theory posits that tight monetary policy leads to decline in investment and ultimately output then inflation decreases. In such conditions, even when price stability is attained, the economy experiences reduced investment, output and employment. The negative impact of the bank rate on gross fixed

capital formation conform to the studies carried out by Olanrewaju (2015) in Nigeria and by Omar (2003) in Venezuela. At lag 4 the impact of bank rate on gross fixed capital formation was not significant but with an unexpected sign which is positive. The results show that a 1 percent increase in the bank rate will lead to 0.02 percent increase in the gross fixed capital formation, ceteris paribus. The results at lag 4 conforms with the McKinnon-Shaw (1973) hypothesis, which posit that an increase in interest rates may induce the savers to save more, which enables more investment. The positive and negative signs shows that the bank rate has different effects at different lags.

In addition to the interest rate effect through investment, Blinder (1987) also illustrated that the effect of contractionary monetary policy on production may come through a contraction in bank credit to the private sector. It is interesting to find that Botswana's domestic credit to the private sector has a positive and insignificant influence on gross fixed capital formation. These results do not conform to most of the studies such as studies conducted by Omar (2003), Munir et al (2010) and Onouorah & Friday (2011). These studies found that domestic credit to the private sector was one of the major determinants of gross fixed capital formation in economies and there was a strong positive impact of credit availability on the growth of investment. From this study, we conclude that an increase of credit availability brings about a 0.14 percent increase in investment, but the impact is statistically insignificant, revealing that in Botswana, credit availability do not have impact on private investment. Munyengwa (2012) and Khanetsano (2007) conducted a study on the monetary policy transmission in Botswana and found that monetary policy is more effective in the interest rate channel, with the policy interest rate being responsible for 15.1 percent of variation in inflation. The credit channel follows with the policy interest rate contributing 12.7 percent and they concluded that the bank lending channel is weak because of Government polices aiming at promoting economic diversification. Therefore, this could also be reason why the credit to the private is statistically insignificant in terms of determining private investment in Botswana.

The short run effects of external debt on gross fixed capital formation are only statistically significant in lag 3 and have a negative sign. This means that all other things held constant a one percent increase in external debt will lead to a decline in gross fixed capital formation by 0.07 percent. Adesola (2009) found that external debt is positively related to gross domestic product

and gross fixed capital formation. Iyoha (1999) asserts that external debt has a negative impact on economic growth, thereby concluding that external debt depresses investment through the disincentive effect and the crowding-out effect.

The coefficient of gross domestic product is negative for lag 4 and positive for lag 5and both significant. Therefore, a one percent increase in GDP will result in 0.5 percent decrease in gross fixed capital formation while at lag 5 a one percent increase in GDP will result in 0.4 percent increase, *ceteris paribus*. However, the overall effect of an increase in GDP will have a decrease in investment. The results do not make economic sense and do not conform to other studies such as Gibescu (2010) who found that gross domestic product is inter-related with the gross fixed capital formation in Romania, Bulgaria, Czech Republic, Poland and Hungary.

Table 5.6 shows that the coefficient of the dummy variable is significant, implying that the 2008 financial crisis lead to 0.13 percentage increase in domestic investment. These results are consistent with a study done by Kathleen (2017) who pointed out that the positive impact of the financial crisis on domestic investment is consistent with monitoring Hypothesis. Kathleen (2017) reported that during the economic crisis period where investors promotes efficient levels of investments by allowing institutional investor firms to decrease their investments before periods of crisis. Therefore, because of their monitoring efforts, the presence of institutional investors becomes more valuable during crisis periods.

Table 5.7: VECM DCPS Equation Results

	Equation 2 DCPS
ECT	-0.035617 [-0.87914]
D(LGFCF(-4))	0.191572 [-1.56818]
D(BRATEQ(-5	0.012596 [0.76140]
D(LDCPS(-1))	0.660949 [5.21465]
D(LDCPS(-4))	-0.351192 [-2.67440]
D(LEXDEPT(-3))	0.015343 [-0.33177]
D(LGDP(-1))	0.062808 [0.25540]
D(LTRADE(-4))	0.751854 [3.41338]
D(LTRADE(-5))	-0.714868 [-2.98876]
DUMMY	0.049533 [0.86963]

Source: Eviews Results

The domestic credit to the private sector equation (equation 2) is another equation of interest in order to see if monetary policy instrument affect domestic credit to the private sector. The equation has the error correction term that is negative but is statistically insignificant. This implies that the dependent variable does not adjust to correct departures from equilibrium.

