MONETARY POLICY SHOCKS AND MACROECONOMIC PERFORMANCE IN REGIONALLY INTEGRATED COMMON MONETARY AREA ECONOMIES

By

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This dissertation is submitted in partial fulfilment of the requirements for the degree of

MASTER OF COMMERCE DEGREE IN ECONOMICS

In the

COLLEGE OF LAW AND MANAGEMENT STUDIES

SCHOOL OF ACCOUNTING, ECONOMICS AND FINANCE

At the

UNIVERSITY OF KWAZULU-NATAL

SUPERVISOR: DR SOPHIA MUKORERA

2021

ETHICAL CLEARENCE REFERENCE NUMBER: 00011881

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I, **Theron Shumba**, declare that:

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DEDICATION

To the wonderful name of Jesus and to God Almighty, my lovely mother Wonai Shumba, my father Tadious Shumba, my lovely wife Nokubonga Shumba and my daughter, Eliana Michelle Shumba.

ACKNOWLEDGEMENTS

I am very grateful to God and my personal Saviour Jesus Christ for His grace and everlasting mercies that He has lavished upon me so that I have been able to complete this dissertation. I ascribe all the glory that is due to His name for all the power and the majesty belongs to Him alone. I greatly appreciate my supervisor, Dr Sophia Mukorera for her guidance, encouragement, and meticulous supervision throughout this project. The precious time and commitment she spent in reading, commenting, and discussing each chapter with me helped me to complete this research project. Any time I reflect on this adventure I will remember the patience that she exhibited towards me throughout the course of this dissertation. I wish to acknowledge the UKZN higher degrees committee for the presentation comments which added to my work. I also want to mention Dr Kutu and Dr Tipoy for their contribution to my work during consultations with them. On a personal level, I wish to extend my appreciation to my beloved wife for the sacrifices she has made and the support she has given in every way possible, including the times she had to give me the space I needed to focus on my studies. She witnessed my diligence and pain in the course of this dissertation. I feel indebted to my colleague Naomi Muindi in the department of Economics at UKZN Pietermaritzburg campus, for helping me with academic materials and information. I wish to thank every person who supported me and showed me kindness thoughout this journey. To God be all the glory, forever and ever.

ABSTRACT

The CMA (Common Monetary Area), comprising of South Africa, Lesotho, Eswatini, and Namibia, has experienced a steady improvement towards economic restructuring. This is due to recent global developments and economic integration where countries are coming together to form regional economic integration initiatives and coordinate their economic policymaking effectively. Just like the CMA countries, many countries, such as Germany, Spain, Italy, Austria, Greece, Luxembourg, the Netherlands, Ireland, Portugal, Finland, France, Belgium, Slovenia, Cyprus, Latvia, Slovakia, Lithuania, Malta, and Estonia, have come together to form a strong monetary union for the purpose of having a sound and effective monetary policy.This study traces how a shock or an unanticipated change in the central bank's policy instrument of South Africa (SA_REPO) affects the selected macroeconomic variables, such as the Real Gross Domestic Product Growth (RGDP_G), inflation (INF), money supply (MS), and lending rates (LRATE), in the entire CMA region. Employing a Panel Structural Vector Autoregressive model (Panel-SVAR) and annual data from 1980–2019, the findings show that a shock in the South African repo rate (SA_REPO) significantly affected the macroeconomic variables, such as RGDP_G, INF,LRATE and MS, in the entire CMA region. The results indicate that a shock in the South African repo rate is followed by a significant decline in the economic growth (RGDP_G), a decrease in inflation, a decrease in money supply and an increase in lending rates in the entire CMA region. The study recommends that CMA monetary authorities and policymakers need to formulate policies toward cushioning the effects of unanticipated monetary policy shocks from the anchor country as well as global shocks.

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ABBREVIATIONS

LENS - Lesotho, Eswatini, Namibia and South Africa

CMA - Common Monetary Area

COMM_PRICES - Commodity prices

GDP - Gross Domestic Product

RGDP – Real Gross Domestic Product

RGDP_G - Real Gross Domestic Product Growth

SA_REPO - South African repo rate

MS- Money Supply

CPI – Consumer Price Index

INF- Inflation

LRATE - Lending rate

Panel-SVAR – Panel Structural Vector Autoregressive

IRFs - Impulse Response Functions

CAEMC - Central African Economic and Monetary Community

Euro Area - Member states of the European Union whose currency is the Euro

WAEMU - West African Economic and Monetary Union

BEAC - Banque des états de l'Afrique Centrale

BCEAO - Banque Centrale des états de l'Afrique de l'ouest

SARB -South African Reserve Bank

SA - South Africa

SACU - Southern African Customs Union

VAR – Vector Autoregression

SVAR – Structural Vector Autoregression

RMA – Rand Monetary Area

ECOWAS – Economic Community of West African States

CBL – Central Bank of Lesotho

BoN – Bank of Namibia

EAC - East African Community

ZAR – South African Rand

MLAR – Minimum Local Assets Ratio

LAR – Liquid Assets Ratio

LEN – Lesotho Eswatini and Namibia

BLS – Botswana, Lesotho and Swaziland (now Eswatini)

P-VAR – Panel-Vector Autoregression

PREFACE

This study focused on a period prior the Covid-19 pandemic, from 1980 to 2019.

CHAPTER 1 BACKGROUND AND INTRODUCTION

1.1 INTRODUCTION

Economists believe that no economy can achieve price stability and stimulate economic performance without a sound monetary policy (Greenspan, 2004; Kumar and Dash, 2020). This means that maintaining price stability depends on an effective and sound monetary policy in order to avoid chronic inflation or deflation and achieve high economic output (Svensson, 2001). The CMA (Common Monetary Area), comprising of South Africa, Lesotho, Eswatini, and Namibia, has experienced a steady improvement towards economic restructuring. This is due to recent global developments and economic integration where countries are coming together to form regional economic integration initiatives and coordinate their economic policymaking effectively. Just like the CMA countries, many countries, such as Germany, Spain, Italy, Austria, Greece, Luxembourg, the Netherlands, Ireland, Portugal, Finland, France, Belgium, Slovenia, Cyprus, Latvia, Slovakia, Lithuania, Malta, and Estonia, have come together to form a strong monetary union for the purpose of having a sound and effective monetary policy.

According to Berkelmans (2005), monetary policy is described as the monetary authorities' course of action to influence interest rates, money supply to achieve output growth, stable prices, and full employment. Monetary policy has been regarded as a prominent component in the formulation of macroeconomic policies, and its implication is principal in determining aggregate economic performance (Cologni and Manera, 2008). A holistic strategy on the part of monetary authorities is important in order to stimulate production, reduce unemployment and achieve sustainable growth. Hence, the importance of the coming together of the CMA countries.

1.1.1 A brief overview of the CMA

The monetary arrangement amongst CMA countries has allowed them to synchronise their exchange rates and monetary policies (Jian-Ye *et al.,* 2006). The CMA regional integration was conceived in the 1960s but officially signed in 1986 (see the background of CMA in Table 3.2 in Chapter 3).

The CMA is a de facto currency union that comprises of four countries: Lesotho, Eswatini, Namibia and South Africa (LENS). The CMA was established to foster economic development among all region members (Nagar, 2020). It was further established to facilitate trade and achieve effective policy coordination (Ikhide and Uanguta, 2010). In this arrangement, a quadrilateral agreement marked the advent of a fixed exchange rate system of the Lesotho Loti, Eswatini Lilangeni and Namibian Dollar against the South African Rand. This agreement offers participant countries the right to issue domestic currencies and a limited degree to control their domestic monetary policies for stabilising their economies (Wörgötter and Brixiova, 2019). However, South Africa directs the areas where the currencies of small member countries are to be legal tender (Debrun and Masson, 2013). In this arrangement, Lesotho, Eswatini and Namibia (LEN) submit their exchange rate policies to the central bank of South Africa or the South African Reserve Bank (SARB), which positions South Africa as a pacesetting economy (Mühlich, 2014).

Consequently, the CMA arrangement prohibits the minor countries: Lesotho, Eswatini and Namibia (LEN), from exerting total autonomy in implementing monetary policy (Nielsen *et al.,* 2005). In this de facto currency union, South Africa's economic dominance is expressed by its exclusive discretion in the formulation of the region's monetary policy (Seleteng, 2010). When implementing monetary policy in CMA economies, South Africa (SA) primarily targets its own economy (Ikhide and Uanguta, 2010). The inherent assumption is that SA always strives to pursue and maintain a healthy and stable economy whilst LEN currencies remain pegged to the Rand (ZAR). In such a setup, the impact of SA's policy decisions can be expected to spread to all CMA economies (Kashima, 2017). The terms of the agreement under the CMA established the harmonisation of the domestic currencies of Namibia, Eswatini and Lesotho. This connotes that all the currencies of LEN countries are pegged at par to the Rand of South Africa, that is on a one-to-one basis (Metzger, 2006).

1.1.2 ECONOMIC PERFORMANCE OF THE CMA COUNTRIES

The integrated CMA economies also exist as a sub-region of the sub-Saharan African (SSA) countries (Masha *et al.,* 2007). Overall, sub-Saharan African countries are plagued with very low real output growth in comparison to other world regions (Alley, 2015). According to Kashima (2017) real economic growth rate or Real Gross Domestic Product Growth rate (RGDP_G) is a leading indicator for measuring the performance of an economy. The RGDP_G reveals the annual percentage change in the total value of goods and services produced in an economy adjusted for inflation (Kaboro *et al*., 2018). Foley (2019) argues that, when there is poor rate of growth in terms of real output, firms have no incentive to invest, and firms become unwilling to hire workers while consumer spending becomes low, hence, leading to low productivity and job losses in the economy.

Evidence presented in figure 1.1 reveals that in the CMA region, the fluctuation of real GDP growth rate for all member countries seems to trend together from 1980 to 2020. Starting from 1980, the general pattern of the co-movement in RGDP_G in the four countries is very similar. This suggests a close association among the countries. The pattern of the regional trend line shows a downward trend, indicating that the CMA region has not been experiencing a positive growth, on average, throughout this period. Specifically, the trend line shows a decreasing gradient of below 5% growth rate from 1980 to 2020 as denoted in figure 1.1.

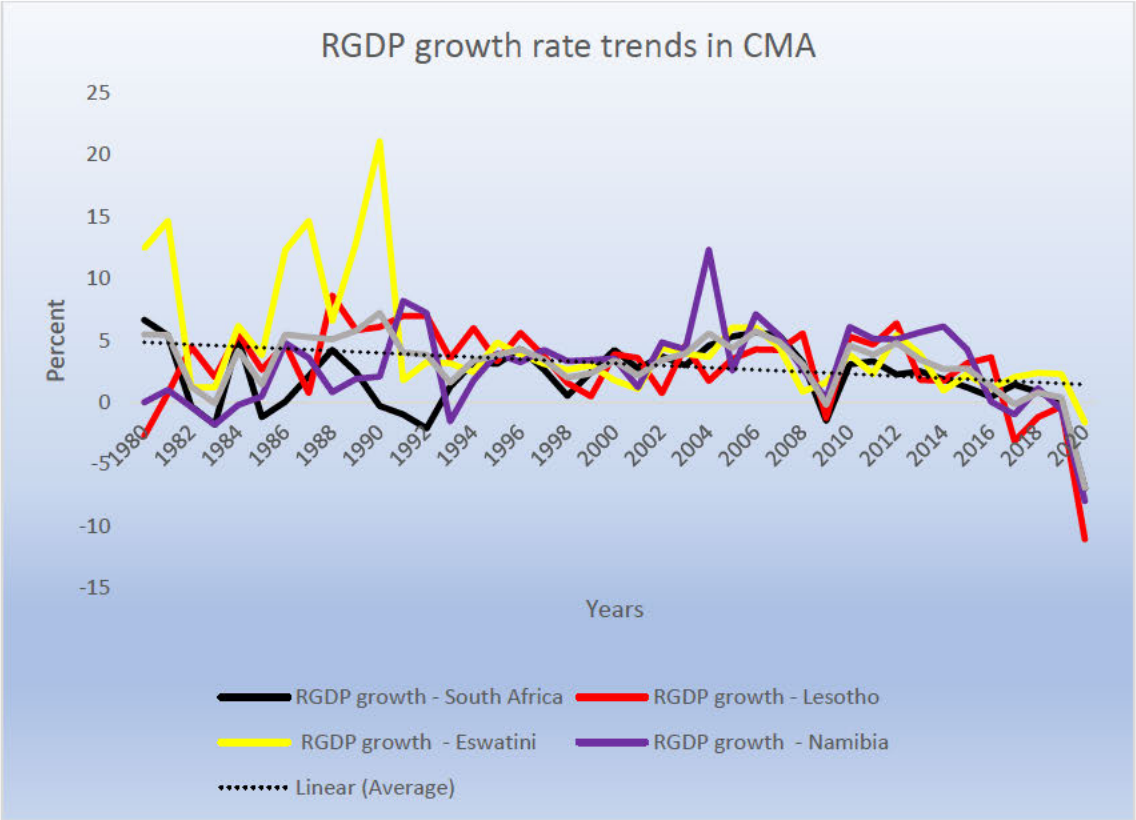


Figure 1.1: Trends in Real GDP Growth of CMA countries

Source: Author's computations using data extracted from WDI indicators (2021)

Furthermore, inflation, as another variable incorporated to measure economic performance, also portrays strong co-movements among CMA countries as discussed in chapter three.

Moreover, changing the lending rates charged by commercial banks when lending money or funds to individuals and firms can positively or negatively impact the output growth of an economy (Peersman and Smets, 2001; Seleteng, 2010). Despite the lending rates in South Africa being marginally higher than the other CMA countries, the graphical analysis in figure 1.2 reveals that regional lending rates trended together in the region between 1982 and 1984. From 1999 until 2019, the lending rates of Lesotho were slightly higher than those of the other countries, whereas SA seemed to have recorded the lowest rates during the same period. Overall, the lending rates in all the countries trended together.

1.1.3 Monetary policy in CMA Countries

Monetary policy is a tool commonly used to stabilise a country's economy (Wang, 2020). Under normal circumstances, the central bank is responsible for formulating and implementing monetary policy. The widely used monetary tools are repo rate, open market operations (OMO) and reserve ratios (Nehra, 2015).

South Africa mainly utilises the repurchase rate or repo rate as a monetary policy tool to regulate its economy (Meyer *et al.*, 2018; Nielsen *et al.*, 2005). Seleteng (2010) posits that in such events, the transmission of the policy action using the repo rate will first impact the lending rate (Lrate) within twenty-four hours as commercial banks adjust their lending rates (Lrate) immediately. Individual CMA countries use the same monetary policy instrument.

A trend analysis of the lending rates of the four countries and SA's primary monetary policy instrument, the repo rate (SA_REPO) portray a close association as they co-move and trend together (see figure 1.2 below).

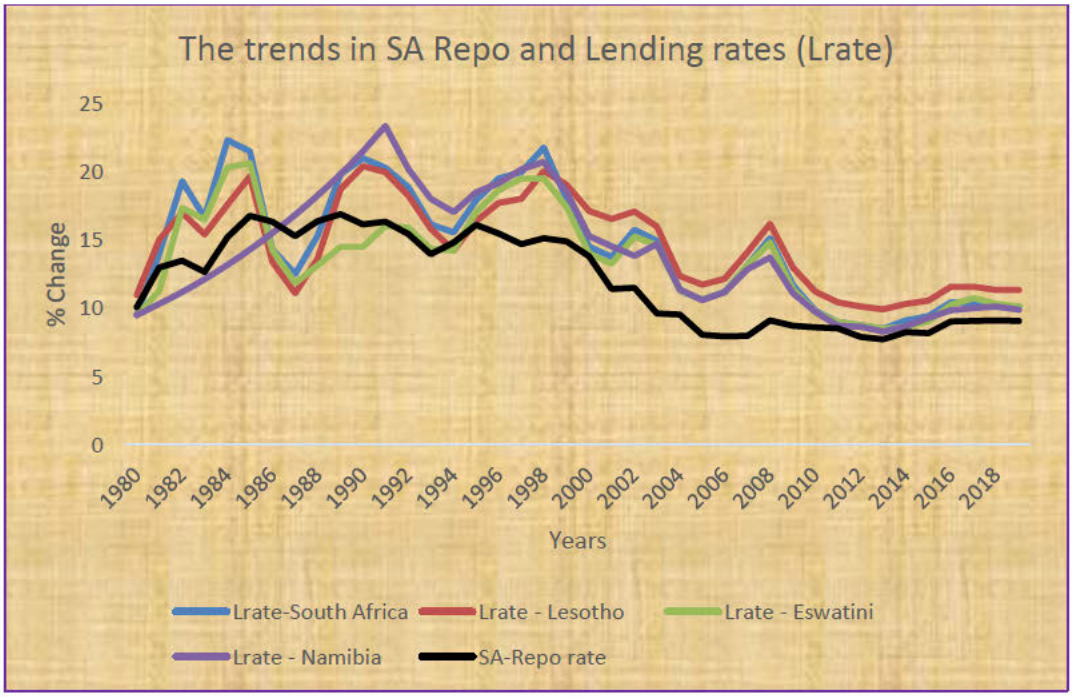


Figure 1.2: Trends of Interest rates in the CMA region

Source: Author's computations from data extracted from World Bank indicators, CMA members' reserve banks and the reserve bank of St Louis (2021)

Another important monetary variable in the CMA countries is money supply. Trend analysis of the money supply curves also suggests a close link between the CMA countries. This is discussed in chapter three.

1.2 MONETARY POLICY SHOCKS

Besides planned monetary policies, monetary shocks can also impact the performance of an economy (Seleteng, 2016). Cheng (2006) describes a monetary shock as an unexpected temporary change in the short-term interest rate or money supply, accounting for variations in output and prices in an economy. Another perspective asserted by Jian-Ye *et al.* (2006) is that a shock can be an unanticipated change in the policy stance by central bank authorities, such as unexpected repo rate changes as a result of disturbances in the economy. The general equilibrium theory propels that once a shock is experienced, the economy will adjust inorder to restore equilibrium, creating a business cycle (Ennis, 2018; Mohr and Fourie, 2011).

Policymakers argue that shocks can be driven by both external and internal circumstances (Kim, 2017). Cheng (2006) believes that domestic monetary authorities of a country trying to curtail the pressure from unexpected disturbances such as recessions, commodity price shocks, oil price shocks or exchange rate shocks may cause a monetary policy shock. In such a case, the effects of the transmission of a shock are known as the spillover effects (Seleteng, 2016).

Masha *et al.* (2007) argue that shocks or disturbances can stimulate or dampen the performance of an economy. On the other hand, some scholars believe that shocks are always counterproductive (Chileshe *et al.,* 2018; Famoroti and Tipoy, 2019). Depending on the side of the divide on whether shocks can stimulate or dampen the economy, as well as whether they are counterproductive, Cheng (2006) posits that the response from central bank authorities to a negative shock is needed in an economy in order to stimulate economic growth and attain price stability.

1.3 Monetary policy and economic growth

Monetary policy plays an important role in determining the performance of critical macroeconomic variables, such as real output growth. For example, a decrease in the short-term interest rate, also known as an expansionary monetary policy, is used to boost GDP growth rate, leading to increased investment and production in the economy (Ennis, 2018). Moreover, trends in the business cycle of an economy can be compared with movements in the short-term interest rate. This follows the argument of Jian-Ye *et al.* (2006) which supports that short-term interest rates can be used as a monetary policy instrument or tool to induce changes in growth in an economy.

The trends in the business cycles and short-term interest rates of the anchor country (South Africa) and LEN countries shows that the economic performance (output growth) of the anchor country has been more sensitive to its monetary policy actions than in LEN countries (see figures 1.3–1.6 below). This is because periods of economic recession in South Africa were followed by an expansionary monetary policy or decrease in the short-term interest rates to stimulate the economy (see figure1.3). For example, between 1980 and 1983 there was a recession in South Africa which saw a decline in RGDP growth from a peak of 6.6% to a slump of -1.8 % (World Bank Development Indicator, 2021). SA's monetary policymakers responded by reducing short term interest rates (expansionary monetary policy) as a way to boost production. Similarly, in the periods of recession in the following years,1989 to 1992, 1996 to1998, 2007 to 2009, and 2013 to 2016, the same response of lowering interest rates is observed. In periods where the South African economy experienced a boom (expansion of RGDP growth) the monetary policy action was to increase the short-term interest rate (restrictive monetary policy), for example, after the boom from 1985 to 1989 the monetary policy action was to implement a contractionary monetary policy depicted by an upward movement of the short-term interest rate curve.

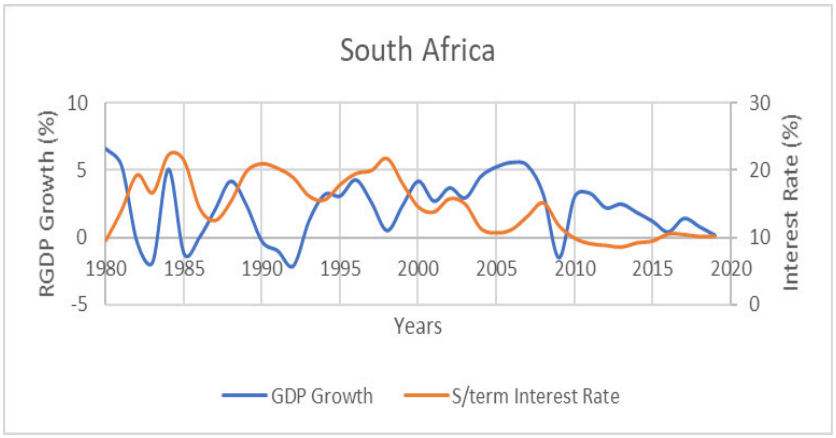


Figure 1.3: Trends of RGDP growth and short-term interest in SA (1980-2019)

Source: Author's computations using data extracted from WDI indicators and Stats SA (2021)

Whereas the movement in the business cycle of the South African economy portrays that its performance in RGDP growth responds to the adjustments in monetary policy actions, the same has not been observed in most cases of the LEN economies. The LEN economies' movement in the business cycle shows that they are less responsive to the monetary adjustment policies during recessions and booms. For example, in figure1.4, after Eswatini experienced a recession (downward movement of the RGDP growth curve) from 1980 to 1982, the short-term interest curve of Eswatini portrays an upward movement, that is an increase in short-term interest rate or restrictive monetary policy, in the same periods. This suggests less effective domestic economic policies because, under normal circumstances, when an economy experiences recession the proper monetary policy action to fine tune and stimulate the economy is an expansionary monetary policy (Ireland, 2011). Similar cases in the implementation of adjustment monetary policies have been observed in Eswatini in periods of economic boom. For example, a boom between 2011 and 2012 was followed by a decrease in the short-term interest rate (expansionary monetary policy).

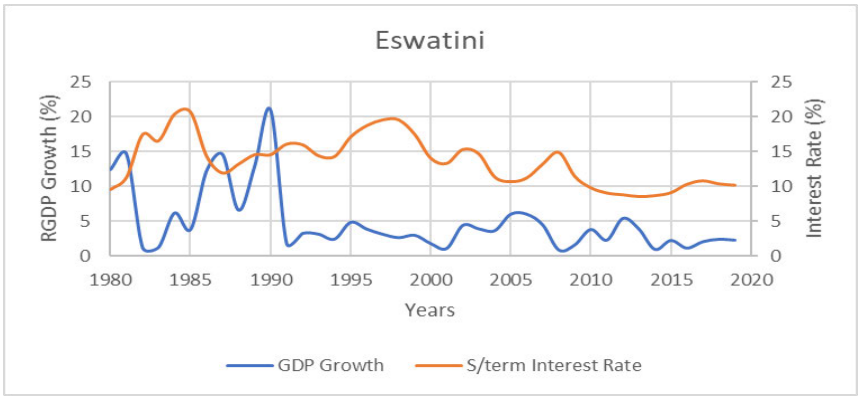


Figure 1.4: Trends of RGDP growth and short-term interest in Eswatini (1980-2019)

Source: Author's computations using data extracted from WDI indicators and reserve bank of Eswatini (2021)

Similar trends in the movement between real GDP growth and short-term interest rate curves are observed in Lesotho, for example, between 2010 and 2012 the economy of Lesotho experienced a boom as denoted by figure 1.5. Instead of a contractionary monetary policy, the short-term interest rate curve depicts a decline suggesting that an expansionary monetary policy (decrease in short-term interest rate) was implemented. Moreso, from 2012 until 2015 Lesotho experienced a recession and yet the short-term interest rate shows an increase (restrictive monetary policy) after real GDP growth contracted.

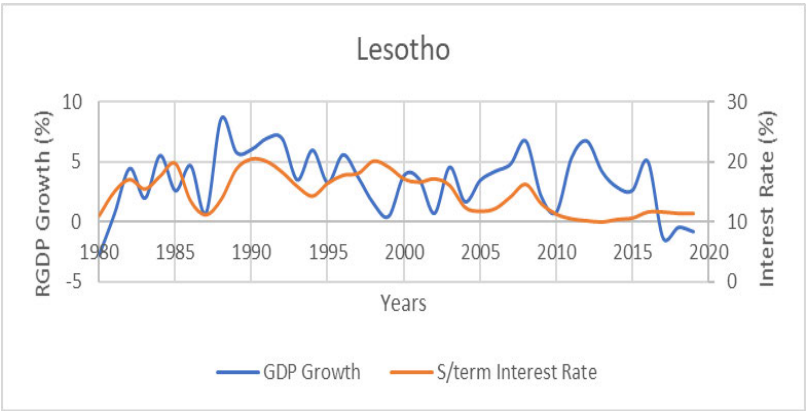


Figure 1.5: Trends of RGDP growth and short-term interest in Lesotho (1980-2019)

Source: Author's computations using data extracted from WDI indicators and CBL statistical bulletins (2021)

Finally, between 1980 and 1991 the Namibian business cycle portrays upswings and downswings, as shown in figure 1.6, yet the short-term interest rate curve shows a continuous upward movement (contractionary monetary policy) from 1980 until 1991. This suggest that the economy is not effectively responding to the implementation of monetary policy in the expected direction. Moreover, between 2009 and 2010 Namibia experienced a boom but the short-term interest curve is declining, showing that after a boom an expansionary monetary policy was implemented. According to the data released by the World Bank Development Indicator (WDI, 2021), Namibia also experienced a recession from 2014 to 2016, that is a decrease in the real GDP growth rate from a peak of 5.75% to a growth rate of -0.28%, also portrayed in figure1.9 by a down swing of the GDP growth curve, but slight changes observed on the upward movement of the short-term interest curve suggests that in this period a contractionary monetary policy was implemented.

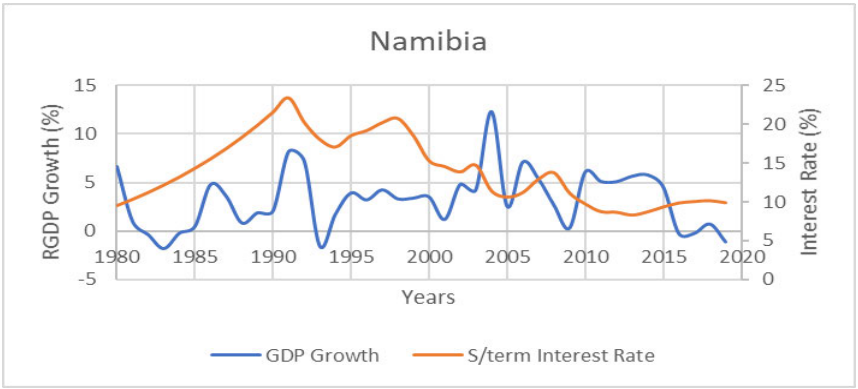


Figure 1.6: Trends of RGDP growth and short-term interest rate in Namibia (1980-2019)

Source: Author's computations using data extracted from WDI indicators and BoN (2021)

The above graphical observation in figures 1.3 to 1.6 also depicts that, unlike South Africa, the scenarios where LEN economies' increase or decrease in the short-term interest rate after a boom or recession may exacerbate poor rate of growth in terms of real GDP. In literature, short-term interest rates are a monetary policy instrument that can be used to stimulate growth in the economy and stabilise prices (Kashima, 2017; Jawadi *et al*., 2016). However, in a monetary integration setup, Furceri *et al*. (2019) asserts that the effect of changes on the anchor country's short-term interest rate can be counterproductive to other member countries' economic performance.

From the above it can be observed that the real GDP growth of the four countries trends together (see figure 1.1), and only South Africa responds to its monetary policy effectively (see figure 1.3). This could mean that the LENS countries' economic performance in terms of output growth majorly reacts or responds to South Africa's monetary policy shocks, which is what this study investigated.

1.4 PROBLEM STATEMENT

Achieving price stability, lowering unemployment, and increasing economic performance are the critical goals for any economy. Monetary policy is one of the key instruments used to drive these goals through a transmission process popularly known as, the monetary policy transmission mechanism. As much as the monetary policy is a tool for stimulating economic performance and enhancing price stability, it is prone to shocks that can negatively affect the economy (Adelakun and Yousfi, 2020).

Evidence from the LENS countries shows that despite collaborating through the CMA, the economies still experience poor economic performance (that is poor real GDP growth). An interesting observation is how the four countries' real GDP growth and lending rates trend together and how they align with the fluctuations in the repo rate of South Africa, as shown in figures 1.1 and 1.2. Yet, the individual economy's response to its domestic monetary policy tool (short-term interest rate) is unconventional and inconsistent with theory, as shown by figures 1.4 to 1.6. In the CMA region, participant members seem vulnerable to monetary policy shocks from the anchor country, South Africa (Seoela, 2020). South Africa's monetary policy shocks could be spilling over into the CMA economies, rendering their domestic monetary policy actions less effective to stabilise their economies. Hence, the need for an empirical investigation of the monetary policy shocks' transmission effects from the anchor country on CMA economies' performance in this monetary union.

1.5 RESEARCH QUESTION

What are the effects of the anchor country's monetary policy shocks on the entire CMA economies' macroeconomic performance in the regional integration?

1.6 AIMS AND OBJECTIVES

This study seeks to investigate the effect of the anchor country's monetary policy shocks on the macroeconomic performance of the entire CMA's economies.

1.7 JUSTIFICATION FOR THE STUDY

Considering the importance of small countries' autonomy when implementing monetary policy, the anchor country's dominance can challenge LEN members in stimulating their economies (Adam, 2012). Therefore, the growing concerns about monetary policy's spillover effects or shocks to the entire region motivated this study. This study sheds light on how a dominant country's monetary policy shocks may impact all the CMA member states' economic viability. The study will help policymakers institute proper performance-enhancing policies and build a safety net to cushion the effects of monetary policy and global shocks.

1.8 ORGANISATION OF THE STUDY

This research study comprises of six chapters. Chapter one sets in motion the study with an introduction of the subject of study and includes a brief overview of the economic performance of the CMA economies, the monetary policy in the CMA and how changes in short-term interest rates trend or behave with the movement of business cycles in CMA economies. Chapter one also states the problem statement, the aim and objective of the study, the research question and justification for the study. Chapter two reviews the theoretical and empirical literature behind the study. This chapter includes the theoretical framework that underpins the study. Chapter three presents the layout of the background and historical events behind the CMA formation, and a brief comparison of the CMA with other monetary unions. It further discusses the movement of performance variables over time and an overview of the monetary policies of the CMA economies. Chapter four presents the research methodology and the econometric models utilised to investigate the effect of the anchor country's monetary policy shocks on the performance of the CMA economies. Chapter five provides a discussion of the estimated results, and findings. Finally, chapter six

encapsulates the summary, conclusion, policy recommendations, and research limitations of the study.

CHAPTER 2 REVIEW OF LITERATURE

2.1 INTRODUCTION

The previous chapter introduced the study. It contained the aim and objective, problem statement, justification of the study and organisation of the study. In chapter two, the theoretical basis of how the anchor country's monetary policy decisions impact and spread to the entire CMA region is the major focus. This chapter begins with a review of related monetary policy theories which helps in examining the effect of a monetary policy shock on economic performance. The monetary transmission mechanism is also included to give the study the background for building a strong theoretical framework for analysing how the anchor country's monetary policy shocks may spill over to the entire region of CMA economies. Finally, the chapter reviews empirical literature that is relevant to monetary policy shocks in our study area.

2.2 THEORETICAL REVIEW

The study is rooted in the Keynesian Theory and Taylor's rule of monetary policy. The Keynesian theory assumes that the velocity of money is constant and the significance of interest rates in the implementation of monetary policy decisions cannot be overemphasised (Alweendo, 2000). As opposed to the Classical theory, the Keynesians do not assume that the economy stays in equilibrium full employment. There is usually disequilibrium where movement away from equilibrium is caused by instability in the economy. In the Keynesian model, money and bonds are handled as substitutes. In line with Mishkin (1995), the following equation depicts how an expansionary monetary policy gets transmitted to the real economy in line with the Keynesian traditional view.

$$M \uparrow \rightarrow i \downarrow \rightarrow I \uparrow \rightarrow Y \uparrow \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.0)$$

Given the above equation, M depicts the supply of money, i represents the rate of interest, whilst I is the investment, and the economic output is denoted by Y (Mishkin,

1995). An easing of the monetary policy (M ↑) provokes a decrease in interest rate ($i \downarrow$). Consequently, the capital cost is reduced, thereby generating growth in investment (I ↑) which ultimately triggers an increase in economic output (Y ↑). According to the assertion of the Keynesian theory of money demand, it is the money demand which deals with the determination of short-run income, output, and employment (Wells, 1983). Based on this assertion, an expansionary policy from the anchor country's monetary policy is expected to lead to an increase in the economic performance of the CMA countries, and vice versa.

Keynes went further to propose different motives or desires for people to hold money in an economy (Galí, 2018). The first motive for holding money is for daily transactions (transactions motive). This connotes that individuals desire to hold money because they need cash balances for settling daily expenses or planned expenditure and to transact within the economy (Ridhwan *et al.,* 2014). However, at the aggregate level, the transactions demand for money is expected to depend positively on the income level. Suggesting that higher incomes in an economy will fuel people to make more transactions or purchases (Furceri *et al.,* 2019).

The second motive for holding money is the precautionary motive, which is the need for individuals to keep excess cash for the sake of meeting unforeseen future eventualities (Omolade and Mukolu, 2018). Keynes identifies this motive for holding money for emergency purposes as proportional to income. The final and third motive, which Keynes considers for holding money is the speculative motive which emanates from the need to hold money to take advantage of variations in the money market (Dwivedi, 2005). He believed such a reason existed because of uncertainty about future interest rates and the connection between interest rate changes and the price of bonds (Ahmad and Ismail, 2018). Keynes's novel idea was that besides money, other assets were regarded as a store of wealth, for example bonds. This is the reason they are also considered as idle balances, which means that real money balances are held for the sake of making capital profits or to avoid capital losses from financial holdings (Ridhwan *et al*., 2014). When the interest rate increases the demand for bonds also increases as people speculate the rising of bond prices when interest rates return to normal.

Keynes summed up all three motives and formulated a liquidity preference function expressed in the following equation:

$$L = f(Y, i) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots.. (2.1)$$

Where L symbolises liquidity preference function, Y is the economic output, and i is the cost of borrowing or rate of interest. Keynes further asserted that people prefer to hold real money balances connoting the value of money adjusted for inflation. In equation (2.2) after factoring in the demand for real money balances Keynes specified the liquidity preference function as:

$$\frac{Md}{P} = f(i, Y) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (2.2)$$

Where (Md) is the money demand, P is the price level or average price of transactions, i is the interest rate and Y is the real output in the economy. A rise in real national output (Y) results in more transactions by economic stakeholders (Wells, 1983). Whereas an increase in the interest rate raises the opportunity cost of holding money, that is people become interested in buying bonds, which ultimately reduces the real demand for money balances (Kashima, 2017). According to Van der Merwe (2004) the Keynesian theory has been criticised for its assumption, which asserts that people either hold bonds or money, as this is unrealistic. This is because in most instances people diversify their portfolios (Woglom, 2003). Furthermore, the possibility of the existence of a liquidity trap, has been dismissed since some people will be in possession of an existing stock of bonds. The liquidity trap connotes an extreme instance in which all efforts to stimulate the economy by reducing interest rates (loose monetary policy) become ineffective and inflationary (Keynes, 2018). The Keynesian theory has been majorly criticised for its failure to provide an explanation for the factors which may cause the nominal interest rate to change (Omolade and Mukolu, 2018). This study includes the Taylor rule which explains how the nominal short-term interest rate is determined in the anchor country, South Africa.

2.2.1 The Taylor Rule in South Africa

According to Springfield (2001), several monetary theories have been developed as a foundation for instituting monetary policy in several economies. However, the central bank of South Africa (the anchor country for the CMA economies), claims the Taylor rule as the closest and most successful theory for describing the SARB's monetary policy decisions (Matemilola *et al.,* 2015). Van der Merwe and Mollentze (2009) posit that the Taylor rule has performed well in explaining movements in the short-term interest rate in South Africa. This rule, which was postulated by John Taylor in 1993, also describes how the short-term interest rate is determined (Van der Merwe, 2004). This rule prescribes how the SARB should adjust its interest rate policy tool in a planned manner with regards to changes in inflation and economic performance (Durlauf and Blume, 2016). The Taylor rule can be a useful framework for analysing the impact of monetary policy shocks (Furceri *et al.,* 2019).

Van der Merwe and Mollentze (2009) assert that the Taylor rule is vital and instrumental in the determination of short-term interest rates for the purposes of achieving the inflation target. In the anchor country, the SARB regulates its monetary policy by targeting the repo rate, which is announced every eight weeks (May *et al.,* 2018; Van der Merwe and Mollentze, 2009). The repo rate is defined as the price at which the SARB lends its liquid cash to the banking system (Naraidoo and Paya, 2012). Policymakers and economic analysts agree that the SARB's repo rate target is one of the most sensitive and the main instrument of monetary policy which influences financial markets in South Africa (Fadiran and Edun, 2013). May *et al.* (2018) assert that the repo rate target in South Africa is explained within the general form of the Taylor rule. They advance that the main objective that underpins the reason why the repo rate target is accounted for within the premises of the Taylor rule models is that, South Africa's central bank aims at attaining stable prices, and sustainable growth in output in the economy.

John Taylor coined the Taylor rule of monetary policy targeting as a monetary approach for setting interest rates to achieve economic stability (Smith and Taylor, 2009). The Taylor rule proposes that a one percentage point rise in inflation must prompt the SARB to increase the nominal interest rate by more than one percentage

point (Taylor, 2019). The Taylor rule assumes that interest rates are related in a linear function to the gap between actual and desired inflation and output values (Kasai, 2011). According to Kasai (2011), in South Africa the Taylor rule is defined as a monetary policy regulation, which stipulates how much the SARB is supposed to modify the instrument of its interest rate policy to variations in economic activity and inflation. The Taylor rule, which was coined in America, is presented as follows:

$$\widehat{\imath_t} = r^* + \pi_t + \alpha_\pi(\pi_t - \pi^*) + \alpha_y(Y_t - Y_t^*) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.3)$$

In the equation above $\widehat{\imath_t}$ is the level of nominal interest rate desired in the economy

r^* denotes equilibrium real interest rate.

π_t symbolises the rate of inflation.

α_π represents the weight on inflation.

α_y represents the weight on the output gap.

π^* depicts inflation target.

Y_t symbolises the output level.

Y_t^* represents the potential output.

In line with the equation displayed above, the Taylor rule asserts that $\alpha_\pi$and α_y must be positive (Davoodi *et al.,* 2013). What this implies is that the SARB must decrease the nominal interest rate as a reaction to negative changes of actual inflation from the set target and GDP from its potential level.