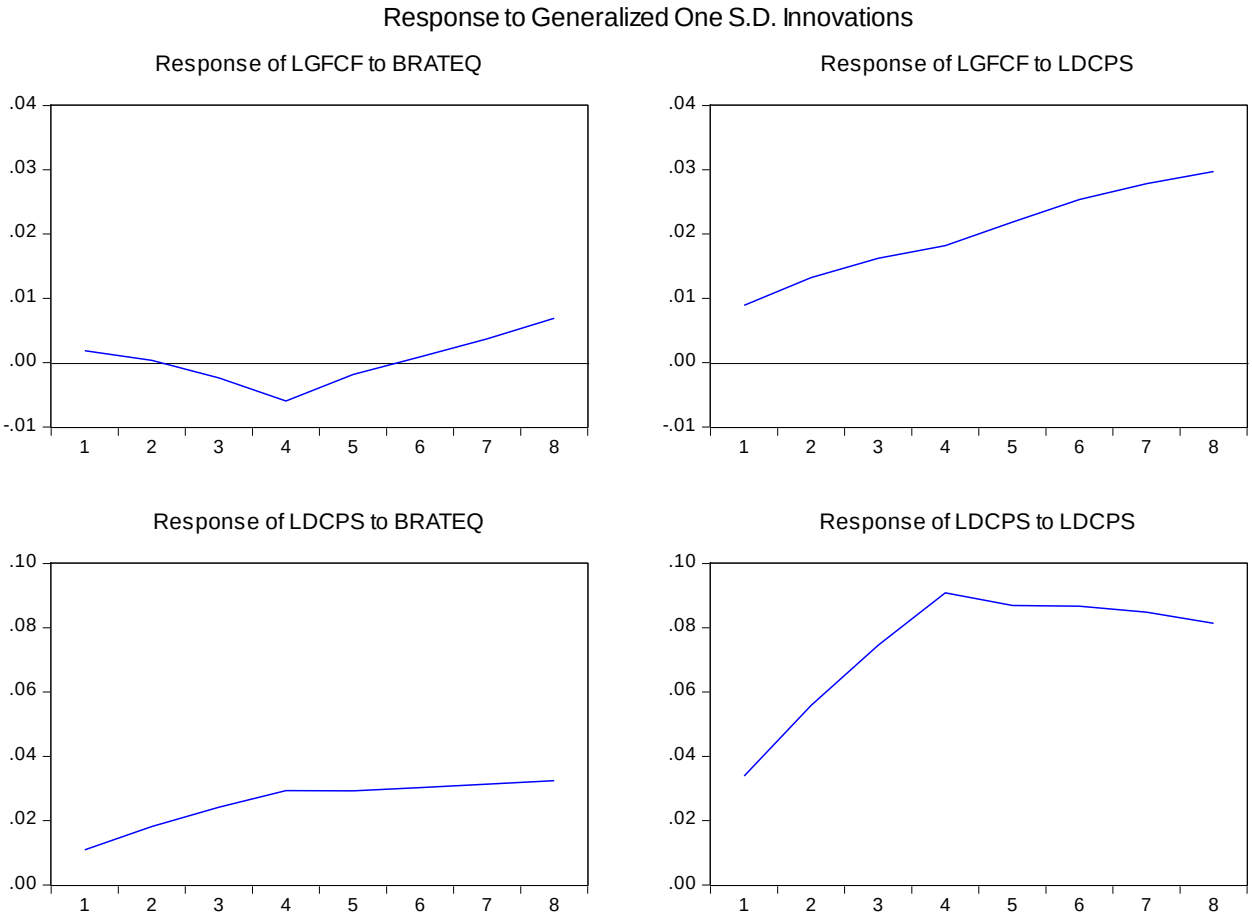
It is more interesting to find that the impact of the bank rate on domestic credit to the private sector is not significant at all lags. Emenike (2016) and Ndikumana (2016) found that monetary policy alterations have positive and significant impact on domestic credit to the private sector in sub-Saharan African countries. According to Khan (2010) in the context of the credit transmission channel, monetary policy affects the supply or relative pricing (the external finance premium) of loans by banks. As tighter monetary policy causes banks to lose the use of some funds which cannot be replaced with other sources of funds (such equity), then the relative cost of funds will increase, decreasing the supply of loans to bank dependent borrowers. The insignificance of the bank rate on domestic credit to the private sector shows that monetary policy shocks is not strong as one would expect. The explanation to this outcome might be that the Government gives out grant and loans schemes that undermine the role of financial intermediaries (Kganetsego, 2007). In this sense, financial intermediaries stop to be the major source of investment finance.