Bringing together the constants and working out the GDP or output terms, the Taylor rule can be specified in simple terms as:

$$\widehat{\imath_t} = \sigma_0 + \sigma_\pi \pi_t + \sigma_y y_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.3.1)$$

The equation 2.3.1 above $\sigma_0 = r^* - \alpha_\pi \pi^*$,$\sigma_\pi = 1 + \alpha_\pi$. Moreover, $\sigma_y = \alpha_y$, whereas $y_t = Y_t - Y_t^*$. Taylor's rule of thumb set $\alpha_\pi = \alpha_y = 0.5$ and suggested $r^* = 2$ and $\pi^* = 2$ in order to arrive at the following identification:

$$\widehat{\iota_t} = 1 + 1.5\pi_t + 0.5y_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2.3.2)$$

Indicated in equation 2.3.2, it is proposed that if π increases by 1%, then interest rates must be raised by 1.5%. Nevertheless, John Taylor agrees that the coefficient of σ_π in equation 2.3.1 might not necessarily be exactly 1.5. Instead, the principle put forward is that the coefficient must be greater than one, which is named the Taylor rule (Bernanke and Gertler, 1995). Therefore, the Taylor principle states that a one percentage point rise in inflation must prompt the SARB to increase the nominal interest rate by more than one percentage point (Castro, 2011).

This principle is viewed as important for analysing historical policy and for the econometric assessment of specific alternative ways that the SARB can use as the basis for its interest rate decisions (Springfield, 2001). However, it has been asserted by Van der Merwe and Mollentze (2009) that the Taylor rule is criticised for many reasons. Firstly, despite the Taylor rule being easy to estimate it is criticised for being difficult to measure the output gap. Secondly, the Taylor rule has a problem defining neutral and real short-term interest rates. Thirdly, the effect of changes in the exchange rate is ignored in the Taylor rule. Fourthly, the Taylor rule is regarded as backward-looking.

2.3 MONETARY POLICY TRANSMISSION CHANNELS

According to Ireland (2010), monetary policy transmission is expressed as the response of real macroeconomic variables to policy-related nominal changes in the short-term interest rate or money stock. Nagar (2020) describes the transmission mechanism as processes by which decisions by monetary authorities are relayed or filtered into the wider economy resulting in output and price changes. According to Dlamini (2014), this process links the operational target of the central bank (usually

short-term interest rates) to its intermediate targets (broad money, exchange rate, medium- to long-term interest rates and credit) and eventually to its goal targets (price stability and output growth). Economists and analysts recognise various channels by which these decisions are transmitted into the economy (Smal and De Jager, 2001; Mishkin,1995; Cheng, 2006; Georgiadis and Gräb, 2016). This section begins by identifying the main channels of monetary policy transmission in literature and the underpinning of the theoretical framework employed in the study. The five main channels identified in literature are as follows:

2.3.1 The interest rate channel of transmission

Several studies have suggested this channel as the primary and most important channel for transmitting shocks of the monetary policy in an economy (Ireland, 2010; Kutu and Ngalawa, 2016; Prabheesh and Rahman, 2019). An expansionary monetary policy creates a decline in the interest rates by inducing a low cost for borrowing and increased investment, and hence, generates a higher output growth. The channel follows this trend:

$$Money\ supply\ \uparrow \Longrightarrow interest\ rates \downarrow \Longrightarrow (Investment \uparrow, Consumption \uparrow) \Longrightarrow \uparrow Y$$

Given that the SARB, which is regarded as the anchor country's central bank, mainly employs the repo rate as its main monetary policy tool in the integrated CMA countries (Fadiran and Edun, 2013; Nielsen *et al*., 2005; Ikhide and Uanguta, 2010), Kamati (2020) asserts that an expansionary monetary policy by increasing the supply of money will lead to a fall in the interest rate. Hence, the fall in interest rate leads to an increase in investment and consumption. This in turn, leads to an increase in output. This study attempts to assess the effect of the anchor country's interest rate on regional performance.

2.3.2 The bank credit channel of transmission

The central bank acts to stimulate the economy by altering money supply growth by means of regulating the amount of bank loans or funds given to borrowers for investment purposes (Afandi, 2005). According to Wulandari (2012), the credit channel reveals that banks also play a significant role in offering bank loans rather than merely creating bank deposits. Economists propose that when monetary authorities implement an expansionary monetary policy, banks respond by increasing credit and reducing (↓) the interest rates (Prabheesh and Rahman, 2019; Ridhwan and Bary, 2018). In this way when banks make loans and credit easily accessible, it stimulates the investors' and consumers' spending appetites. According to Rossouw *et al.* (2014), in South Africa, following the announcement of the repo rate, commercial banks change their lending rates immediately. On the other hand, when the SARB heralds an increase of the repo rate, banks respond by raising the cost of borrowing they charge customers for the loans. When the loans become expensive and difficult to get, firms and consumers cut their investment (I) and consumption (C) expenditures, respectively. This ultimately affects total output and aggregate demand in South Africa (Grandes, 2003). Ahmed and Islam (2004) present the bank credit channel as follows:

$$\downarrow M \Longrightarrow Bank\ deposits\ \&\ Bank\ loans \downarrow \Longrightarrow I \downarrow \Longrightarrow Y \downarrow$$

A monetary contraction, for example, decreases money growth $(\downarrow M)$ and with the passage of time bank deposits and loans offered by banks to borrowers diminish. This effect consequently reduces investment $(I \downarrow)$ and ultimately causes a decline in RGDP $(Y \downarrow)$.

2.3.3 Money effect channel of transmission

This channel illustrates the central bank 's authority in using money supply to regulate the total expenditure or output of the economy (Mishkin, 1995). This channel does not emphasise the primary role of interest rates in transmitting the effect of monetary policy on economic performance (Ireland, 2010). The following example is an equation

which illustrates a contractionary policy implemented to curb inflationary pressure in an economy (Ahmed and Islam, 2004; Arnoštová and Hurník, 2005).

$$M \downarrow \Longrightarrow repo \uparrow \Longrightarrow (\downarrow C, \downarrow S) \Longrightarrow I \downarrow \Longrightarrow \downarrow Y$$

In the money effect channel, in a drive to ease inflation, monetary authorities react by causing a decrease in money growth $(M \downarrow)$, which has the negative effect of increasing the interest rate, in our case the repo rate. Economic stakeholders respond by cutting down on spending $(\downarrow C)$ and saving $(\downarrow S)$ and investment also dwindles (Jawadi *et al*., 2016). This process causes a reduction in investment $(I \downarrow)$ and ultimately reduces total output $(Y \downarrow)$ in the economy.

2.3.4 Asset price channel of transmission

Mishkin (1995) illustrates the impact of the asset price channel by placing an emphasis on stock prices. Employing the q approach of investment by Tobin, where q is defined as the market value of firms divided by the replacement cost of capital. Tobin demonstrates that when the price of equities becomes less relative to the capital cost, businesses will opt for new equities to purchase investment goods leading to a decline in investment (Canova *et al.,* 2004). Household consumption also becomes less because low equity prices reduce people's wealth. Keynesians and monetarists agree that a monetary contraction causes asset prices to fall (Mishkin, 1995).

$$(\uparrow nominal\ interest\ rates\ ) \Longrightarrow \downarrow q \Longrightarrow I \downarrow \Longrightarrow Y \downarrow$$

Ireland (2010) asserts that: ''an increase in short-term interest rates prompted by policy instruments makes debt instruments more attractive than equities to the investors, *ceteris paribus*''. The implication of this is that a contractionary monetary policy reduces equity prices (Ireland, 2010). Consequently, this causes the value of $(q \downarrow)$ to fall because of the decline in the value of a firm relative to its capital cost replacement. A low $(\downarrow q)$ gives rise to reduced investment $(I \downarrow)$, due to the fact that

the cost of investment becomes very high (Nelson, 2004). A low q implies that after monetary policy tightening, investment projects lack funding, leading to a decline in output. Conversely, a high q causes investment to increase and ultimately an expansion in output.

2.3.5 The exchange rate channel of transmission

The exchange rate channel plays a significant role in reflecting the way monetary policy affects the domestic economy as demonstrated in several studies (Afandi, 2005; Boeckx *et al.,* 2020; Mihov, 2001). The way shocks are transmitted through this channel relies mainly on the economy's degree of openness and the exchange rate regime implemented in the particular economy (Mojon *et al.,* 2003). In an open economy that is under a flexible exchange rate, monetary contraction ($M\downarrow$) induces increases in interest rates ($\uparrow$), and exchange rate appreciation ($\uparrow$) which causes a decline in net exports as domestic goods become exorbitant in the international market thereby consequently effecting a fall in the total output.

$$\downarrow M \Longrightarrow \uparrow interest\ rates \Longrightarrow \uparrow exchange\ rate \Longrightarrow \downarrow NX \Longrightarrow Y\downarrow$$

In contrast, an expansionary monetary policy will ultimately induce an increase in net exports as domestic goods become less costly in comparison with external goods, leading to expansion of output (Afandi, 2005). Nevertheless, theory suggests that because the exchange rates of CMA economies are fixed to the Rand, it is alleged that the CMA region should follow SARB exchange rate policies (Nielsen *et al.,* 2005; Ziaei, 2013).

2.4 THEORETICAL FRAMEWORK FOR THE WHOLE CMA

Adopting the studies of Kamati (2020) and Ikhide and Uanguta (2010), this study uses the interest rate channel and deploys the repo rate as South Africa's or the anchor country's primary monetary policy tool. The South African repo rate (SA_REPO), defined as the interest charged on the SARB's refinancing system, has been

characterised as the main effective instrument used by the SARB considering the behaviour of capital flows in the CMA (Kasai, 2011; Krause, 2004).

The repo rate illustrates how shocks from the monetary policy actions of the anchor country are transmitted into the entire region (Ikhide and Uanguta, 2010). In line with Seleteng (2016), we will follow an approach stemming from the traditional Keynesian view and closely analyse the link between South Africa, the anchor economy and the CMA economies adopting the channel portrayed by Mishkin (1995), such that:

$$\uparrow Repo \Longrightarrow rrates \uparrow \Longrightarrow (Investment \downarrow Consumption \downarrow) \Longrightarrow \downarrow Output$$

Given the above, a contractionary monetary policy depicted by an increase in the repo rate $(\uparrow Repo)$ causes an increase in other short-term interest rates depicted as $(\uparrow rrates)$. The increase in the repo rate, shown above, spreads to other short-term interest rates, provoking an increase in the cost of capital so that the borrowing cost becomes high, leading to a drop in investment $(\downarrow I)$ and subsequently, consumption $(\downarrow C)$. The process ultimately ends with the decline in output $(\downarrow Y)$. This study applies the repo rate as the dominant country's main policy tool adopting a similar criterion as Kamati (2020). Their study validates the repo rate of South Africa as an appropriate policy tool in the CMA economies. Originating from close economic linkages between South Africa and LEN countries, the repo rate may directly affect other interest rates, such as lending rates, immediately (Fourie *et al.,* 2004; Seleteng, 2016). The above relationship is assumed to hold in the entire CMA region as we investigate the overall performance of the economy in the CMA following a shock in the SA_REPO.

2.5 EMPIRICAL REVIEW OF STUDIES ON MONETARY POLICY SHOCKS AND ECONOMIC PERFORMANCE.

Various studies in the body of literature regarding the impact of a monetary shock on economic performance of a country have been carried out, both in developing and developed countries. Such studies are based on time series and panel data analyses. In this study, a review of empirical studies related to the impact of a monetary shock

on economic performance of developing and developed countries is carried out. The study begins with literature from developing countries.

2.5.1 Empirical studies in developing countries.

Given that a considerable amount of literature has been published which investigates the impact of monetary policy shocks on economic performance in both developed and developing countries, few studies have investigated the impact of the dominant or anchor country's repo rate on the region's economic performance in the CMA. Amongst the few studies in the CMA countries, is the notable work of Ikhide and Uanguta (2010) and the study by Seoela (2020). The study by Ikhide and Uanguta (2010), using a VAR model, investigated how a shock in the repo rate of South Africa affected price levels, credit, and money of the CMA countries, while assessing LEN economies' ability to undertake independent policy. The results of their investigation validate the repo rate (SA_REPO) in place of bank rates as an effective policy tool for impacting smaller countries in the CMA and that participant members were not capable of undertaking independent monetary policies. Ikhide and Uanguta's (2010) findings from the impulse response functions (IRFs) and the cumulative forecast errors of the estimated VAR reveal that prices, lending rates, money supply, and private sector credit, respond instantly to a shock in the anchor country's repo rate. However, one of the challenges mentioned in Ikhide and Uanguta's (2010) study is the unavailability of output or GDP data, which was not incorporated in the study. This study attempts to bridge this literature gap by using a different time frame as we pool annual data frequencies for all CMA economies to incorporate the output growth variable (RGDP_G).

According to Kamati (2014), real output growth rate (RGDP_G) is an important variable or component for measuring the performance of an economy. In a country-specific study, Kamati (2014) used a SVAR framework to examine the impact of Namibian monetary policy shocks on real output growth, private credit, and prices in the Namibian domestic economy. The findings based on the IRFs and variance decompositions indicated that a shock in domestic interest rate reduces economic growth, private credit, and inflation in the economy. However, even though Namibia is part of the CMA, their study did not find evidence of the effectiveness of the South

African monetary policy shocks through the repo rate on the Namibian economy. In contrast to Ikhide and Uanguta's (2010) study, Kamati (2014) recommended that the central bank of Namibia keep independent monetary policy decisions in order to achieve higher economic performance. These findings reveal that researchers do not have a unified view and have not reached a consensus on the impact of monetary policy shocks on the CMA. This study aims to bridge the literature gap by assessing the impact of the anchor country's monetary policy shocks on all the members of the CMA region using panel data.

The recent study by Seoela (2020) investigated the impact of unexpected interest rate shocks of monetary policy transmission in the CMA region. Seoela's (2020) study focused on the period after inflation targeting, which focused on the observations from 2000 to 2018. Such an approach implies that the results of the CMA economies' performance from its formation were not considered in the analysis. This rules out important information in analysing the regional performance of the integrated economies from the beginning of the CMA agreement. The main challenge in Seoela's (2020) study was the unavailability,of data especially for output or GDP in monthly frequencies. This caused the researcher to deliberate on using the temporal disaggregation procedure of data forecasting following the Chow Lin Approach. However, one of the major drawbacks of the Chow Lin Approach in the study of Seoela (2020), is that the covariance matrix is unknown, which may yield inconsistent and misleading results. Therefore, this study attempts to fill the literature gap identified in the body of knowledge. Firstly, this study includes data before the implementation of the inflation-targeting framework from 1980 to 2019. Secondly, this study, by incorporating annual secondary data for real output growth or RGDP_G which is readily available for the selected time frame (1980 to 2019), bridges the literature gap by investigating the impact of a monetary policy shock on an important performance indicator, such as regional real output growth. Moreover, one of the challenges mentioned in Seoela (2020)'s findings was the effects of the price puzzle after a contractionary monetary shock. This study also seeks to close the literature gap by including global commodity prices to mitigate the price puzzle problem in CMA identified by Seoela (2020)'s study.The previous studies in the CMA did not incorporate global control variables, which could also impact the performance of CMA

countries, since the CMA countries interact globally with other countries in world markets.

Saxena (2008) investigated the impact of monetary policy shocks on economic performance by employing an SVAR model using quarterly data spanning from 1990 to 2004. The study focused on eight countries, the regional currency union known as the Central African Economic and Monetary Community (CAEMC) area and two additional countries, Uganda and Nigeria. The findings of the study revealed that the impact of a money supply shock on output growth and inflation was not strong in Uganda and Nigeria, especially in periods of high liquidity. At the same time the CAEMC showed no significant impact either. Bikai and Kenkouo (2015), employing Panel-VAR and SVAR models, argued that these results are biased as the study included too few observations, which resulted in few degrees of freedom. Bikai and Kenkouo (2015), further contended that the study included periods of structural shifts in each CAEMC economy which could have contributed to the lack of effectiveness of monetary policy shocks in the region.

Furthermore, Buigut (2007) employed data for East African Community (EAC) countries from 1982 to 2004 to examine the impact of shocks and the suitability of a monetary integration, and to assess the source of aggregate output changes using the VAR econometric model. The results showed that a positive monetary policy shock highly affected output. However, in certain countries, nominal interest shocks (increase of the short-term interest rate) triggered an output decrease, while a positive shock (loose monetary policy) provoked an increase in output in other countries. However, the findings reveal mixed results although expansionary monetary policy shocks stimulate the performance of some of the EAC economies. Sheefeni and Ocran (2012), using the SVAR model in Namibia, investigated the impact of interest rate shocks on the real output, money supply and prices of the economy. Employing quarterly data spanning from 1993 to 2016, the estimated results from the IRFs and variance decompositions indicate that shocks in the interest rate significantly influenced real domestic output and prices.

An important study closely related to the methodology used in our study, is a study in the East African region conducted by Cheng (2006). Using a non-recursive SVAR econometric technique, Cheng (2006) investigated the impact of a shock in the short-

term interest rate on prices, output, and the exchange rate for the time frame 1997 to 2005. The findings revealed that an exogenous rise in the short-term interest rate or repo rate reflected an insignificant effect on real output. The findings of Cheng (2006) also showed that policy-driven shocks lead to a significant decrease in prices, whilst the exchange rate tends to appreciate. Cheng's (2006) results suggest a strong relationship between monetary policy shocks and economic performance. A country specific study in Malawi, done by Mwabutwa *et al.* (2013) used a Time Varying Parameter Vector Autoregression (TVP-VAR) model to investigate the impact of monetary policy shocks from 1981 to 2010.The results reveal that responses of GDP and prices to shocks have changed over the years. However, their findings revealed that before 2000 the effect of monetary policy shocks was weak and not consistent with theory. Sheefeni (2017) employed a Bayesian Vector Autoregression (BVAR) model to investigate the effect of an expansionary monetary policy shock on real output growth and prices in Namibia using quarterly data from 2000 to 2016. The findings of his study reveal that a shock in the interest rates (increase in interest rates) reduces real GDP growth rate (RGDP_G) and prices (inflation) to eight quarters after which the impulse or effect begins to die off. The results further show that the effect on inflation was positive but wears off after the fifth quarter.

There are several lessons learnt from these studies. Firstly, monetary shocks on the interest rate (unexpected rise in the interest rate) seem to cause a significant impact on economic performance. However, there seems to be variations in terms of the effect. Moreover, SVAR models seem to be instrumental econometric tools in analysing the impact of monetary policy shocks on economic performance. Specifically, SVAR which is a hybrid of the VAR, seems to be predominant when it comes to the empirical analysis of the impact of monetary policy shocks on economic performance. The SVAR framework has been employed in country-specific studies in developing countries. However, the country-specific studies of Seoela (2020) and Kamati (2014) assert that the main drawback of using SVAR to analyse the impact of monetary policy shocks on economic performance, is the issue of compromising the degrees of freedom. However, this study seeks to circumvent this problem by conducting an area or regional study by pooling data for all four CMA economies to increase the number of observations. Therefore, this justifies the Panel-SVAR used in this study and fills the knowledge gap by solving the degrees of freedom problem. To

the best of our knowledge, the researcher is not aware of any study that specifically uses Panel-SVAR in the CMA region to analyse the implications of monetary shocks from the anchor country on the entire region. Our study follows the recommendations of Kutu and Ngalawa (2016), among others, to identify monetary policy shocks in the CMA by employing a Panel- SVAR model.

2.5.2 Empirical studies in the developed countries

Given that few studies in developing countries have widened their investigations on the implications of shocks from the anchor country in the CMA territory, it is vital to review strongly connected literature from other areas. This gives our current study a background to analyse the impact of an anchor country's monetary policy shocks in a monetary or currency union setting. In developed countries, Bayoumi and Eichengreen (1992) carried out an empirical study in 11 economically integrated Euro Area countries and the US. Using VAR econometric technique, their study analysed the impact of monetary policy shocks on the Euro Area countries and the US. The study found out that the impact of the shocks was more significant in Euro Area countries than in the US territory.