The short run effects of trade openness on gross fixed capital formation, turned out to be negative and significant at lag 4 while at lag 5 there is a positive influence on investment. However, the sum of the coefficients indicate that the overall effect of increase in trade openness will be an increase in domestic investment. All other things held constant a one percentage increase in trade openness will result in an increase in gross fixed capital formation by 0.04 percent in a years' time. Dritsakis & Varelas (2006) and Ricardo (1817) pointed out that trade openness expansion contributes to economic growth by increasing the percentage of gross fixed capital formation. Ricardo in his study in 1817, note that trade stimulates increase in production especially when a country has a comparative advantage in a certain product.

5.7 Impulse Response Functions

Figure 5.3 shows the impulse responses which seek to answer the question, how do modelled variables respond to any shocks or innovations on any of the other variables. Impulse responses measure the time profile of the effects of a shock on expected future values of a variable. In the VECM model, there are six variables included with a period of ten years. For the purpose of this study, analysis will be limited to the response of GFCF to BRATE, the response of DCPS to BRATE and the response of GFCF to DCPS. The results are shown below:

Figure 5.3: Generalized Impulse Response Function



Source: Eviews Results

As indicated in Figure 5.3, the response of gross fixed capital formation to the bank rate, shows that a one standard deviation shock to the bank rate leads to a decrease in gross fixed capital formation which is felt at the fourth quarter and it start increasing at the firth quarter up to the eighth quarter. More precisely, our empirical investigation, based on the impulse response functions by Boiviny & Giannoniz (2002) and Tenreyro & Thwaites (2016) among others, point that monetary policy significantly influence private investment. Moreover, our estimation of a small structural model of Botswana economy indicates that bank rate shocks are responsible for about 0.04 response of private investment. This implies that unexpected shocks to the bank rate have been followed by a smaller response investment at lag 4. However, our model investigation reveals that contractionary monetary policy shocks on domestic investment is predominantly due to the increase in the cost of borrowing.

The second graph shows that a one standard deviation shock to the domestic credit to the private sector leads to a steady increase in gross fixed capital formation from the first to the eighth quarter. This implies that domestic credit shocks have a significant impact on investment. This result is further confirmed by generalized impulse responses proposed by Pesaran & Shin (1998). Therefore, this suggests that domestic credit shocks could promote private investment.

With regards to the response domestic credit to the private sector to the bank rate, a one standard deviation shock to the bank rate leads to a slight increase in domestic credit to the private sector up to the fourth quarter and then levels off afterwards. As put forward by Mishkin (1995), the credit channel functions through two mechanisms, the balance sheet channel and the bank lending channel. Theory proposes that an increase in interest rates decreases the total credit that banks can supply to investors and, through the bank lending channel, will in turn decrease aggregate demand and ultimately investment. With the impulse response functions, we see that a shock to the bank rate i.e. increase in the bank rate, does not lead to a decrease in credit growth. Therefore, this shows that the impact of the bank rate shock is weak on domestic credit. This can be explained by studies done by Khanetsano (2007) and Munyengwa (2012) on monetary policy transmission in Botswana. The authors pointed out that the credit channel is weak in monetary policy transmissin mechanism.

5.8 Variance Decomposition

This section presents the variance decomposition analysis to determine the contribution of each shock to the variance of each endogenous variable. Indication on the contribution of shocks is essential for the reason that even if the impact on variables are estimated to be statistically significant, they may not be economically large (Starr, 2005). Tables 5.8 and Table 5.9 shows variance decomposition of GFCF and DCPS respectively.

Table 5.8: Variance Decomposition of GFCF

Period	S.E.	LGFCF	BRATEQ	LDCPS	LEXDEPT	LGDP	LTRADE
1	0.024208	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.045291	98.74923	0.317136	0.000202	0.004597	0.320325	0.608510
3	0.066577	96.41404	0.956080	0.010847	0.049853	0.818265	1.750918
4	0.087877	93.40536	1.874531	0.033626	0.184791	1.382798	3.118890
5	0.100929	90.72516	1.694563	0.623113	1.209316	1.146145	4.601703
6	0.111571	86.93244	1.423777	1.856019	2.759562	0.938034	6.090164
7	0.120943	81.94756	1.220228	3.554206	4.844217	0.901834	7.531954
8	0.129752	75.99553	1.194001	5.530738	7.284452	1.255924	8.739352

Source: Eviews Results

Table 5.9: Variance Decomposition of DCPS

Period	S.E.	LGFCF	BRATEQ	LDCPS	LEXDEPT	LGDP	LTRADE
1	0.253289	13.48961	8.761278	77.74911	0.000000	0.000000	0.000000
2	0.519786	12.82509	8.888441	78.26329	0.007641	0.005579	0.009965
3	0.833601	12.81245	8.863036	78.28950	0.022540	0.007544	0.004929
4	1.186960	13.14414	8.791508	77.98657	0.042250	0.007188	0.028349
5	1.418428	13.39600	8.911004	76.54125	0.047079	0.006180	1.098480
6	1.610669	14.30847	8.984346	73.93361	0.093539	0.006839	2.673198
7	1.767979	15.80968	9.059939	70.36063	0.199408	0.011497	4.558849
8	1.894144	17.86970	9.134798	65.97297	0.361691	0.016670	6.644170

Source: Eviews Results

The forecast error variance decomposition results reported in Table 5.8 shows that most of the variations in the GFCF are accounted by the variation in its own shocks followed by TRADE, BRATE, EXDEBT, GDP and lastly DCPS. For example, in the firth quarter, Shock to the bank rate cause 1.69 percent variation in GFCF. In quarter 8, shocks to bank rate account for the least variations. Taken as a whole this indicates that unanticipated monetary policy shocks account for only a small part of the variations in private investment. This can be attributed to the less role played by financial intermediaries in Botswana. Domeastic credit shocks explain 0 percent of investment fluctuations in quarter one and this share increases to about 5.5 percent in two years. Therefore, this shows that domestic credit is economically significant but not statistically significant (see VECM results) in terms of explaining private investment.

The forecast error variance decomposition results reported in Table 5.9, show that monetary policy shocks are the third dominant source of domestic credit to the private sector after gross fixed capital formation. For example, innovations to monetary policy explain just 9 per cent of domestic credit to the private sector fluctuations at eighth quarter while innovations to gross fixed capital formation account for 18 per cent. These results show that shocks in GFCF and BRATE account for more variation on DCPS in the long run. Therefore, the impact of monetary policy on credit availability is economically significant. These results conform to studies by Berkelmans (2006), Nunkoo (2010) and Wulandari (2012) who concluded that the response of credit to changes in monetary policy are found to be significant.

CHAPTER SIX: CONCLUSION, POLICY IMPLICATIONS AND RECOMMENDATIONS

6.0 Introduction

This chapter presents the conclusion and implications of the findings of the study. Policy recommendations drawn from the findings of the study are provided at the end of this chapter together with suggested areas of further research.