Sousa and Zaghini (2008) also carried out a study to examine how monetary policy shocks impact the G5 (UK, Euro Area, Canada, US, and Japan). Utilising an SVAR framework their findings revealed that following an expansionary monetary policy shock, output drops temporarily, whilst the global monetary aggregate decreases significantly. More so, in response to an unexpected decrease in the short-term interest rate, the general price level increases permanently. The IRFs derived from their estimation depict that a positive shock to the regional liquidity results in a permanent rise in the price level and money supply aggregate (M3), whereas real output and exchange rate increase temporarily.

Jarociński (2010) employed a Bayesian VAR estimation to compare responses of important performance indicators after an interest rate and money supply shock in Euro Area economies and New Member States (NMS) of central Europe. The results showed high inflation figures after a monetary policy shock in the NMS and Euro Area economies. However, the inflation in the NMS was more volatile than inflation in the

Euro Area countries, exhibiting a steeper Philips curve. However, despite the fact that the reviewed literature in the Euro area reveals lack of consensus amongst the researchers, the impact of monetary policy shocks on the region can either be positive or negative depending on what the monetary authorities want to achieve.

Peculiar to the mixed and widely held views of other researchers in the Euro Area, Neri and Nobili's (2010) research analysed the impact of commodity prices shocks and the European Central Bank's (ECB) responses to macroeconomic developments on the Euro Area economy. Their results reflected that the impact of commodity prices shocks is partly offset by the ECB's strategy of raising short-term interest rates to alleviate the expanding economy's inflationary pressure. Commodity prices are shown as crucial in solving the price puzzle in European monetary policymaking. In a review of Neri and Nobili's (2010) study, one of the limitations in the existing body of literature concerning CMA economies is that few studies around the topic have been done in the CMA. However, no study that we are presently aware of has incorporated global variables, such as commodity prices and federal funds rates, in analysing the impact of the anchor country's monetary shocks. The argument is in line with Omoshoro-Jones and Bonga-Bonga (2020), which revealed that much uncertainty still exists about the impact of global variables on the anchor country's monetary policy stance in the CMA region. This study seeks to close this literature gap by incorporating commodity prices in our analysis.

Moreso, Peersman (2004), estimated a Vector Autoregression (VAR) method and other macro-econometric models using macroeconomic data and microdata for banks. The study found that the impact of monetary policy shocks on the performance of all European Monetary Union member countries is significant. Contrary to other researchers' widely-held views, the results show that tightening of monetary policy reduces output, and consequently prices, after a time lag.

In a similar study, Mirdala (2009) employed an SVAR model to analyse the responsiveness of the real output growth (RGDP_G), prices, exchange rate, and interest rates of new member countries of the European Monetary Union to a positive monetary shock for a period spanning from 1999 to 2008.The results of the IRFs and variance decompositions reveal that a positive shock reduces RGDP_G and decreases prices in the new member countries. The results suggest that expansionary

monetary policy increases the vulnerability of the new member countries to monetary shocks which significantly influences the performance of these countries.

Barigozzi *et al.* (2014) pooled data from North European and South European countries and employed a Structural Dynamic Factor model using a large panel of quarterly data to investigate the responses of Euro Area countries to the monetary policy shocks from the European Central Bank. Their findings confirm that an expansionary monetary policy shock revealed a significant homogenous response on the RGDP, while the response of inflation (prices) revealed that there are some differences in North and South Europe. The results showed that monetary policy shocks have a significant impact on the performance of economies.

Angeloni *et al.* (2003), utilising different econometric frameworks, including SVAR and wide-scale econometric techniques, studied the impact of a monetary policy shock on the performance of 10-Euro Area economies. The study incorporated short-term interest rates, output (GDP), money stock, prices, and the exchange rate. Their findings revealed that an unexpected increase or shock in the short-term interest rate temporarily decreases GDP, reaching its peak after approximately one year. Prices reflect a slow response initially, with inflation hardly moving and then falling gradually over the coming years.

Overall, the reviewed literature indicates that monetary policy shocks can significantly impact or influence economic performance, either positively or negatively. Given this view, it is crucial to carry out a study that provides insightful analysis of the implications of the anchor country's monetary policy shocks in the CMA economies. Hence, the study will add to the existing body of literature since there are few studies which have been extended to the CMA region in developing countries. Moreover, in the studies extended to analyse the effect of the anchor country's policy shocks in CMA economies very few have incorporated the economic output variable in their studies.

2.6 CONCLUSION

The chapter discussed both theoretical and empirical literature included in the study. The chapter also covered the theoretical framework and went further to review previous studies conducted in developing and developed countries. These studies reveal that there is a significant influence of monetary policy shocks on the performance of regionally integrated economies. Consequently, studies conducted in individual countries of the CMA region also show that few studies have managed to extend to the entire CMA region. However, the reviewed literature in the CMA region reflects that VAR and SVAR models were used in the studies to examine the implications of monetary shocks in each CMA member country. These reviewed empirical studies reveal that econometric techniques were employed in a time series data environment. To the best of our knowledge, no study we are aware of employed the Panel-SVAR framework to analyse the impact of a monetary policy shock on the performance of the entire CMA region. This study seeks to bridge the gaps revealed in the literature within the regionally integrated CMA economies. The next chapter focuses on the common monetary policy arrangements in the CMA region.

CHAPTER 3 THE COMMON MONETARY AREA ARRANGEMENT

3.1 INTRODUCTION

The previous chapter focused on a theoretical and empirical review of the literature that is relevant to this study. It briefly outlined the theoretical model in which the study is rooted and further highlighted the empirical review from developing and developed countries. In this chapter, the historical background and leading features of the CMA arrangement are highlighted and discussed. This chapter also discusses the monetary policy transmission mechanism and further analyses some of the critical macroeconomic variables included in the Panel-SVAR model adopted for the study and derived from the transmission channels. These macroeconomic variables are captured in the study to indicate the performance of the member countries before and after the agreement.

3.2 DESCRIPTION OF THE GEOGRAPHICAL AREA SIZE OF THE CMA

The CMA occupies the bottom part of southern Africa as it connects four countries which are regionally integrated. Among the members of the CMA, South Africa covers the biggest geographic area, followed by Namibia, Lesotho and Eswatini respectively, as shown in table 3.1 below:

Table 3.1: Area size

Country	**Area size**
South Africa	1 219 090 km^2
Lesotho	30 355 km^2
Eswatini	17 364 km^2
Namibia	825 615 km^2
CMA	2 092 424 km^2

Source: Masha et al. (2007)

As shown in table 3.1, and on the map in figure 3.1, the four CMA countries occupy a geographical area of 2 092 424 km^2. South Africa, which is the southernmost part of the CMA, shares the border to its North with Zimbabwe and Botswana. The country covers an area of 1 219 090 km^2. Namibia covers an area of 825 615 km^2 and is located to the North-west of South Africa. The western side of Namibia borders with the Atlantic Ocean, whereas it shares its southern and eastern borders with South Africa. Lesotho is a landlocked country which occupies an area of 30 355 km^2 and is encircled by South Africa. Lastly, Eswatini covers the smallest area in the CMA, 17 364 km^2 and is partially surrounded by South Africa and is bordered by Mozambique to the East.

Figure 3.1: Map for CMA countries

Source: Mühlich (2014)

3.3 THE HISTORICAL BACKGROUND OF THE CMA ECONOMIES

3.3.1 History of the formation of CMA

The setting up of the regional integration of the CMA economies has gone through several stages in its current development (Seleteng, 2016). The chronological events behind the formation of the current CMA are presented in table 3.2. In fact, the CMA has been refined over many years and is a formalisation of a de facto situation (Nielsen *et al.,* 2005). The monetary cooperation of these economies began in an era when the territories of the four countries were under the influence of British colonialism (Masson and Pattillo, 2004). In 1910, the South African union was established followed by the creation of the South African Reserve Bank in 1921. Trade and capital movement in the countries neighbouring South Africa was less restricted (Metzger, 2006).

Table 3.2: Events behind the CMA formation

Period	Historical Events in the development and formation of the CMA agreement
Prior to 1960	From the establishment of the SARB in 1921, the then Pound of South Africa, was the common currency.
The 1960s	The current CMA members attained independence, not counting Namibia, which followed the others in 1990. After World War II, the South African Rand replaced the Pound in 1961.
1961	The South African Pound was a common currency, and the monetary union existed informally.
1961-1974	Apart from Namibia, the other countries gained independence. Although the Rand replaced the Pound, the arrangement remained informal.
1974	Botswana, Lesotho, and Eswatini agreed to sign the so-called RMA (Rand Monetary Area) treaty
1975	Botswana exited the group in order to regain and pursue independent monetary and exchange rate policies.
1986	The RMA was replaced by the signing of the CMA agreement amongst the three countries, Lesotho, Eswatini and South Africa
1992	Following its independence from South Africa in 1990, Namibia joined and became a CMA member in 1992. The joining of Namibia transformed the trilateral agreement into a quadrilateral agreement, which is also known as a multilateral CMA. Eswatini prohibits the circulation of the Rand in its territory for monetary management purposes
2000	The Reserve Bank of the anchor country, South Africa, adopts inflation targeting within a 3-6% band.
2003	Reauthorisation of the Rand by Eswatini alongside the Lilangeni.

Source: Jian-Ye et al. (2006)

In colonial times, the British Pound, the then currency of South Africa, became the medium of exchange, which circulated in the entire territory of Botswana, Lesotho and Eswatini (formerly Swaziland). These countries were formerly known as the BLS states (Botswana, Lesotho, and Swaziland, now Eswatini). However, after the second World War in 1961, South Africa decided to become independent from Britain (Debrun and Masson, 2013). This dissociation caused South Africa to introduce the Rand as its formal currency, thereby replacing the Pound (Kashima, 2017). The BLS states also gained their political independence from Britain in the 1960s. Following the freedom from British rule, negotiations between South Africa and the BLS states took place (Stuart, 1992). These negotiations culminated in an informal agreement in 1974, which established the Rand Monetary Area (RMA). In 1975, Botswana opted out of the RMA to secure the independent management of its monetary policies, albeit that it took part in the informal agreement. In 1986, the RMA treaty was revised and replaced by the CMA arrangement (Wörgötter and Brixiova, 2019). Prior to its independence in 1990, Namibia was a de facto member of the union (Mühlich, 2014). Consequently, in 1992 Namibia officially joined, which commenced the official existence of the current CMA's multilateral arrangement.

3.3.2 The agreements in the CMA meetings

According to Mühlich (2014), the development of the current arrangement has undergone three important phases. These three phases are classified by the three agreements as presented in table 3.3 below. Some members exited and new members joined, and over time, important characteristics of the first agreement have not changed (Wörgötter and Brixiova, 2019). Generally, the third agreement is a formalisation of the informal relationships that pre-existed the integration of these countries (Seleteng, 2016).

Table 3.3: CMA Important Meetings and Agreements

Important Meetings	**Agreements**	**Participants**	**Location**	**Date**
(1)	RMA treaty	Lesotho, Botswana Eswatini and South Africa	Pretoria, South Africa	5 Dec 1974
(2)	CMA treaty	South Africa, Eswatini and Lesotho	Pretoria, South Africa	01 April 1986
(3)	Current Multilateral CMA treaty	Lesotho, South Africa Eswatini and Namibia	Windhoek, Namibia	Feb 1992

Source: Stuart (1992)

3.3.2.1 The first agreement

The attempts to introduce the existing monetary union can be traced back to the first major meeting held in Pretoria on 5 December 1974 (see table 3.3). The agenda of this meeting, chaired by South Africa, was focused on addressing the prevailing challenges of integration in their monetary systems (Collings, 1978). The agreement was centred on coordinating the exchange rate and monetary policies and equitable distribution of benefits created among RMA members (Kalenga, 2001).

3.3.2.2 The second agreement

The second treaty, encapsulating the governments of Lesotho, South Africa and Eswatini, was an amended agreement, agreed upon on 1 April 1986 in Pretoria (Stuart, 1992). The amendments, which were largely all-encompassing, detailed the dissatisfaction of Eswatini around the first agreement of 1974. This culminated in the signing of a new agreement and the RMA was replaced by the CMA (Stuart, 1992). Namibia sent in their request to join the CMA countries.

3.3.2.3 The third agreement

In a meeting held in Windhoek, Namibia in February 1992, Namibia clarified its standpoint concerning its interest to be part of the CMA (Alweendo, 2000). In the same year Namibia officially joined the CMA and the multilateral CMA treaty replaced the trilateral treaty of April 1986. According to Mühlich (2014), there are important features which characterise the current arrangement that replaced the first and second agreement. Hence, the following section deals with the current attributes of the CMA arrangement.

3.3.3 Important features of the CMA arrangement

The current CMA agreement, which was ratified by the joining of Namibia in 1992, is a refinement of the first and second agreement (Nielsen *et al.,* 2005). In order to understand the operations of the third agreement there are features which encompass the third agreement as highlighted in Article 2 of the arrangement (Jian-Ye *et al.,* 2006). Masha *et al.* (2007) points out that the main goal of the agreement (Article 2) is stated thus: ‘‘the arrangement should aim at providing sustained economic development and offer equitable benefits for the entire CMA countries and must be focused on encouraging the advancement of less developed participant countries’’. According to Jian-Ye *et al.* (2006), the salient features incorporating the current CMA agreement are listed as follows:

- All CMA countries, also known as the LENS countries (Lesotho, Eswatini, Namibia and South Africa), have their central banks, which assume the responsibility of issuing their domestic currencies. However, the small members (LEN countries) are to surrender their exchange rate policies to the SARB. At the same time, the monetary policy decisions of small members are partially restrained by the agreement in order to maintain the exchange rate peg. That is, the LEN countries (Lesotho, Eswatini and Namibia), are not allowed to issue the Loti, Lilangeni, and Dollar in places where the Loti, Lilangeni and Dollar are not legal tender.

- The bilateral agreements between Lesotho and Namibia specify that their currencies must be supported by South African Rand assets or foreign reserves, maintaining stability in the CMA.
- South Africa obligated itself to provide each CMA member compensatory payments for seigniorage they forgo for permitting the Rand to circulate in CMA members' currency areas.
- Namibia and Lesotho peg their currencies, the Dollar and the Loti, at par to the Rand of South Africa (ZAR), respectively. Although this commitment has been valid de-facto in Eswatini, they had banished it in 1986 and reinstated it in 2003.
- In collaboration with the banks of the other member countries, the SARB determines the implementation and enactment of a common exchange rate control system.
- Capital mobility has no restrictions in the CMA participating countries.
- The foreign reserves common pool, shared amongst participant members, is supervised by the SARB. At participant members' request, South Africa will then make the foreign exchange from the available common pool.
- Lesotho, Eswatini and Namibia are permitted to hold foreign reserves for immediate needs. However, up to 35% of the reserves can be held in other currencies besides the Rand.

3.4 EXCHANGE RATE AND MONETARY POLICIES IN CMA ECONOMIES

Based on the view expressed by economists and policymakers, exchange rate and monetary policy are key in determining regional performance of integrated economies (Jian-Ye *et al.,* 2006). Despite that the governors of CMA countries' central banks meet four times a year, the LEN countries are restrained in formulating policies. However, to a limited degree, there are several ways that LEN countries utilise to direct monetary policies in their domestic economies for stabilisation purposes (Kashima, 2017). Whilst the major country, South Africa, also known as the anchor country, focuses mainly on maintaining the stability of its currency (Masha *et al.,* 2007), other members import exchange rate policies from the anchor country by preserving enough foreign

exchange reserves (Dlamini, 2018). According to Ikhide and Uanguta (2010), the entire CMA is centred on safeguarding the pegged exchange rate. Hence, LEN countries are obligated to set their interest rates not far away from the interest rates of the anchor country to protect the fixed currency peg from deviations that are detrimental to their agreement (Debrun and Masson, 2013). Namibia, Eswatini and Lesotho are also obligated to back their domestic currencies issued with foreign exchange reserves (Ocran, 2012). Similar strategies have been developed in each country's monetary policy to manage their economies, which may be affected by the anchor country's policy stance. For instance, commercial banks' lending rates that are popularly used in LEN economies to regulate their economies are set close to the interest rates in South Africa (Debrun and Masson, 2013). According to Ikhide and Uanguta (2010), the CMA has not yet developed financial structures, compared to other unions, in order to facilitate the region in implementing successful and healthy policies, but they have set a pace toward building an effective monetary coordination.

3.5 COMPARISON BETWEEN THE CMA AND OTHER MONETARY UNIONS

This section focuses on conducting a comparison of the CMA region with other monetary unions from both developed, and developing, countries. The essence of the comparison is to identify the potential areas in which the CMA region requires improvement and development. This is in line with Masha *et al.* (2007), who revealed that other important features of the CMA economies become apparent when compared to other fully developed monetary integrations. In Europe and other regionally integrated economies in Africa, there are long-established monetary unions such as the Euro Area (member states of the European Union), the WAEMU (Western African Economic and Monetary Union), and CAEMC (Central African Economic and Monetary Community). A comparison of the CMA against these long-established monetary unions further assists in reflecting on the areas in which the CMA region is lagging behind in its goal to be categorised as a full-fledged monetary union and the benefits which accrue for full-fledged unions. This is because the benefits of developing into a full-fledged monetary union are far reaching in terms of economic performance and development for the entire integrated region (Debrun and Masson, 2013).

Firstly, it is asserted by Tjirongo (1998), that given the sole responsibility to formulate monetary policy which exerts influence over the entire CMA region, the SARB does not focus on regional performance as its primary goal compared to what is obtainable in other regional monetary unions. This has increased the call by many scholars for the establishment of a joint central bank in the CMA in order to achieve effective policy coordination in the region (Seleteng, 2016; Jian-Ye *et al.,* 2006). More so, Dlamini (2014) argues that the exchange rate peg is irrevocable and too rigid, in such a way that it cannot accommodate a country's specific shocks. Hence, it does not offer mutual support for an adjustment mechanism, especially if the peg comes under economic strain.

Furthermore, table 3.4 reveals that, except in the CMA, all other monetary unions have established regional banks and regional currencies, for instance the CAEMC (Central African Economic and Monetary Community), Euro Area, and WAEMU have regional banks. The regional bank for the CAEMC is the BEAC (Banque des états de l'Afrique Centrale), while the WAEMU 's regional bank is the BCEAO (Banque Centrale des états de l'Afrique de l'ouest), and the Franc is their regional currency. The European Central Bank is the regional bank for the Euro Area whilst the Euro is their regional currency. The CMA economies do not have a regional currency but rather issue their domestic currencies which are pegged to the Rand (ZAR) (Wörgötter and Brixiova, 2019). The development of a regional bank and currency indicates that other monetary unions have gone a step further in forming a safety net which assists them in offsetting both internal and external shocks. Another concern is that the CMA arrangement does not offer fiscal transfers amongst the participant countries, which may help to shield their economies in the event of shocks (Nielsen *et al.,* 2005). Specifically, Debrun and Masson (2013), asserted that full-fledged monetary unions have a formal mechanism for fiscal transfers from their respective regional banks which helps to cushion the impact of shocks among participant economies. On the other hand, each member of the CMA has its domestic central bank, and the absence of a regional bank prevents regional surveillance and commitments toward curtailing adverse shocks that may affect the economic performance of the entire region (Alweendo, 2000).

In addition, when compared to other regional groupings in the world, the CMA region has the lowest number of participants or members (see table 3.4). The Euro Area has

twelve participants, while the WAEMU has eight participants, followed by CAEMC which has six participants and, lastly, the CMA with four participants. Debrun and Masson (2013) claim that the more developed a monetary union becomes the more the number of its participants tends to increase. On the other hand, unlike other monetary unions, which have developed a regional currency, the CMA monetary union does not have a regional currency. Instead in the CMA region, the SARB possesses influence in the entire area and the Rand is, in fact, a de facto currency. The CMA has a characteristic that resembles the Euro Area in that only the CMA and Euro Area are a free-trade area, unlike the other monetary unions (the CAEMC and the WAEMU).