6.1 Conclusion

The main purpose of this study was to analyse the impact of monetary policy on private sector credit and private investment in Botswana. Time series econometric techniques using quarterly data for the period 1990 to 2017 was conducted to fulfill this purpose. The Phillips Perron (PP) test for stationarity showed that series were stationary at first difference. The Johansen Cointegration test depicts a long run relationship of one cointegrating vectors. The AR Roots test was used to ascertain the stability of the model. Residual tests were carried out as well to ensure that the data does not have a problem of autocorrelation and heteroscedasticity. The Vector Error Correction model results indicated a negative and significant relationship between gross fixed capital formation and monetary policy in Botswana within the sample period of study.

The results showed that the bank rate (BRATE), external debt (EXDEBT), real gross domestic product (GDP) and the dummy variables representing the 2008 financial crisis have a significant impact on gross fixed capital formation (GFCF). The variables that did not influence the gross fixed capital formation are domestic credit to the private sector (DCPS) and trade (TRADE) in the VECM. The findings of this study are consistent with studies carried out in Nigeria by Olanrewaju (2015) in Nigeria and by Omar (2003) in Venezuela. The coefficient of the monetary policy instrument i.e. bank rate have a negative impact on gross fixed capital formation in a case when the bank rate rises. This shows that in a case of contractionary monetary policy the domestic investment would fall by a magnitude of 0.02 per cent and this impact is felt in a year's time. On the other hand, expansionary monetary policy by 1 per cent would lead to an increase in private investment in a years' time by 0.02 per cent.

The study was able to establish a link between domestic credit to the private sector and gross fixed capital formation. The evidence shows that private investment is not influenced by commercial

bank credit availability. This could be explained by the fact that the Government have been providing grants and loans to local projects so as to diversify the economy away from the mining sector. Therefore, it could be that the Government grants and loans contribute a lot to domestic investment than commercial banks credit. The results also showed that the monetary policy instrument i.e. bank rate does not have an impact on domestic credit to the private sector. These results can be explained by the studies done by Munyengwa (2012) and Kganetsano (2007) who found that the credit channel is weak in terms of monetary policy effectiveness in Botswana.

The results have shown that the hypothesis that changes in the bank rate do not have a significant on investment is rejected. The hypothesis that changes in the bank rate do not significantly affect credit to the private sector is statistically rejected. The results also showed that the impact of the credit to the private sector on private investment is not statistically significant. Therefore, the null hypothesis that changes in the bank credit do not significantly affect private investment is statistically rejected. However, the variance decomposition results showed that the impact is economically significant. In conclusion, the study has shown that like most developing countries monetary policy has impact on private investment. The results imply that monetary policy through the use of the bank rate is important for private investment growth.

6.2 Policy Recommendations

From the findings and conclusion of the study, it is recommended that:

- The monetary policy framework aiming at achieving the medium term inflation rate of 3-6 % should also be used to boost private investment in Botswana. In a case on an accommodating monetary policy it means that the reduced bank rate will stimulate domestic investment and this will also help in the process of diversification of the economy. On the other hand, contractionary monetary policy would lead to a decrease in domestic investment but the impact is not large. This is shown by the variance decomposition which depicts that monetary policy shocks account for less variation on private investment. This means that in periods of inflation crisis, monetary policy can be used to keep inflation within the medium term target of 3-6 % without hurting investment.

6.3 Limitations of the Study

The major limitation of the study was unavailability of time. The study would have loved to examine the impact of other monetary policy channels such as the exchange rate channel on private investment.

6.4 Recommendations for Future Research

The study focused on the impact of the bank rate on domestic investment in Botswana. This was done under the limiting factor such as time thus more could be done so as to improve the results.

1. It would be interesting to examine the impact of other monetary policy instrument such as Bank of Botswana certificate on private investment and credit availability.
2. Another interesting area would be looking on the impact of Government grants and loans on domestic investment in Botswana.

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APPENDICES

Cointegrating Eq:	CointEq1
LGFCF(-1)	1.000000
BRATEQ(-1)	-0.046612 (0.01727) [-2.69912]
LDCPS(-1)	0.172300 (0.12183) [1.41421]
LEXDEPT(-1)	0.459880 (0.06141) [7.48829]
LGDP(-1)	-0.267679 (0.12117) [-2.20915]
LTRADE(-1)	-0.753090 (0.22769) [-3.30756]
C	-0.990724

Error Correction:	D(LGFCF)	D(BRATEQ)	D(LDCPS)	D(LEXDEPT)	D(LGDP)	D(LTRADE)
CointEq1	-0.095463 (0.02746) [-3.47623]	1.047474 (0.27782) [3.77027]	-0.035617 (0.04051) [-0.87914]	-0.625908 (0.13625) [-4.59369]	0.048331 (0.01902) [2.54078]	-0.006805 (0.02304) [-0.29541]
D(LGFCF(-1))	0.545220 (0.10448) [5.21851]	-0.099784 (1.05699) [-0.09440]	-0.053908 (0.15413) [-0.34975]	0.040390 (0.51838) [0.07792]	0.033264 (0.07237) [0.45964]	0.028151 (0.08764) [0.32122]
D(LGFCF(-2))	0.144553 (0.08387) [1.72355]	-0.180781 (0.84849) [-0.21306]	0.015017 (0.12373) [0.12137]	0.233200 (0.41613) [0.56041]	-0.013331 (0.05809) [-0.22948]	-0.009706 (0.07035) [-0.13796]
D(LGFCF(-3))	0.116785 (0.08666) [1.34768]	-0.746181 (0.87669) [-0.85113]	0.025904 (0.12784) [0.20262]	0.500525 (0.42996) [1.16413]	-0.037384 (0.06003) [-0.62280]	0.000145 (0.07269) [0.00200]
D(LGFCF(-4))	-0.584225 (0.08281) [-7.05532]	-2.649809 (0.83774) [-3.16306]	-0.191572 (0.12216) [-1.56818]	0.213592 (0.41085) [0.51988]	-0.069927 (0.05736) [-1.21914]	-0.034578 (0.06946) [-0.49781]
D(LGFCF(-5))	0.291042 (0.09239) [3.15006]	1.385638 (0.93472) [1.48241]	0.150786 (0.13630) [1.10625]	0.186885 (0.45842) [0.40768]	0.034700 (0.06400) [0.54221]	0.029806 (0.07750) [0.38458]
D(BRATEQ(-1))	-0.011530 (0.01322)	0.660271 (0.13374)	0.004579 (0.01950)	0.023326 (0.06559)	-0.002690 (0.00916)	-0.002604 (0.01109)