Table 3.3: Important features between the CMA and other monetary unions

	CMA	***CAEMC**	**Euro Area**	***WAEMU**
One currency?	No. Instead a de-facto common currency	Yes	Yes	Yes
Is the Central Bank common?	No. Instead the SARB has dominant influence	Yes	Yes	Yes
Shared pool of reserves?	Not available	Available	Available	Available
Regional surveillance of fiscal policy	Not available	Available	Available	Available
Number of Participants	4	6	12	8
Free-trade area	Yes	No	Yes	No

The intensity level of capital mobility	High	Low	High	Low
Common external tariff	Yes	Yes, in principle	Yes	Yes

Source: Masha et al. (2007)

*WAEMU=West African Economic and Monetary Union

**SARB= South African Reserve Bank

***CAEMC=Central African Economic and Monetary Community

At the same time, regional surveillance of fiscal policy and a common pool of reserves are establishments in more advanced unions, which provide a leeway, or a cushion, among members in the event of a shock (Masson and Pattillo, 2004). Except for the CMA region, all other monetary unions have a shared pool of reserves and fiscal arrangements where they can pool resources to support other members. Table 3.4 further reveals that, despite a few similarities, such as having an external tariff and a high intensity of capital mobility like other unions, it can be deduced that the CMA still lags behind in becoming a full-fledged monetary union (Mühlich, 2014).

In a nutshell, there is less institutional and financial development in the current CMA monetary cooperation, compared to other monetary arrangements in Europe and other parts of Africa. Therefore, this research seeks to examine the extent to which CMA regional performance is galvanised from the effect of monetary policy shocks from the anchor or dominant country.

3.6 ECONOMIC PERFORMANCE IN THE CMA ECONOMIES

This section focuses on examining the economic behaviour and performance of key macroeconomic indicators before and after the integration agreement of the entire CMA or LENS' (Lesotho, Eswatini, Namibia and South Africa) economies. This analysis includes a few selected variables employed in the study which cover the period from 1980 to 2019.

As shown in figure 3.2, in the CMA region there were periods marked by persistent declines in the RGDP growth in all the countries (Manwa *et al.,* 2019). For example, in 1981, the RGDP growth (RGDP_G) of Eswatini was 14% but in the following year (1982) it declined to 1%. While in South Africa, the RGDP_G declined from 5% to below 1% in the same period. Namibia recorded a growth rate of 0.9 % which declined to -1.8% in the same period. Whereas Lesotho experienced a fall from 4.4% to 1.9% in the period 1982 to 1983.

Given this declining trend in the RGDP growth across the CMA region, Ikhide and Uanguta (2010) maintained that the cause of poor economic performance can be attributed to their loss of monetary policy autonomy to stabilise domestic economic disturbances in their territories. Other studies have also argued that the CMA arrangement has constrained the smaller members from applying independent monetary policies to stimulate their economies (Nielsen *et al.,* 2005; Seleteng, 2016; Seoela, 2020). This is because South Africa, as a giant economy in the CMA agreement, is viewed as a regional pacesetter in monetary policy formulation (Debrun and Masson, 2013). Some economists and policymakers further assert that the monetary dominance from the anchor country and the way it was set-up may expose the region to adverse shocks (Barigozzi *et al.,* 2014).

Based on figure 3.2, it can be concluded that there are many instances where the RGDP growth of all the countries in the CMA region declined. Therefore, the evidence of common trends of persistent declines in the RGDP growth of CMA countries has become a cause for concern in the region. Hence, the purpose of the study is to investigate the impact of monetary shocks from the anchor country on the economic performance of the CMA region.

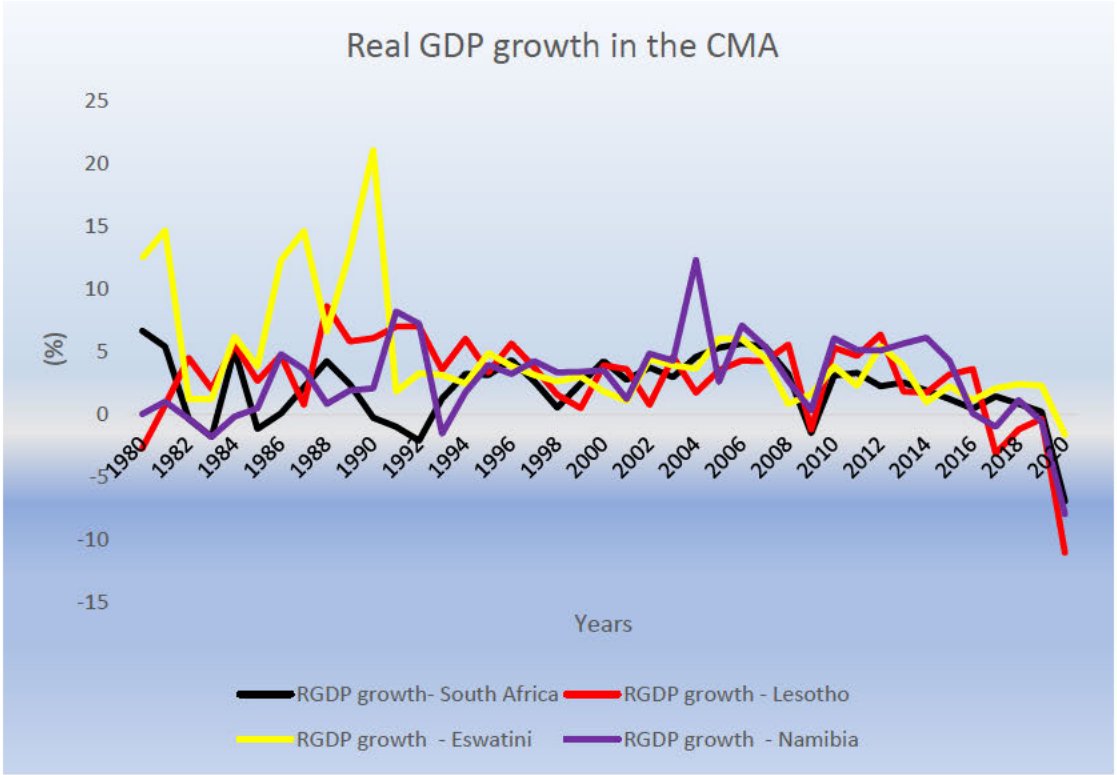


Figure 3.2: Computation from the World Bank economic indicators data (2021)

Source: Author's computation from the World Bank economic indicators data (2021)

In addition, the inflation rate is also regarded as the most significant measure of price stability in an economy (Van der Merwe, 2004), and another indicator for measuring the performance of the economy. This variable has been incorporated to capture the behaviour of the aggregate price level in CMA countries. The inflation rates of the CMA economies also tend to follow a similar direction over a long period of time (see figure 3.3). For instance, from 1974 to around 2001, the aggregate inflation rates among the countries trend together. However, in 2002, the inflation rate in all countries rises steeply where Lesotho recorded the highest peak of 33.8%, followed by a rate of 12% for both Namibia and Eswatini, whilst the inflation rate for South Africa was recorded at 9%. Nevertheless, between 2004 and 2019, all four countries experienced a similar level of inflation in their economies.

Although the small member countries in the CMA benefited from the inflation targeting from the anchor country (Urom *et al.,* 2019), the trajectory of inflation rates for Lesotho became more volatile in the periods after the CMA agreement than before the

monetary integration. In 2001, Lesotho computed a negative inflation rate of -9.60% and in 2002, it increased sharply to 33.81%, whereas South Africa's inflation rate was 9.48% (Phiri, 2010). According to Phiri (2010), the major factor which contributed to a significant difference in trends of inflation in 2001 in Lesotho from that of the anchor country was a fall in the supply of credit in Lesotho, which had a negative effect on consumer spending. Ikhide and Uanguta (2010) asserted that credit declined in Lesotho because lending rates were higher in Lesotho than in South Africa thereby compelling institutional borrowers to shift their borrowing from Lesotho to South Africa. Whilst the sharp increase in inflation in 2002 far beyond that of the anchor country was attributed to structural factors in the domestic economy of Lesotho and an increase in the costs of production (Seleteng, 2010). Consequently, LEN countries' inflation rates tend to follow the trend pattern of the anchor country, South Africa, as depicted in figure 3.3, despite that there were periods which reflected high, and volatile, fluctuations in other member countries, especially after the inflation target framework was introduced in 2000. For example, in Lesotho around 2002, the inflation rate was higher than the rest of the participant countries. These trends pose a question concerning the impact of monetary policy shocks on prices (inflation) which is also a performance indicator in the CMA region.

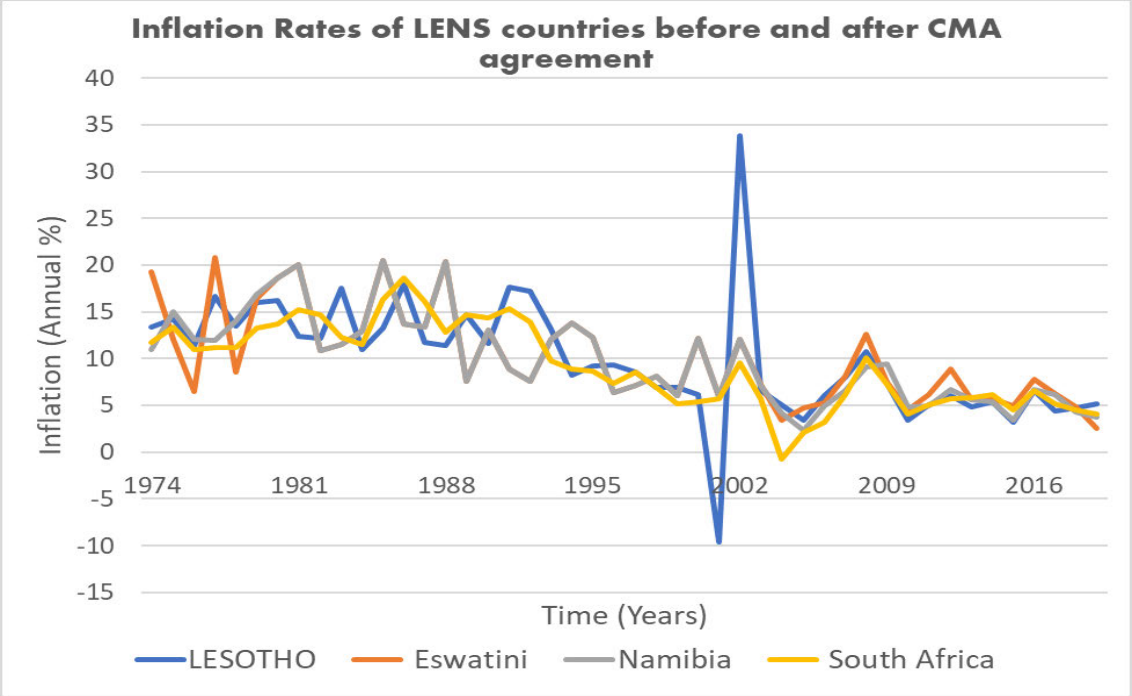


Figure 3.3: Trends in inflation rates in the CMA region

Source: Author's computation using data from the World Bank economic indicators data (2021)

Moreover, the rate of money growth, which is the (M2) definition of money supply, resembles co-movement as observed in figure 3.4. It reveals a form of volatility in the money growth across the region. Periods such as 1975, 1991, 2009 and 2017 were marked with a sharp increase in the money supply growth rate while other periods were marked with a sharp decline. Ikhide and Uanguta (2010), argue that money supply growth in an expansionary monetary policy can stimulate the performance of the economy. However, excess liquidity may weaken the effectiveness of expansionary monetary policy (Agénor and El Aynaoui, 2010). Although, some distortions have been created in the money supply growth in the CMA region since the abolishing of the circulation of the Rand in Eswatini (Seleteng, 2016), such distortions among the members are also one of the weaknesses of policy coordination in the CMA arrangement.

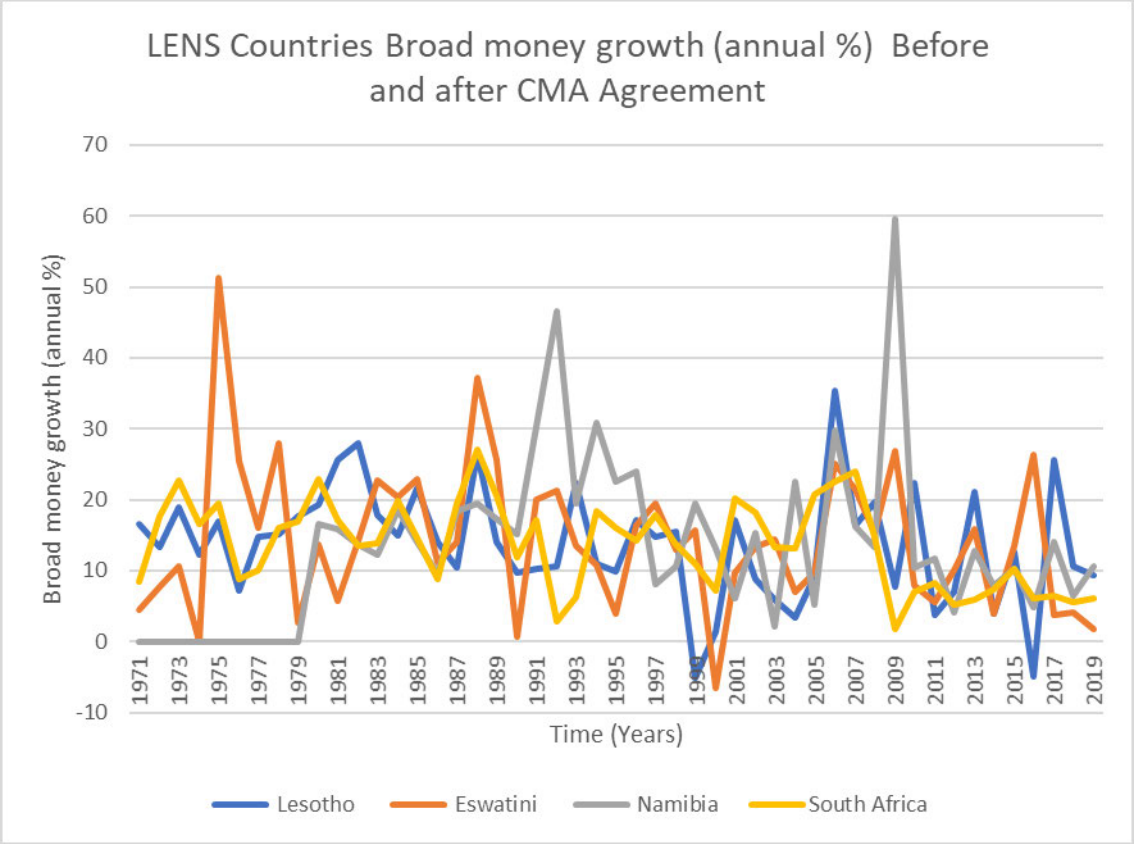


Figure 3.4: Trends in Money Supply in the CMA region

Source: Author's computation from the World Bank economic indicators data (2021)

Finally, in the CMA regional integration, the graphical presentation in figure 3.5 reflects co-movements in the lending rates. Although the lending rates of Lesotho rose above the lending rates of South Africa in 2002, whilst Eswatini had the lowest lending rates in the period between 1987 and 1993, it has been noted that the lending rates of LEN countries tend to move in tandem with the anchor country's lending rates. However, lending rates in Namibia in 1987 and 1993 were essentially higher than the rest of the participants. Similarly, in 1976 and from 1999 to 2019, the lending rates in Lesotho topped the percentage figures of all members of the CMA agreement.

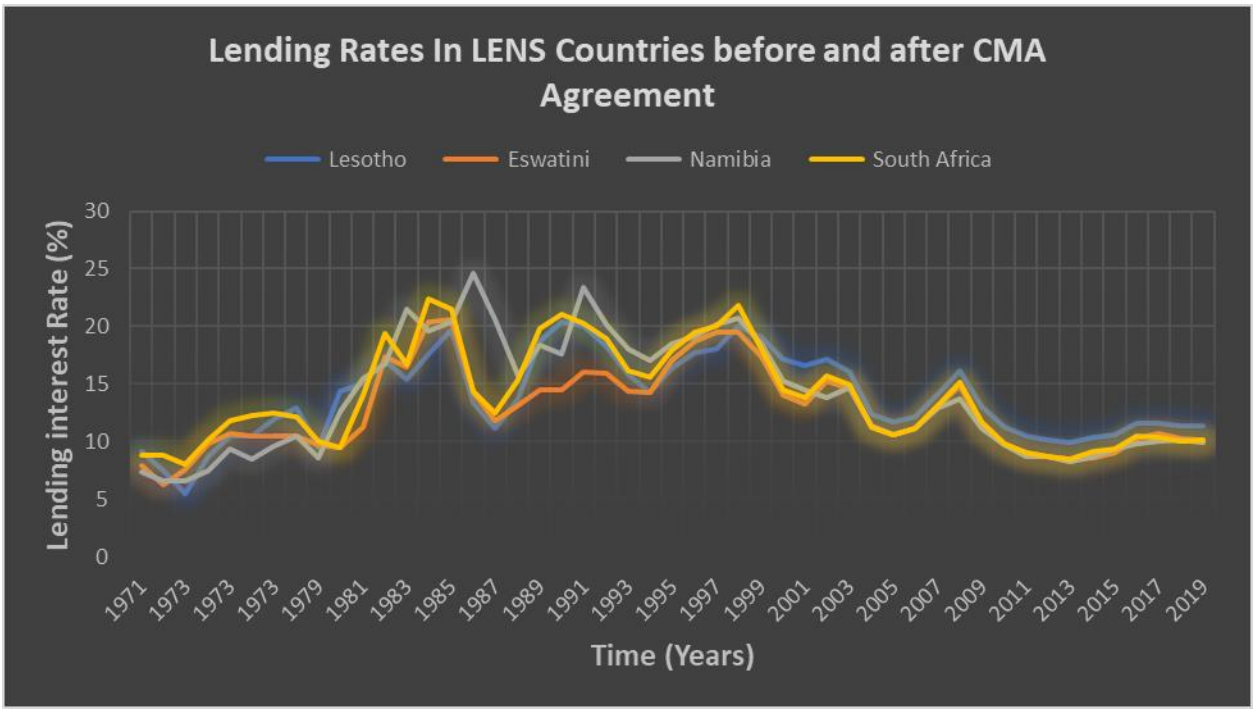


Figure 3.5: Trends in Lending rates of CMA economies

Source: Author's computation using data from the World Bank development indicators (WDI) (2021)

Conclusively, the discussion of the performance indicators of the CMA revealed that the macroeconomic variables in the LENS are closely connected and trend together. Which may be attributed to the exchange rate and monetary policy linkages among the countries. The co-movement also suggests that a panel study is suitable for the whole region to assess the impact of monetary policy shocks on the performance of the CMA region. Famoroti and Tipoy (2019) carried out a related study which investigated the macroeconomic effects of external monetary policy shocks on the economic growth of the ECOWAS (Economic Community of West African States).

3.7 CONDUCT OF MONETARY POLICY IN THE CMA OR LENS.

This section discusses how monetary policy has been conducted in the domestic economies of LENS countries. The discussion encapsulates the conduct of monetary policy before and after the formation of the CMA. All LENS countries are included starting with South Africa, which is regarded as the anchor economy in the CMA.

3.7.1 South Africa

In the year 2000, the SARB changed from the eclectic approach of conducting monetary policy (Smal and de Jager, 2001). Even though price stability and low inflation were the primary goals under the eclectic approach, there was no benchmark or a clear target for measuring progress. The handling of capital account shocks became complex concerning the exchange rate. Seleteng (2010) asserts that after the formation of the CMA there were no radical changes in how monetary policy operated under the inflation target, since the SARB did not shift its monetary instrument. The argument of Seleteng (2010) was that the repo rate is still the main instrument of monetary policy. Since South Africa's policy stance is assumed to spread over the whole CMA region, it is crucial to understand how the monetary policy of South Africa has evolved.

First and foremost, the central bank of South Africa (SARB) is predominantly in charge of exchange rate policy formulation in the CMA region in order to maintain the fixed peg (Jian-Ye *et al.,* 2006). Therefore, the monetary policy stance that South Africa chooses, and implements, is assumed to have implications on the rest of the CMA countries (Ikhide and Uanguta, 2010). Provided that the currencies of LEN economies maintain the set fixed parity to the Rand, the inherent assumption of the terms of the CMA agreement is that the economic condition of South Africa will spread to the rest of the members (Masha *et al.,* 2007). In the past, monetary authorities in South Africa have deployed different monetary policy regimes in pursuit of a stability goal (Aron and Muellbauer, 2019). The SARB has a primary goal to keep the Rand’s value on the grounds of price stability and sustainable output growth in the economy (Rossouw and Padayachee, 2020). Based on these goals, different monetary policy regimes have been operating from pre-inflation targeting until the current inflation targeting was introduced. Under this current inflation targeting framework the goal is centralised on achieving price stability (Hollander and Van Lill, 2019). However, the central bank keeps close supervision over the developments in other financial and fundamental indicators in deciding the appropriate level of short-term interest rates (Dlamini, 2018).

According to Aron and Muellbauer (2009), the liquid asset ratio framework was employed until the beginning of the 1980s to control credit and interest rates. These

controls were focused on alleviating inflation by monitoring the growth of monetary aggregates. South African monetary authorities appointed the De Kock Commission of Inquiry to enhance monetary policy efficiency. According to Hollander and Van Lill (2019), high inflation rates impeded real growth, employment, and other macroeconomic objectives in the long run. Only maintaining an environment of economic price stability could best support the sound performance of the economy.

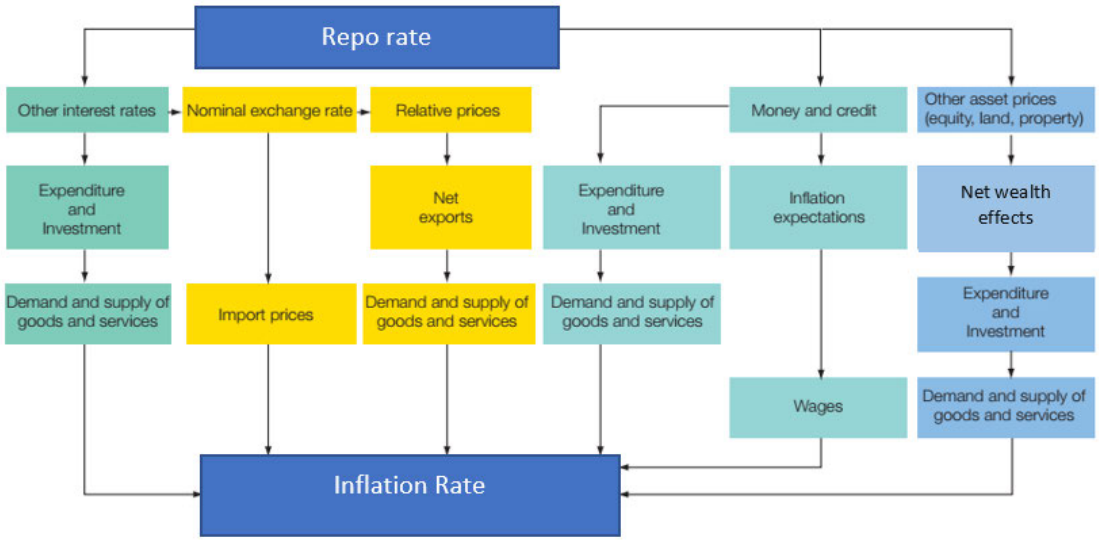
Furthermore, in the 1970s, the De Kock Commission recommended various reformations towards a market-oriented approach, based on a cash reserve system (Stals, 1996). Under the operation of the cash reserve system, the central bank's discount rate influenced interest rates in the money market, whereas open market operations (OMO) determined the amount of credit available complemented by additional liquidity policies (Aron and Muellbauer, 2009). The Commission of Inquiry brought about a shift in the policy direction from a direct restrictive system to a market-based monetary policy using the discount policy (Hollander and Van Lill, 2019). This policy, also referred to as the accommodation policy, became famous in South Africa. The introduction of financial liberalisation in the 1980s made money supply targeting difficult and increased the capital flows from 1995 (Aziakpono and Wilson, 2015). According to Stals (1996), since the beginning of 1990, eclectic indicators were added to the money supply guidelines (also known as money growth targets).

The eclectic approach implied money supply growth and the extension of credit, as intermediate guidelines for short-term interest rates (Woglom, 2003). Nevertheless, the policy was not transparent during this era, which reduced the central bank's accountability. For example, from 1996 to 1998, the policy actions implemented during this period were questionable and affected economic growth (Aron and Muellbauer, 2019). In line with Aron and Muellbauer's (2009) assertion, the lack of transparency led South Africa to adopt inflation-targeting in 2000. The cabinet of the anchor economy approved the proposal for inflation targeting in 1999 and it was officially introduced in February 2000. Inflation targeting was mainly aimed at increasing transparency, predictability, and accountability (Nielsen *et al.,* 2005). This monetary approach operates through the public announcement of inflation quantitative targets (Smal and de Jager, 2001). The South African government set a 3–6% target which

the SARB aims to attain through the partnership of the SARB and the Minister of Finance (Aziakpono and Wilson, 2015).

This position, which the government stands upon, reflects that price stability is monetary policy's fundamental goal. This gives the SARB essential freedom to pursue the inflation target. According to Nielsen *et al.* (2005), under this approach, the suitable measure of inflation in South Africa was depicted as CPIX, which is the Consumer Price Index excluding mortgage rates, and is maintained within a 3-6% target band. The central bank utilises the repo rate as a main tool for curtailing inflation within the targeted band. The repo rate is a short-term interest rate utilised by the central bank to meet the financing needs of the banks (Nielsen *et al., 2005).* The central bank's MPC (Monetary Policy Committee) holds meetings at regular intervals to review feasible changes to the repo rate. The flow chart shown in diagram 3.1 shows that the repo rate has immediate effects on economic variables, including exchange rates, other asset prices, other interest rates, money, and credit. The central bank adjusts the official short-term rates, that is the repo rate, to keep inflation within 3-6% of the target bandwidth.

Diagram 3.1: The Monetary Policy Transmission Mechanism in South Africa



Source: Smal and De Jager (2001)

3.7.2 Namibia

In 1992, Namibia was the last country to join the CMA agreement after gaining its independence from South Africa on 21 March 1990 (Kalenga, 2001; Seleteng 2016). Namibia had been under 70 years of South African rule, which replaced the German protectorate in 1884 (Tjirongo, 1998; Kashima, 2017). Namibia had a choice to make after the attainment of its independence, to ensure economic stability and viability (Kamati, 2020). In 1992, Namibia decided to join the CMA, and in the following year, 1993, the country introduced its currency, the Namibian Dollar (NAD). Nonetheless, within the spheres of the CMA, South Africa continues to have a domineering influence over the determination of Namibia's exchange rate policies (Kalenga, 2001). Therefore, the Namibian Dollar came under a fixed exchange rate and peg to the South African Rand (Ocran, 2012). According to Kalenga (2001), to maintain the fixed peg, it became apparent that Namibia could no longer exercise total autonomy in the formulation of its monetary policy. This meant Namibia has to set its short-term interest rates close to that of South Africa to avoid deviating from the peg (Ikhide and Uanguta, 2010). The implication is that the decision for Namibia to join and remain under the CMA proposes abandonment of her discretionary monetary policy in favour of the fixed peg (Ocran, 2012). However, after the Namibian Dollar was officially introduced, a separate bilateral arrangement existed between Namibia and South Africa regarding the peg features (Sheefeni and Ocran, 2012). The two crucial features of the bilateral arrangement are: (1) the obligation to convert the Dollar of Namibia to the Rand at a fixed rate. (2) The Bank of Namibia's (BoN) liabilities required to be backed by the South African Rand or other foreign assets (Kalenga, 2001).

According to Alweendo (2000), after the formation of the CMA, Namibia under a restricted monetary policy, employs the reserve requirement as a monetary policy instrument. However, Kashima (2017) asserts that because most commercial banks in Namibia are South African owned the use of reserve requirement is limited. After the CMA agreement, the Namibian central bank in its monetary policy, which is instituted for domestic stabilisation purposes, utilises the bank rate to regulate reserves. Moreover, Namibia makes use of rates, which are paid to commercial banks, on funds which the central bank keeps on a short-term basis, namely the call rate (Kamati, 2020).

In figure 3.6, the representation shows the transmission process from domestic market rates in the economy of Namibia. The rates in the money market respond in the short run to show changes in the official short-term interest rate. According to Kashima (2017), commercial banks adjust their lending rates instantly following the change in the official short-term interest rate. Firms and individuals quickly respond to changes in the lending rates by commercial banks as they alter investment and spending decisions (Sheefeni and Ocran, 2012). In a nutshell, the evidence of the impact of South Africa, or the anchor country's monetary policy shocks on the performance of the economy of Namibia and other participants, is lacking.

Therefore, a study is necessary to investigate the impact of South Africa's monetary policy shocks on the macroeconomic performance of all the CMA economies.

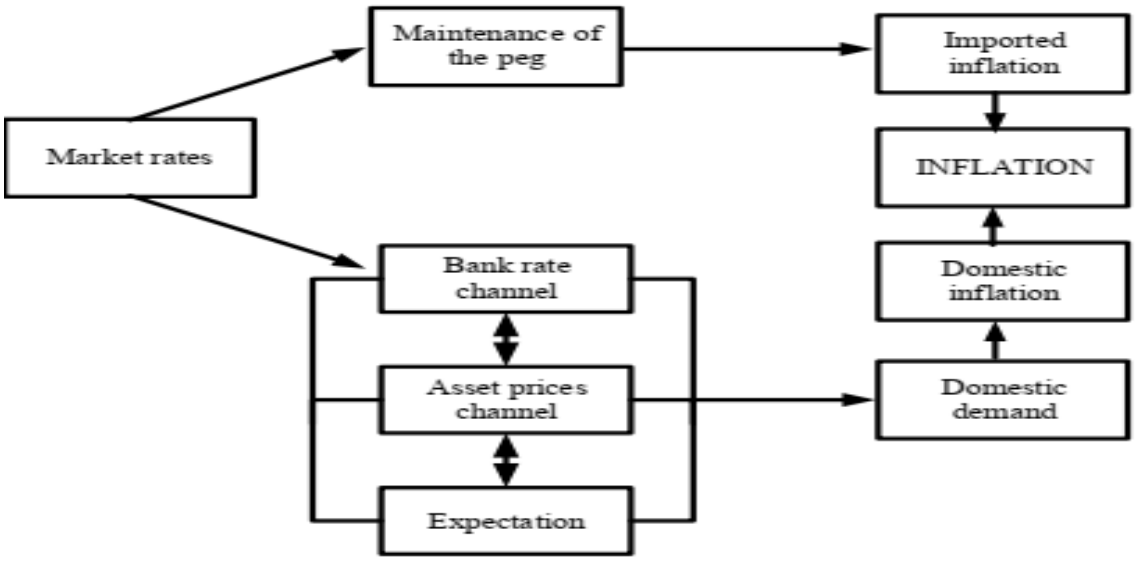


Figure 3.6: Namibia's transmission mechanism

Source: Alweendo (2008).

3.7.3 Lesotho

The main goal of the Central Bank of Lesotho's monetary policy, as stipulated in Section 5 of the Central Bank of Lesotho Act of 2000, is tailored towards the attainment of price stability and output growth (Seleteng, 2016). At the centre of its monetary policy is the fixed exchange rate, which is characterised by a fixed peg of the Loti to

the Rand under the CMA agreement (Stuart, 1992; Dlamini, 2018). The CBL (Central Bank of Lesotho) sustains the peg by maintaining net international reserves (NIR) at a level that guarantees a one-to-one exchange between the Loti and the Rand (Mallick and Sousa, 2012). According to Ikhide and Uanguta (2010), under a constrained monetary policy, the CBL operationalises the monetary policy through open market operations (OMO), which influences the short-term interest rates with a view to align them with those in the CMA, albeit with an allowable deviation margin. Seleteng (2016) asserts that before 1999, the CBL 's monetary framework was through the direct and indirect manipulation of the interest rate. According to Wörgötter and Brixiova (2019), Lesotho's short-term interest rates, such as the treasury bill rate, mirrored and followed the movements of short-term interest rates in the anchor country. Furthermore, commercial banks in Lesotho were answerable to the MLAR (Minimum Local Assets Ratio) that were deliberated to attract and foster local investment in order to boost the economy's performance (Khoabane, 2015). After 1998, this policy became unpopular until its elimination, and this gave rise to a new policy which permitted local banks to determine their lending rates as well as depositing rates and from 2000 the LAR (Liquid Assets Ratio) approach substituted the previous framework. This is because, local banks would choose to play it safe by keeping deposits under the custody of the CBL and avoid the risk of lending to private stakeholders. In conclusion, to a greater extent the monetary policy action, and decisions of the CBL, reveal that Lesotho's monetary policy autonomy has been restrained in order to maintain the currency peg to South Africa.

3.7.4 Eswatini

The ultimate objective of the central bank of Eswatini is to promote price stability, and to attain stable and sound financial systems that will ensure sustainable output growth in the economy (Dlamini, 2018). Eswatini's monetary policy is to a greater extent influenced by the anchor country since it is an active member in the CMA (Dlamini, 2014). Despite this, after the CMA agreement, Eswatini once prohibited the circulation of the SA Rand in its country, her policies cannot be treated separately from the CMA arrangement for the underlying rationality that it remained a member of CMA (Dillner, 2021). Given the fixed exchange rate peg between Eswatini's currency and the

dominant South African Rand, coupled with free capital mobility, the small economy of Eswatini is highly responsive to the interest rates from the anchor economy in the CMA and their rates of inflation move together (Dlamini, 2018). Monetary policy in Eswatini under this configuration must ensure lowest interest rate differentials in order not to disturb the currency peg with SA (Ikhide and Uanguta, 2010). According to Ikhide and Uanguta (2010), the intermediate goal for monetary policy in Eswatini is to maintain the exchange rate peg. The decision of Eswatini to keep its membership in the CMA implies limited scope to undertake discretionary monetary policy in response to domestic developments (Nielsen *et al*., 2005). Moreso, to a limited degree the monetary authorities in Eswatini utilise open market operations, discount rates and reserve requirements for domestic monetary management (Dillner, 2021).

According to Jian-Ye *et al.* (2006), Eswatini's interest rates are closely dependent on South Africa's monetary policy environment. This assertion is supported by Ikhide and Uanguta (2010), who maintain that Eswatini, prior to the independence of South Africa, operated an interest rate policy which was enforced to stimulate investment in the country through a lower cost of capital. However, after South Africa attained independence, foreign investors who used to be attracted to Eswatini because of its proximity to the South African market, transferred their investment directly to South Africa (Ikhide and Uanguta, 2010). This foreign direct investment diversion negatively impacted Eswatini , resulting in low GDP growth (Masha *et al.,* 2007). The Central Bank of Eswatini (CBE) responded by introducing new policies directed towards narrowing the gap between interest rates in the anchor country and those in Eswatini. These frameworks were to alleviate inflationary pressures and prevent capital flight (Mühlich, 2014). Nevertheless, Masha *et al.* (2007) argue that such a policy stance can be economically viable provided there is economic stability in the anchor country. The implication is that policy disturbances or economic instability in the anchor country have a chance of spilling over to Eswatini (Ikhide and Uanguta, 2010).

Hence, the extent of Eswatini's economic performance is dependent upon the condition and structure of the anchor country's economy and the monetary policy stance of the central bank of South Africa (Ikhide and Uanguta, 2010). Therefore, this study is imperative to determine the degree to which the monetary policy shocks from South Africa affect the economic performance in the CMA.

3.8 CONCLUSION

The beginning of this chapter discussed the background and history of the CMA and its formation, which included the agreements that were made. The chapter also offered a comparison between the CMA and other full-fledged unions. The chapter went a step further to discuss the key performance indicators in CMA countries and the monetary policies of the LENS. It is revealed that LEN countries have instituted a broad range of monetary policies in order to regulate their domestic economies. However, the bilateral agreements between LEN countries and South Africa prohibit them from a choice of policies that could end up distorting the fixed exchange rate peg. The monetary policies adopted by the participant members of the CMA region to a large extent seem to be influenced by South Africa. The performance variables of the entire CMA region seem to move in tandem with those of South Africa. As indicated, this may increase the vulnerability of these countries to shocks which may either stimulate or dampen the economic performance of the entire region in terms of price stability and output growth. This study therefore seeks to investigate the effect of the anchor country's monetary policy shock on the regional performance of CMA economies.

CHAPTER 4 RESEARCH METHODOLOGY

4.1 INTRODUCTION

The previous chapter focused on discussing the common agreements among the CMA countries that helped them in the formation of the monetary union. The current chapter discusses the methodology used to answer the research objectives. It begins by outlining the research approach and design. Followed by a description of the data used in the study and its sources.The next section introduces the models utilised to explore how the performance of the CMA region responds to an unexpected change in the monetary policy tool of the anchor country. Finally, it outlines the econometric technique and statistical tests used to answer the research aims and objectives that are set for this study.

4.2 RESEARCH APPROACH AND DESIGN

The research approach and design encapsulates the description of the data and the sources of the data as depicted in table 4.1. It also includes the definition of variables and how they were measured. This section outlines the estimation techniques incorporated in the study.

4.2.1 Data and Sources of Data

The study used annual data spanning from 1980 to 2019. The starting period was determined by data availability while the cut-off date was dictated by an attempt to stay out of the Covid-19 period to avoid a seasonal break. Among the CMA countries, the partial and total lockdown started in the first quarter of 2020, hence, the decision for the cut-off date to be 2019. Data employed for the study's analysis is real GDP growth, inflation, money supply, lending rates, repo rate and global commodity prices. The annual data for each of the domestic variables and exogenous variables was collected from secondary sources, as indicated in table 4.1 below.

Table 4.1: Description of Variables

Variable	Data Sources	Data Frequencies	Abbreviation	Description
Commodity Prices	World Bank's Development Indicators (WDI), Quantec database and the Federal Reserve Bank of St Louis (FRED).	*A*nnual percentages	COMM_PRICES	Global shock or external shock
SA Repo Rate	Statistics South Africa (Stats SA) and the Federal Reserve Bank of St Louis (FRED)	Annual percentages	SA_REPO	Short-term interest rate
Real GDP Growth	Federal Reserve Bank of St Louis (FRED), and World Bank's Development Indicators (WDI)	Annual percentages	RGDP_G	Economic – performance captured as economic growth
Inflation Rate	World Bank's Development Indicators (WDI), the central banks of each of the CMA countries, namely, SARB bulletins, the bulletins from the reserve bank of Namibia (BoN), the CBL (Central Bank of Lesotho), and the reserve bank of Eswatini.	Annual percentages	INF	Annual consumer price index measured as a percentage
Money Supply	World Bank's Development Indicators (WDI), the central banks of each of the CMA countries, namely, SARB bulletins, the bulletins from the reserve bank of Namibia (BoN), the CBL (Central Bank of Lesotho), and the reserve bank of Eswatini.	Annual percentages	MS	M2 definition of money
Lending Rates	World Bank's Development Indicators (WDI), and the Federal Reserve Bank of St Louis (FRED).	Annual percentages	LRATE	Rates charged by commercial banks

The data for all other variables, such as commodity prices (COMM_PRICES), inflation (INF) and money supply (MS), real GDP growth (RGDP_G) and lending rates (LRATE) are found in annual frequencies. Whilst the data for the South African repo rate (SA_REPO), is found in monthly frequencies. Since the SA_REPO data is only available in monthly frequencies, to convert it to annual frequencies like the other variables, a frequency conversion method in E-Views was used. The conversion of

high-frequency data to low frequency is a common procedure in the literature (Elbourne, 2008; Kutu and Ngalawa, 2016).