	[-0.87216]	[4.93698]	[0.23481]	[0.35564]	[-0.29381]	[-0.23479]
D(BRATEQ(-2))	-0.002945	0.111361	-0.000731	0.005193	-0.001875	-0.002629
	(0.01280)	(0.12953)	(0.01889)	(0.06353)	(0.00887)	(0.01074)
	[-0.23004]	[0.85970]	[-0.03872]	[0.08174]	[-0.21137]	[-0.24475]
D(BRATEQ(-3))	-0.005463	0.070513	-0.001624	-0.028854	0.001807	0.000230
	(0.01290)	(0.13048)	(0.01903)	(0.06399)	(0.00893)	(0.01082)
	[-0.42355]	[0.54040]	[-0.08535]	[-0.45090]	[0.20230]	[0.02122]
D(BRATEQ(-4))	0.021394	-0.610400	-0.009465	0.056816	-0.008930	-0.005875
	(0.01265)	(0.12800)	(0.01867)	(0.06277)	(0.00876)	(0.01061)
	[1.69094]	[-4.76885]	[-0.50707]	[0.90509]	[-1.01896]	[-0.55358]
D(BRATEQ(-5))	-0.023538	0.411978	0.012596	-0.050968	0.005962	0.006293
	(0.01121)	(0.11345)	(0.01654)	(0.05564)	(0.00777)	(0.00941)
	[-2.09902]	[3.63138]	[0.76140]	[-0.91604]	[0.76759]	[0.66898]
D(LDCPS(-1))	0.018880	-0.067213	0.660949	0.160513	0.016492	0.002871
	(0.08592)	(0.86919)	(0.12675)	(0.42628)	(0.05951)	(0.07207)
	[0.21975]	[-0.07733]	[5.21465]	[0.37655]	[0.27713]	[0.03984]
D(LDCPS(-2))	0.011809	-0.083168	0.143710	0.069002	-0.002532	0.027206
	(0.08914)	(0.90185)	(0.13151)	(0.44229)	(0.06175)	(0.07478)
	[0.13248]	[-0.09222]	[1.09276]	[0.15601]	[-0.04101]	[0.36383]
D(LDCPS(-3))	0.012707	-0.139388	0.049455	0.122240	-0.005663	0.000163
	(0.09040)	(0.91459)	(0.13337)	(0.44854)	(0.06262)	(0.07583)
	[0.14056]	[-0.15241]	[0.37081]	[0.27253]	[-0.09044]	[0.00214]
D(LDCPS(-4))	0.144832	0.679722	-0.351192	-0.145193	-0.085415	-0.013576
	(0.08901)	(0.90051)	(0.13132)	(0.44164)	(0.06166)	(0.07467)
	[1.62711]	[0.75482]	[-2.67440]	[-0.32876]	[-1.38535]	[-0.18183]
D(LDCPS(-5))	-0.002410	-0.661922	0.216042	0.320005	0.074223	-0.012891
	(0.08437)	(0.85360)	(0.12448)	(0.41863)	(0.05844)	(0.07078)
	[-0.02857]	[-0.77545]	[1.73562]	[0.76440]	[1.26999]	[-0.18214]
D(LEXDEPT(-1))	-0.011878	-0.083508	0.007473	0.320820	-0.005079	0.000827
	(0.02643)	(0.26741)	(0.03899)	(0.13115)	(0.01831)	(0.02217)
	[-0.44939]	[-0.31228]	[0.19165]	[2.44626]	[-0.27738]	[0.03730]
D(LEXDEPT(-2))	-0.028531	-0.017591	0.001731	-0.003105	5.79E-05	-0.010075
	(0.02609)	(0.26398)	(0.03849)	(0.12946)	(0.01807)	(0.02189)
	[-1.09345]	[-0.06664]	[0.04497]	[-0.02399]	[0.00320]	[-0.46030]
D(LEXDEPT(-3))	-0.069577	0.567250	-0.015343	-0.328377	0.030248	-0.003240
	(0.03135)	(0.31715)	(0.04625)	(0.15554)	(0.02171)	(0.02630)
	[-2.21947]	[1.78859]	[-0.33177]	[-2.11121]	[1.39300]	[-0.12321]
D(LEXDEPT(-4))	-0.034903	0.774354	0.006791	0.060838	0.045141	0.053563
	(0.02837)	(0.28699)	(0.04185)	(0.14075)	(0.01965)	(0.02380)
	[-1.23039]	[2.69818]	[0.16227]	[0.43224]	[2.29729]	[2.25095]
D(LEXDEPT(-5))	0.019162	-0.537686	0.007296	0.005463	-0.005878	-0.005757
	(0.03130)	(0.31664)	(0.04617)	(0.15529)	(0.02168)	(0.02625)
	[0.61225]	[-1.69810]	[0.15802]	[0.03518]	[-0.27114]	[-0.21928]