The variables included in the analysis can be defined as follows:

- The Commodity Prices ($COMM\_PRICES$): This variable represents the global prices of goods and services and contains information about the world's business cycles. According to Kutu *et al.* (2016) the global business cycle is the driver of domestic business activities. Hence the inclusion of commodity prices to control for the global economy's stance, which is likely to influence performance in the CMA. The global commodity prices variable is also included in line with the argument by other authors that it can be utilised as a control variable to mitigate the effect of the prize puzzle (Rossouw and Padayachee, 2020). This variable captures external shocks from the global market. The study incorporates commodity prices to capture external shocks in conformity to the studies of Mallick and Sousa (2013), Kang *et al*. (2020), and Elbourne and de Haan (2006).
- South African repo rate (SA_REPO): The repo rate is a monetary policy instrument for the entire CMA region since South Africa is the leading economy. The repo rate is defined as a short-term interest charged on the SARB's refinancing system. It has been described as a crucial instrument mechanism used by the SARB in implementing monetary policy (Ikhide and Uanguta, 2010; Kasai, 2011). The SA_REPO is included in the study in line with Ikhide and Uanguta's (2010) study.
- The Lending Rates ($LRATE$): This is the rate charged by financial institutions (commercial banks) to lend money to the people in the CMA countries. This variable is incorporated in the model in line with Seleteng (2016) and captures the shock's impact on each member country's economic activity.
- The Money Supply (MS): This is defined as the entire stock of currency and other liquid instruments in the economy (Galí, 2018). It includes cash, coins and other balances held in the form of cheque, savings, and term deposits (Mishkin, 1995). The study utilises the M2, which is the broad definition of money. According to Mohr (2004) the M2 is equal to M1 (small-denomination time deposit, saving deposit and money deposit) plus all other short-term and medium-term deposits of the domestic private sector with monetary institutions.

The M2 includes the narrow definition of money, other deposits and notes and coins plus other deposits under the custodian of the monetary authorities as a monetary policy instrument used by the SARB and central banks of the CMA countries (Van der Merwe, 1999). The inclusion of the M2 definition of money supply as an endogenous variable in this study is in harmony with studies done in developing countries and follows the studies of: Alam (2015), Kashima (2017), Montes and Machado (2013), Ramey (1993), and Seleteng (2016).

- The Inflation Rate (INF): The variable captures the annual consumer price index measured as a percentage. In this study, the Consumer Price Index (CPI) is used as a proxy to capture the rate of inflation in the CMA region (Chimobi, 2010; Kamati, 2020). According to Mohr and Fourie (2011), it is defined as the persistent increase in the general level of prices over time. This variable is incorporated to capture price fluctuations in the CMA region in line with Ikhide and Uanguta's (2010) study.
- Real Gross Domestic Product Growth (RGDP_G): The RGDP_G is the annual rate of increase in total production of goods and services in the CMA countries at constant prices or adjusted for price fluctuations (Kashima, 2017; Ramey, 1993). The RGDP_G, also referred as economic growth, is proxied to capture the CMA economies' performance in line with Kashima's (2017) study.

4.2.2 Estimation Techniques

The theoretical framework, which is derived from the traditional Keynesian view as discussed in the literature review section, helped in clearly describing the process through which SA's monetary policy stance ends up spilling over into LEN economies. The structural analysis of the impact of a shock on the anchor country's main monetary policy tool (SA_REPO) on the performance of CMA countries can be best examined through a panel study which helps limit potential heterogeneities, since CMA countries share many economic similarities. Moreover, Structural Vector Autoregression (SVAR) models whose structural equations are founded on economic theory are well suited for such an empirical analysis (Pedroni, 2013; Kamati, 2020). Hence, the choice in this study to employ a Panel Structural Vector Autoregression econometric technique.

To achieve the set objective, this study pools annual data comprising of six selected variables for the CMA economies. The idea for pooling the annual data using the Panel Structural Vector Autoregression ($Panel - SVAR$) model is rooted in the empirical studies of Manwa *et al.* (2019), Akande (2017) and Kutu and Ngalawa (2016). The Panel-SVAR involves the use of IRFs and variance decompositions to analyse the impact of shocks on the economy. The choice of the $Panel - SVAR$ for this study over other methods was also because it can incorporate or accommodate both exogenous and endogenous variables without compromising the strength of each variable in the model (Lee *et al.,* 2012). In addition, it allows the study to have a large sample size with sufficient degrees of freedom (Torres-Preciado, 2021). Furthermore, Panel-SVAR models rely on theory for sorting out the contemporaneous link between variables in a model. Like the SVAR, Panel-SVAR models are used in monetary and fiscal policy analysis (Famoroti and Tipoy, 2019). The technique allows the imposition of structural restrictions that help to prevent spurious results (Farka, 2009; Akande, 2017). Finally, the $Panel - SVAR$ model is constructed in this study to help capture the dynamic behaviour of all variables in the model in order to give a more efficient estimation of parameters (Kutu and Ngalawa, 2016).

According to Kutu and Ngalawa (2016), the Panel-SVAR is built in a similar way to the Panel-VAR (Panel Vector Autoregression), however the structural restrictions imposed on the $Panel - SVAR$ are the only exception.The structural restrictions in the $Panel - SVAR$ assist it to restrict the attention in the model to rotations that generate shocks, which satisfy an anticipated sign in the reaction of important variables (Kutu *et al.,* 2016). These restrictions aid the IRFs and the variance decompositions in identifying the response of the variables to a shock in another variable in the system. Therefore, this study adds to the literature body by conducting an area study that utilises a $Panel - SVAR$ technique to investigate the impact of monetary policy shocks on the performance of CMA economies.

4.3 SPECIFICATION AND SETTING UP OF THE $Panel - SVAR$ MODEL

The study regresses the $Panel - SVAR$ econometric model using two exogenous variables and four endogenous variables. The endogenous variables included in the model comprise of real GDP growth, lending rates, inflation, and money supply. Whilst

the system treats commodity prices and SA_REPO as two exogenous variables. Assuming the following structural panel equation represents the CMA countries:

$$AY_{it} = G_{i0} + B_1 Y_{it-1} + B_2 Y_{it-2} + \cdots + B_k Y_{it-k} + \delta X_t + W\varepsilon_{it} \quad \text{.....(4.1)}$$

A denotes an invertible $(g \times g)$ matrix illustrating that our model's variables behave or vary contemporaneously; Y_{it} represents a $(g \times 1)$ vector of variables that our model has specified as endogenous in a way that $Y_{it} = Y_{1t,}\, Y_{2t,}\, Y_{3t} \ldots\ldots Y_{nt}$. G_{i0} is a $(g \times 1)$ vector showing countries' intercept terms; i represents country specific variables. B_j is a $(g \times g)$ matrix of coefficients of lagged endogenous variables (for every $j = 1 \ldots . k$); δ and X_t are vectors of coefficients and the exogenous variables successively which capture external shocks; W is a $(g \times g)$ matrix which its non-zero diagonal elements permit for direct implications of other shocks on more than one endogenous variable in the system. Lastly, ε_{it} is a vector of uncorrelated error terms, also referred to as white noise structural disturbances.

However, the first equation of the $Panel - SVAR$, representing CMA economies according to Enders (2008), cannot be estimated directly because matrix A shows a contemporaneous relation on the variables, hence, making the equation inestimable because of feedback effects inherent in the structure. Nevertheless, to estimate the model, the equation is transformed into a reduced form $Panel - SVAR$ as suggested by Enders (2008).

Pre-multiplication of equation (1) by (A^{-1}), which is the inverse of A, gives us the reduced form Panel-SVAR model in standard form as follows:

$$Y_{it} = A^{-1}G_{io} + A^{-1}B_1 Y_{it-1} + A^{-1}B_2 Y_{it-2} + \cdots A^{-1}B_k Y_{it-k} + A^{-1}\delta X_t + A^{-1}W\varepsilon_{it} \quad \text{.....(4.2)}$$

Depicting

$$A^{-1}G_{i0} \; is\; equal\; to\; D_i, A^{-1}B_1 \ldots . A^{-1}B_k = E_i \ldots . . E_k, A^{-1}\delta = \alpha \text{ and } A^{-1}W\varepsilon_{it} = \mu_{it} \text{ ..(4.3)}$$

Therefore equation (4.3) becomes:

$$Y_{it} = D_i + E_1 Y_{it-1} + E_2 Y_{it-2} + \cdots E_k Y_{it-k} + \alpha X_t + \mu_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4.4)$$

Equation (4.1) and equation (4.4) differ because the former is referred to as a primitive or long form $Panel - SVAR$ whereby variables affect each other contemporaneously. Subsequently, the latter is signified as a reduced form $Panel - SVAR$ whereby all the right-hand side variables of the equation are pre-determined at a time (t) and it is named a reduced form Panel-SVAR. In the reduced form $Panel - SVAR,$ no variable affects the other immediately or directly. The error term μ_{it} is a compound of structural shocks in Y_{it} which denotes a vector of endogenous variables for all CMA countries (South Africa, Lesotho, Eswatini and Namibia) at a time (t) (Enders, 2008; Kutu and Ngalawa, 2016).

Equation (4.4) can be rewritten as follows:

$$Y_{it} = D_i + A(L)Y_{it} + K(L)X_t + \mu_{it} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots .(4.5)$$

In equation (4.5), Y_{it} and X_t are $(n \times 1)$ vectors of the CMA countries' endogenous and exogenous variables respectively, denoted as follows:

$$Y_{it} = (LRATE, MS, RGDP\_G, INF) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots .. (i)$$

$$X_t = (COMM\_PRICES, SA\_REPO) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (ii)$$

Moreover, D_i is a vector of constants portraying each member of the CMA's intercept terms, whereas $A(L)$ and $K(L)$ are matrices of polynomial lags capturing the behaviour between endogenous variables and its lags (Herve, 2017; Ziaei, 2013; Kutu and

Ngalawa, 2016). $\mu_{it} = A^{-1}W\varepsilon_{it}$ is a vector of disturbances which can be re-organised as $A\mu_{it} = W\varepsilon_{it}$.

Following Kutu and Ngalawa (2016), equations (4.4) and (4.5) have the same characters since both are reduced form $Panel - SVARs$ extracted from the primitive $Panel - SVAR$ framework of equations (4.1), where all the variables have contemporaneous effects on each other and depict a hypothetical description of the CMA countries.

More so, we proceed further to recover the information in the structural equation by imposing restrictions on A and W system of equations in the matrices framework as:

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ f_{21} & 1 & 0 & 0 & 0 & 0 \\ f_{31} & f_{32} & 1 & f_{34} & f_{35} & 0 \\ f_{41} & f_{42} & f_{43} & 1 & f_{45} & 0 \\ f_{51} & f_{52} & 0 & f_{54} & 1 & 0 \\ f_{61} & f_{62} & f_{63} & f_{64} & f_{65} & 1 \end{bmatrix} \begin{vmatrix} \mu_t^{COMM\_PRICES} \\ \mu_t^{SA\_REPO} \\ \mu_{it}^{RGDP\_G} \\ \mu_{it}^{INF} \\ \mu_{it}^{MS} \\ \mu_{it}^{LRATE} \end{vmatrix} =$$

$$\begin{bmatrix} b_1 & 0 & 0 & 0 & 0 & 0 \\ 0 & b_2 & 0 & 0 & 0 & 0 \\ 0 & 0 & b_3 & 0 & 0 & 0 \\ 0 & 0 & 0 & b_4 & 0 & 0 \\ 0 & 0 & 0 & 0 & b_5 & 0 \\ 0 & 0 & 0 & 0 & 0 & b_6 \end{bmatrix} \begin{vmatrix} \varepsilon_{it}^{COMM\_PRICES} \\ \varepsilon_{it}^{SA\_REPO} \\ \varepsilon_{it}^{RGDP\_G} \\ \varepsilon_{it}^{INF} \\ \varepsilon_{it}^{MS} \\ \varepsilon_{it}^{LRATE} \end{vmatrix} \quad \text{..... (4.6)}$$

In equation (4.6), the matrix on the left side is known as matrix A, which refers to the model's non-recursive restrictions, whereas the matrix on the right side (W) depicts a diagonal matrix. Moreover, the following expressions $\mu_t^{COMM\_PRICES}, \mu_t^{SA\_REPO}, \mu_{it}^{RGDP\_G}, \mu_{it}^{INF}, \mu_{it}^{MS}$ and μ_{it}^{LRATE} are known as reduced-form residuals. In the CMA arrangement, these are disturbances to the foreign and the domestic variables. Given the information of each variable in the system, they further represent unexpected movements; and $\varepsilon_t^{COMM\_PRICES}, \varepsilon_t^{SA\_REPO}, \varepsilon_{it}^{RGDP\_G}, \varepsilon_{it}^{INF}, \varepsilon_{it}^{MS}$ and ε_{it}^{LRATE} are structural shocks inherent in the equations respectively. Non-zero coefficients $(f_{21} - f_{65})$ included in the above

matrices show that variables influence each other instantaneously while 0 indicates a sluggish response or influence.

As shown in both the A and W matrixes, the way variables are ordered is rooted in theory and is based on the variable's arrangement in our identification scheme, i.e. how variables affect each other. The variables are ordered from the most exogenous variable to the least endogenous because international variables are assumed to affect the domestic variables. Moreover, shocks may be propagated from the external or global world to the domestic economies of the entire CMA region (Berkelmans, 2005). As an illustration, our matrix's first row computes the external shock on the CMA depicted as commodity prices ($COMM\_PRICES$). In descending order, $COMM\_PRICES$ is followed by $SA\_REPO,$ as shown in row 2, where South Africa acts as the anchor economy in setting monetary policy in the CMA arrangement. Therefore, South Africa's shocks are deemed to be transmitted to the CMA region and not the other way around, since South Africa serves as a pacesetting economy for the entire region. Given this analysis, the SA_REPO is assumed to respond instantaneously to only the $COMM\_PRICES$ as indicated by f_{21}.

The third, fourth, fifth and sixth rows capture domestic variables of each of the CMA countries. In line with Cheng (2006), the $RGDP\_G$, INF and MS are ordered sequentially to capture their contemporaneous responses. For instance, the $RGDP\_G$ in row 3 responds instantaneously to $COMM\_PRICES$, SA_REPO, INF and MS. The idea is that shocks from the global market can have an adverse effect on the economy. In addition, both inflation and money supply are believed to have an impact on RGDP_G. This is in line with Kamati (2020) and Greenspan (2004), who revealed that prolonged inflation or deflation could negatively affect output.

In the fourth and fifth rows, the terms $f_{41}, f_{42}, f_{43}, and\ f_{45}$ reflect the contemporaneous response of inflation (INF) to $COMM\_PRICES$, SA_REPO, $RGDP\_G$ and money supply (MS), whereas $f_{51}, f_{52}\ and\ f_{54}$ describe the contemporaneous relationship of MS to $COMM\_PRICES$, SA_REPO and INF. This ordering and the contemporaneous responses are in line with Cheng (2006). Eventually, lending rates in the last row (row 6) are assumed to respond immediately to all variables. Ngalawa and Viegi (2011) revealed that commercial bank lending rates are assumed to reflect a contemporaneous response to all the variables in the model. This is so because all

the economic agents are forward-looking as future activity expectations form an essential determinant of credit demand.

4.3.1 Identification of shocks

In this model, shocks have been identified by imposing zero restrictions on the coefficients of matrices A and W, which is depicted in equation (4.6). This study adopts the method highlighted by Kutu and Ngalawa (2016); Akande (2017); and Famoroti and Tipoy (2019) in which the panel framework needs $2n^2 - n(n+1)/2$ or 51 restrictions on both A and W matrices, whilst n represents the number of variables. Since matrix W is a diagonal matrix, 30 exclusion restrictions are imposed on matrix W, while 21 restrictions need to be imposed on the A matrix for the framework to be just identified. Our non-recursive $Panel - SVAR$ imposes 13 zero restrictions on A; therefore, the system is overidentified, and 17 free parameters in the A matrix and 6 in the W matrix must be estimated (see equation 4.6 above).

4.4 REASONS FOR USING PANEL DATA

The choice for panel data is justifiable in our study as it gives our model more degrees of freedom and is more efficient than time series data since it prevents collinearity of variables (Gujarati and Porter, 2009). Pooling cross-sectional data together has the advantage of dynamic adjustment and computing the effects that are not visible in time series (Famoroti and Tipoy, 2019). Another advantage of employing panel data is that it prevents the loss of information. This is because panel data is suitable when a group-wise or regional analysis is required rather than an individual-based investigation (Kim, 2017; Monfort *et al.,* 2003). Moreover, employing panel data is preferable compared to time-series data because in a panel data framework the total number of observations increases. Incorporating panel data also reduces the noise which comes from the individual time series, heteroscedasticity is not an issue in panel data analysis. Peersman and Smets (2001) assert that in a situation where data is not enough for individual analysis, especially in developing countries where data availability is an issue and not enough to fit regressions which use time series data,

panel data analysis is suitable. Finally, panel estimation techniques take into consideration the heterogeneity associated with individual data.

4.5 STATISTICAL TESTS

4.5.1 Nonstationary Data Tests

Rather than carrying out a unit root test for the study, the recommendations of Pedroni (2013) and Kutu and Ngalawa (2016) of estimating SVAR and Panel-SVAR in levels, is adopted in this study. It is argued that using data in levels instead of differencing averts the loss of crucial statistical information (Berkelmans, 2005). The advantage of such an approach is that it gives consistent parameter estimates which can be derived from the natural form of the data. According to Berkelmans (2005), this gives results that are more robust compared to results in a differenced SVAR or Panel-SVAR framework. Furthermore, it is supported that incorporating lag length in SVARs and Panel-SVARs can yield stationary variables even with I (1) variable. This technique has been widely adopted in several studies investigating the impact of monetary shocks on economic performance, for instance Kutu and Ngalawa (2016) and Jawadi *et al.* (2016) utilised the same approach.

4.5.2 Model Lag length

Selecting an optimal lag length is critical because too few lags lead to autocorrelation problems and too many lags reduce the degrees of freedom (Afyouni *et al.,* 2019; Worsley, 2005; Gujarati and Porter, 2009). As stated by Ng and Perron (2001) and Ngalawa and Viegi (2011), the use of a lag length test for the model selection tends to make the values of k too small for unit root tests to retain good sizes and avert distortion. In addition, selecting an appropriate optimum lag length alleviates serial correlation in the residuals (Akande, 2017; Ng and Perron, 2001).Therefore, the process of selecting an optimum lag length when estimating a VAR or SVAR model is crucial (Fragetta, 2010). In line with Alam (2015), this study tests for different criteria for lag selection in choosing an optimum lag length that is suitable for the model. To accomplish this, there are five main procedures popularly employed by researchers: the sequential modified LR test (LR), Akaike information criterion (AIC), Schwarz

information criterion (SC), Final prediction error (FPE), and the Hannan-Quinn information criterion (HQ). Hence in this study, the LR, HQ, FPE, AIC and SC are utilised to select the most suitable optimum lag length. The lowest value of LR, FPE, AIC, HQ and SC is preferred for a model to be well specified and appropriately modelled (Ng and Perron, 2001).

4.5.3 Diagnostic Tests

After choosing the optimum lag for the model, several diagnostic tests comprising of tests for serial correlation, heteroscedasticity and normality are carried out to test for the non-zero mean of the error term and check for the robustness of the Panel-SVAR model. That is, the diagnostic tests implicitly evaluate or test if the regression model has been specified in a correct manner with regards to the regressors incorporated and model robustness. The standard null and alternative hypotheses which are tested for normality test, serial correlation and heteroscedasticity tests are as follows:

$H0: \alpha = 1$, residuals are normally distributed, and there is no serial correlation and no heteroscedasticity.

$H1: \alpha \neq 1$, residuals are not normally distributed, and there is serial correlation and heteroscedasticity.

4.5.4 Block Exogeneity Test

Following the empirical studies of Chimobi (2010) and Sokhanvar (2019), this study conducted a block exogeneity test to provide a more informed exploration of the relationship among the variables in the model. Whilst the repo rate (SA_REPO) changes are dictated by the monetary policy committee from the anchor economy in an exogenous fashion (Seleteng, 2016), global commodity prices (COMM_PRICES) are treated also as an exogenous shock. The test therefore seeks to determine whether the SA_REPO and COMM_PRICES granger cause the economic performance that is economic growth (RGDP_G) of the region. In detail, whether commodity prices (COMM_PRICES), repo rate (SA_REPO) and other variables (such

as INF, MS, LRATE), significantly impact economic performance (RGDP_G) in the CMA economies. The test also examined the direction of causation between the two exogenous variables and economic performance.