D(LGDP(-1))	0.083743	-0.211335	0.062808	0.248580	0.513355	-0.000373
	(0.16669)	(1.68640)	(0.24592)	(0.82706)	(0.11546)	(0.13983)
	[0.50238]	[-0.12532]	[0.25540]	[0.30056]	[4.44602]	[-0.00267]
D(LGDP(-2))	-0.009020	-0.351459	-0.023139	-0.162402	0.127497	0.008887
	(0.15399)	(1.55784)	(0.22717)	(0.76402)	(0.10666)	(0.12917)
	[-0.05858]	[-0.22561]	[-0.10186]	[-0.21256]	[1.19533]	[0.06880]
D(LGDP(-3))	-0.017836	0.220081	-0.012026	-0.174778	0.055422	0.001875
	(0.15588)	(1.57700)	(0.22996)	(0.77341)	(0.10797)	(0.13076)
	[-0.11442]	[0.13956]	[-0.05229]	[-0.22598]	[0.51329]	[0.01434]
D(LGDP(-4))	-0.475759	1.014674	0.020252	-0.184694	-0.463905	0.167857
	(0.15455)	(1.56356)	(0.22800)	(0.76682)	(0.10705)	(0.12964)
	[-3.07833]	[0.64895]	[0.08882]	[-0.24086]	[-4.33338]	[1.29477]
D(LGDP(-5))	0.357898	-0.882455	0.033874	0.650675	0.198068	-0.105841
	(0.15416)	(1.55962)	(0.22743)	(0.76489)	(0.10678)	(0.12932)
	[2.32158]	[-0.56581]	[0.14894]	[0.85068]	[1.85485]	[-0.81847]
D(LTRADE(-1))	-0.128448	1.162215	-0.073014	-0.572693	0.111626	0.759977
	(0.14738)	(1.49098)	(0.21742)	(0.73122)	(0.10208)	(0.12362)
	[-0.87157]	[0.77950]	[-0.33582]	[-0.78320]	[1.09347]	[6.14748]
D(LTRADE(-2))	-0.031430	0.148678	0.111952	-0.137239	0.015292	0.165180
	(0.14976)	(1.51506)	(0.22093)	(0.74303)	(0.10373)	(0.12562)
	[-0.20988]	[0.09813]	[0.50673]	[-0.18470]	[0.14742]	[1.31491]
D(LTRADE(-3))	0.003459	-0.064595	0.044102	0.091210	0.000123	0.042750
	(0.15166)	(1.53430)	(0.22374)	(0.75247)	(0.10505)	(0.12722)
	[0.02281]	[-0.04210]	[0.19711]	[0.12121]	[0.00117]	[0.33604]
D(LTRADE(-4))	-0.146107	4.301140	0.751854	-1.807813	0.017344	-0.708566
	(0.14931)	(1.51050)	(0.22027)	(0.74080)	(0.10342)	(0.12524)
	[-0.97858]	[2.84750]	[3.41338]	[-2.44037]	[0.16770]	[-5.65755]
D(LTRADE(-5))	0.038205	-1.646380	-0.714868	0.024228	0.136619	0.528781
	(0.16213)	(1.64023)	(0.23919)	(0.80442)	(0.11230)	(0.13600)
	[0.23564]	[-1.00375]	[-2.98876]	[0.03012]	[1.21652]	[3.88811]
C	-0.045523	0.484081	-0.010303	-0.298801	0.040049	-0.006069
	(0.01559)	(0.15772)	(0.02300)	(0.07735)	(0.01080)	(0.01308)
	[-2.91998]	[3.06919]	[-0.44797]	[-3.86287]	[3.70857]	[-0.46408]
DUMMY	0.125077	-1.500548	0.049533	0.861075	-0.073792	0.002972
	(0.03861)	(0.39060)	(0.05696)	(0.19156)	(0.02674)	(0.03239)
	[3.23960]	[-3.84166]	[0.86963]	[4.49502]	[-2.75924]	[0.09176]
R-squared	0.758819	0.790873	0.673413	0.459330	0.726616	0.713580
Adj. R-squared	0.653096	0.699200	0.530251	0.222324	0.606776	0.588025
Sum sq. resids	0.038613	3.952022	0.084038	0.950553	0.018526	0.027170
S.E. equation	0.022999	0.232674	0.033929	0.114111	0.015931	0.019292
F-statistic	7.177406	8.627178	4.703862	1.938055	6.063239	5.683441
Log likelihood	269.2258	23.92074	228.0083	99.44248	308.1483	287.8546
Akaike AIC	-4.457091	0.171307	-3.679403	-1.253632	-5.191477	-4.808577
Schwarz SC	-3.627907	1.000491	-2.850219	-0.424448	-4.362293	-3.979393

Mean dependent	-0.001173	-0.061778	0.032537	0.027800	0.029055	-0.004095
S.D. dependent	0.039048	0.424238	0.049504	0.129398	0.025405	0.030057

Determinant resid covariance (dof adj.)	1.48E-17
Determinant resid covariance	1.58E-18
Log likelihood	1269.874
Akaike information criterion	-20.11084
Schwarz criterion	-14.98497

Source: Eviews Results