The standard null and alternative hypothesis which are tested for block exogeneity tests are as follows:

$H0: \alpha = 1$, No Granger Causality

$H1: \alpha \neq 1$, The null hypothesis is not true

A probability value (p-value) of less than 5% is necessary to conclude that there is granger causality.

4.5.5 Estimating the Panel-SVAR

4.5.5.1 Impulse Response Functions (IRFs)

Impulse response functions (IRFs) are defined as functions that reflect feedback effects in response to a shock introduced in the structural model (Kutu and Ngalawa, 2016; Seleteng, 2016; Seoela, 2020). Introduced first by Sims (1980) in VAR modelling, IRFs can reveal the dynamic interactions between variables. They can show the outcome of structural innovations over chosen variables that are included in a model (Stock and Watson, 2005). In a specified timeframe, IRFs outline the behaviour of a variable following the shock from other variables. In other words, IRFs are employed for assessing the variable's robust responses to innovations in the $Panel - SVAR$ system. IRFs are also known for capturing the impact of a one-unit structural shock to the residual of the response variable incorporated in a VAR or SVAR model (Elbourne and de Haan, 2006). In a bid to reinforce our study, IRFs explain the impact of shocks from the South African repo rate (SA_REPO) on all the selected macroeconomic performance indicators for the CMA countries (Kim, 2017; Kutu and Ngalawa, 2016).

4.5.5.2 Variance Decompositions

According to Famoroti and Tipoy (2019), variance decompositions explain the percentage of a shock on a variable attributed to its innovations or innovations

associated with other dependent variables in the model. In investigating the impact of monetary policy shocks on the performance of CMA countries, variance decompositions assist in assessing the percentage of a shock on each variable (Kamati, 2020).

4.6 ETHICAL CONSIDERATIONS

In this study, the principal investigator or author was sincere in gathering data, analysing the data, and drawing conclusions. The author made sure that the information encapsulated in the study was original, and gave the summary of the work in their original words. The study fully acknowledged the work of other authors included in the study and ensured that they were properly referenced. The study ensured that the quality of the data was inserted into the research. The question the study sought to answer was verified by the research supervisor and confirmed as relevant to this field of study.

4.7 CONCLUSION

The methodology chapter highlighted the econometric model employed in the study to investigate the impact of monetary policy shocks on the performance of CMA economies. The chosen variables in the CMA region were theoretically rooted and were estimated in levels so as to avert the loss of information which is connected to first and second differencing. The optimal lag length selection criteria were also employed for model selection. The diagnostic tests were presented to assess the robustness and suitability of the Panel-SVAR model. The block exogeneity tests were incorporated to assess the relationship among the variables. Finally, the IRFs and variance decomposition present the results of the impact of monetary shocks on the CMA economies.

CHAPTER 5 MODEL ESTIMATION, DISCUSSION OF RESULTS AND ANALYSIS

5.1 INTRODUCTION

Whereas the preceding chapter gave details about the Panel-SVAR framework employed for this study, this chapter presents and discusses the empirical analysis for interpreting the output results derived from the Panel-SVAR analysis. The Panel-SVAR was carried out in levels as a way of circumventing the loss of vital information or distortion that is normally connected with differencing data (unit root test) in a Panel-SVAR. As stated earlier, the study aims to investigate the impact of shocks from the anchor country's monetary policy on the economic performance of CMA economies. In its framework to achieve this objective, the study ordered 6-variables to determine the contemporaneous relationship in the model. The chronological process for the Panel-SVAR estimation approach in this chapter involves the lag length test, the diagnostic tests for serial correlation, heteroscedasticity, and normality. It encapsulates the block exogeneity tests of the variables in the model. It further involves IRFs and the variance decompositions.

5.2 LAG LENGTH TESTS AND SELECTION CRITERIA

The five different lag selection criteria, as discussed in the previous chapter, were employed to allow for adjustments in the Panel-SVAR and the achievement of residuals which are well-behaved. This allowed the study to compare and validate results as well as choosing the best among the lags. Based on table 5.1, the presented results reflect that all five methods, the LR, AIC, FPE, HQ and SC chose an optimal lag length of three (3). Hence, this is adopted for the study. The chosen lag length of 3-lags for the study allows for more accurate and robust results without shortening or widening the estimation sample or compromising the degrees of freedom. This selection of 3-lags is guided by previous studies, such as Frimpong and Oteng-Abayie (2006) and Ren *et al.* (2013), who revealed that it yields more accurate results without compromising the degrees of freedom. The study is further guided by Abrigo and Love

(2016) who used 3-lags in their studies. The next step is to conduct diagnostic tests that test our model's suitability since our lag selection criterion has chosen 3-lags.

Table 5.1: Panel-SVAR Lag Length Test

VAR LAG ORDER SELECTION CRITERIA

Lag	LogL	LR	FPE	AIC	SC	HQ
0	1850.4172	NA	3163.574	25.08672	- 25.20823	-25.13609
1	1086.3526	1455.8552	0.168833	15.24799	-16.09855	-15.59357
2	927.4989	289.7986	0.032170	13.58782	-15.16744	-14.22962
3	756.1072	298.7774*	0.005193*	11.75821*	-14.06687*	-12.69621*

In table 5.1 the lag order selected by the criterion is indicated by an asterisk * and the acronyms of the criteria in the table are described as follows:

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

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

5.3 PANEL- SVAR FRAMEWORK DIAGNOSTIC TESTS

5.3.1 Diagnostic tests

For the study to validate the results from the analysis and prevent the misspecification of the functional form of the model, this section deals with normality tests, serial correlation tests and heteroscedasticity tests so as to check for the robustness and suitability of the Panel-SVAR. The benchmark null hypothesis that is tested for normality, serial correlation and heteroscedasticity tests is as follows:

5.3.1.1 Normality tests

H0: α=1, residuals are normally distributed

H1: α≠1, residuals are not normally distributed

Table 5.2: Panel-SVAR Normality tests

Comp	Skewness				Kurtosis				Jarque-Bera		
	Skew	Chi-sq	Df	Prob	Kurtosis	Chi-sq	Df	Prob	Chi-sq	Df	Prob
1	0.2548	3.1228	1	0.6104	2.6478	4.4021	1	0.7824	4.4024	2	0.6467
2	-0.0742	8.2405	1	0.2918	3.8895	9.5842	1	0.9733	9.5852	2	0.2135
3	0.1568	1.8136	1	0.3217	2.5885	4.4321	1	0.2314	4.2474	2	0.8758
4	-0.9748	4.8065	1	0.8712	1.5536	1.1232	1	0.3215	1.5321	2	0.7865
5	-0.0382	1.9621	1	0.7432	3.3671	7.1324	1	0.4247	7.1802	2	0.6432
6	-2.0256	7.2411	1	0.6942	1.8019	2.0612	1	0.5832	2.0617	2	0.5021
Joint		3.1272	6	0.3410		4.4042	6	0.7453	5.4019	12	0.3429

Table 5.2 reflects the normality test results carried out based on three popular tests which are skewness, kurtosis and Jarque-Bera. The results obtained indicate that at 5% level of significance, all of the variables passed the normality tests at individual and joint levels. As shown in the table, the estimation results and the majority decision show that the residuals are normally distributed, and the data combinations are suitably modelled, indicating that the data distribution and the residuals of the model for all the CMA economies are normally distributed. The null hypothesis that residuals are normally distributed cannot be rejected.

5.3.1.2 Test for Serial Correlation

H0: α=1, there is no serial correlation

H1: α≠1, there is serial correlation

Table 5.3: Serial Correlation LM Test

Null Hypothesis: no serial correlation at lag order h		
Lags	LM-stat	Prob
1	348.5184	0.2137
2	229.2481	0.2712
3	205.3343	0.2431
4	217.0206	0.3126
5	244.3215	0.5391
6	161.7806	0.3128

Table 5.3 shows that at 5% level of significance, there is no serial correlation in the model. It shows that there is not enough evidence to reject the null hypothesis of no serial correlation in the model. Therefore, the alternative hypothesis of serial correlation in the model is rejected.

5.3.1.3 Heteroscedasticity Test

H0: α=1, there is no heteroscedasticity

H1: α≠1, there is heteroscedasticity

Table 5.4: Heteroscedasticity test

Heteroscedasticity joint test		
Null Hypothesis: no heteroscedasticity		
Chi-sq	Df	Prob.
2113.826	504	0.6531

Table 5.4 shows the result for the heteroscedasticity test that was conducted so that it would be possible for the study to decide whether variability of the random disturbance is different across the elements of the vectors. Based on the result, it is therefore confirmed that the model is free from heteroscedasticity.

On the aggregate, the study does not have enough evidence to reject the null hypotheses of normal distribution of residuals, no serial correlation in the model and no heteroscedasticity in the model. Therefore, the results presented indicate that the Panel-SVAR model is suitable to assess the effect of monetary shocks from the anchor country on the economic performance of CMA countries.

5.3.1.4 Block Exogeneity Tests

Table 5.5 presents the result of the block exogeneity test used to assess the association or influence of exogenous variables COMM_PRICES and SA_REPO and domestic variables on economic growth (RGDP_G). Economic growth is treated as a proxy for economic performance. The result further portrays the direction of causation between the two exogenous variables and domestic variables.

$H0: \alpha = 1$, No Granger Causality

$H1: \alpha \neq 1$, The null hypothesis is not true

Table 5.5: Block Exogeneity Tests

	VAR Granger Causality/Block Exogeneity Wald Tests			
	Null Hypothesis: No Granger Causality			
	Dependent variable: RGDP_G			
Excluded	Chi-sq	Df	Prob	Null Hypothesis Conclusion
COMM_PRICES	37.43287	3	0.0000	Reject null
SA_REPO	27.18418	3	0.0001	Reject null
INF	278.7088	3	0.0000	Reject null
MS	77.92017	3	0.0000	Reject null
LRATE	12.73747	3	0.0003	Reject null
All	694.7395	15	0.0000	Reject null
	Dependent variable: COMM_PRICES			
Excluded	Chi-sq	Df	Prob	
SA_REPO	62.33386	3	0.2037	Cannot reject null
RGDP_G	14.54994	3	0.8522	Cannot reject null
aa	19.84473	3	0.9102	Cannot reject null
MS	42.15274	3	0.6120	Cannot reject null
LRATE	60.46580	3	0.7810	Cannot reject null
All	117.4468	15	0.2782	Cannot reject null
	Dependent variable: SA_REPO			
Excluded	Chi-sq	Df	Prob	
COMM_PRICES	11.20028	3	0.6107	Cannot reject null
RGDP_G	30.55871	3	0.2302	Cannot reject null
INF	3.874056	3	0.2754	Cannot reject null
MS	55.64048	3	0.7903	Cannot reject null
LRATE	93.92808	3	0.8791	Cannot reject null
All	694.7395	15	0.5728	Cannot reject null
	Dependent variable:INF			
Excluded	Chi-sq	Df	Prob	
COMM_PRICES	12.66133	3	0.0054	Reject null
SA_REPO	19.37470	3	0.0002	Reject null
RGDP_G	15.40724	3	0.0015	Reject null

MS	5.692426	3	0.0076	Reject null
LRATE	15.36011	3	0.0015	Reject null
All	104.8089	15	0.0000	Reject null
	Dependent variable: MS			
Excluded	Chi-sq	Df	Prob	
COMM_PRICES	15.96759	3	0.0012	Reject null
SA_REPO	29.81778	3	0.0001	Reject null
RGDP_G	139.5838	3	0.0000	Reject null
INF	20.74790	3	0.0000	Reject null
LRATE	35.81602	3	0.0001	Reject null
All		15	0.0000	Reject null
	Dependent variable: LRATE			
Excluded	Chi-sq	Df	Prob	Reject null
COMM_PRICES	8.444694	3	0.0077	Rejet null
SA_REPO	104.1175	3	0.0000	Reject null
RGDP_G	26.99915	3	0.0000	Reject null
INF	3.569559	3	0.0019	Reject null
MS	66.45323	3	0.0003	Reject null
All	321.0115	15	0.0000	Reject null

The p-values less than 5% means that we reject the null hypothesis.

The result therefore shows that when economic growth (RGDP_G) is the dependent variable the null hypothesis of no granger causality is rejected in favour of the alternative hypothesis at 5% level of significance for all variables, both individually and jointly. This result shows that the two exogenous variables (COMM_PRICES and SA_REPO) and other domestic variables, like inflation (INF), money supply (MS) and lending rates (LRATE) granger causes economic growth (RGDP_G) which is a proxy for economic performance of the CMA countries. This is an indication that all the variables in the model significantly impact economic performance (RGDP_G) in the CMA countries.

The block exogeneity test also revealed the direction of causation in that, when COMM_PRICES are the dependent variable the null hypothesis cannot be rejected, showing that all the variables do not granger cause COMM_PRICES individually and

jointly at 5% significance level. Based on the results above the direction of causality between COMM_PRICES and RGDP_G is unidirectional.

The test results further indicated that when SA_REPO is the dependent variable the null hypothesis cannot be rejected, revealing that all variables do not granger cause SA_REPO both individually and jointly at 5% level of significance. Hence the direction of causality is unidirectional between SA_REPO and RGDP_G in the model, which shows that the SA_REPO can indeed be used to predict the future values of economic performance (RGDP_G).

Lastly, the block exogeneity test results table reveals that when inflation (INF), money supply (MS), and lending rates (LRATE) are dependent variables respectively,the null hypothesis of no granger causality cannot be accepted for INF, MS and LRATE. The alternative hypothesis is accepted showing that all variables granger causes INF, MS, LRATE both individually and jointly at 5% level of significance. The conclusion is that a bi-directional causation between INF and RGDP_G, between MS and RGDP_G, and between LRATE and RGDP_G has been observed. However, a unidirectional causation is revealed from COMM_PRICES to RGDP_G and also from SA_REPO to RGDP_G.

This test helped in verifying the importance of global shocks from COMM_PRICES and anchor country monetary policy shocks from the SA_REPO in influencing RGDP_G that is economic performance.

5.4 IMPULSE RESPONSE FUNCTIONS (IRFS)

The main objective of the study was to investigate the impact of monetary policy shocks from the anchor country, South Africa, on the economic performance of the CMA region. To achieve this objective, both the impulse response functions and variance decompositions were employed. As revealed by Sims (1992), the IRFs permit us to trace out on the time path (current and future values) of the variables in our model to a one-unit rise in the current value of one of the VAR errors. This instance helps this study to explain the impact of a one-unit structural shock in the global commodity prices and South African repo rate (SA_REPO) on the selected performance variables

of CMA economies, such as economic growth (RGDP_G), money supply (MS), inflation (INF) and lending rates (LRATE).

Following the view expressed by Berkelmans (2005) that, “the domestic variables are deemed not to affect the international variables (exogenous shocks) and the transmission of international shocks to the domestic economy can be very rapid”, this study focuses on analysing the impact of exogenous shocks on the domestic variables and not the other way around. This strategy is also supported by Kutu and Ngalawa (2016) who revealed that the external variables (shocks) are believed to affect the domestic variables and the domestic variables are not believed to affect the external variables. Therefore, the impact of the two exogenous variables, commodity prices (COMM_PRICES) and SA repo rate (SA_REPO), on the economic performance of the CMA region are examined. The study also examined how the domestic macroeconomic variables contemporaneously or sluggishly affect each other.

The estimated results of IRFs graphs for the two exogenous variables’ effect on the domestic variables are presented under sections 5.4.1 and 5.4.6 while the results of IRFs graphs on how the domestic macroeconomic variables affect each other are presented in sections 5.4.2, 5.4.3, 5.4.4 and 5.4.5 respectively. In line with Seleteng (2016) and Dlamini (2018) so as to explain the impact of a shock using the IRFs graphs, the first three quarters represent the short run whilst the last last quarter demarcates the longrun period. Assuming that a quarter is made up of three years since the study incorporated annual data (Dlamini, 2018).

5.4.1 Impulse Responses of Domestic Variables to Monetary Policy Shocks

The repo rate (SA_REPO) has been presented as a second exogenous variable in the P-SVAR model ordering that captured the impact of monetary policy shocks from the SA economy inline with Seoela (2020). In line with Ikhide and Uanguta (2010), the SA_REPO was treated as an exogenous variable and the anchor country’s main monetary policy tool which captured the impact of monetary policy shocks from SA on the economic performance of the CMA region.

Based on the results shown in figure 5.1, a one standard deviation structural shock from the SA_REPO has a negative impact on real GDP growth (RGDP_G) of CMA

economies. For instance, RGDP_G contracted for the entire periods because of a restrictive monetary policy from the anchor country. Economic growth initially declined and continued to gradually move downwards, and it remained in the negative region for the rest of the years. This finding of the initial decline in RGDP_G is in line with Ayopo *et al.* (2016) and Safitri and Kumar (2014) who revealed that an increase in the short-term interest rate has a negative effect on economic growth. The finding is further in line with Ndikumana (2016) who carried out a study in sub-Saharan African countries on the implications of monetary policy shocks on the economy. It can therefore be concluded that the shocks from the anchor country's monetary policy have a negative effect on the economic performance (RGDP_G) of CMA economies. Previous studies of Kashima (2017) and Kamati (2020) asserted that economic growth (RGDP_G) is a significant indicator of measuring economic performance. Therefore, the findings of the study added to the existing body of knowledge by including the economic growth variable which was not incorporated in Ikhide and Uanguta's (2010) study.

Furthermore, at the earlier stages the monetary policy shocks from the anchor country initially reduce inflation (response of INF to shock SA_REPO). Specifically, a one standard deviation shock in the SA_REPO from the anchor country sharply decreases INF in the beginning years. Thereafter, it gradually picks up before the impact starts to die off in the remaining periods.

The initial fall in inflation (INF) following a shock or an increase in the SA_REPO is in line with economic theory and general expectations, which state that a contractionary monetary policy reduces the inflationary level in the economy (Kumar and Dash, 2020). This finding conforms to Mallick and Sousa (2012) whose study investigated the effects of monetary shocks on emerging economies. Using modern Bayesian methods along with the more sign restrictions approach, they found that a contractionary monetary policy shock reduces inflation in these countries in the short term and stabilises it over a longer period of time. This result shows that the anchor country can effectively use the repo rate as a tool to curb inflation in the CMA region. This is in conformity to the previous findings of Ikhide and Uanguta (2010), which portrayed that changes in the repo rate help the CMA in maintaining price stability.

However, in the CMA region this finding differs from the recent study by Seoela (2020), whose findings revealed that a shock in the SA_REPO increases inflation in all CMA countries which contradicts theory. Seoela (2020) identified their result as an anomaly known as the price puzzle, which pointed out that the policymakers could be setting the interest rate without observing future inflation signals (Rossouw *et al.*, 2014). Despite that Seoela's (2020) study did not incorporate global commodity prices. Other authors suggested that the inclusion of this variable in SVAR models assists in curbing the price puzzle (Kamati,2020; Canova, 2011).

Giordani (2004) also asserts that the forecasting ability of global commodity prices helps to mitigate the price puzzle. Hence, by including global commodity prices this study bridged the literature gap identified in Seoela (2020)'s unconventional result after monetary tightening. This variable can also serve as an information variable which can help the SARB in setting policy rates accurately as opined by the proponents of the Taylor rule (Giordani, 2004). Sims (1992), the first author to comment on the empirical anomaly in VARs which is associated with monetary tightening, verified the use of commodity prices to arrest the price puzzle problem. This study therefore fills the literature gap by including global commodity prices which adds onto Ikhide and Uanguta (2010) and Seoela (2020), whose studies did not incorporate the global variable.

A contractionary innovation to the anchor country's main monetary policy tool, showed that an increase in the SA_REPO resulted in a sharp decline in money supply of the CMA countries at earlier stages. This result conforms to theoretical expectations which assert that money supply decreases after an increase in the short-term interest rate due to the inverse relationship between money supply and interest rates (Ndou *et al.,* 2018). However, findings from past studies in CMA countries indicate that the reaction of money supply after a shock in the repo rate is inconclusive. For instance, Seoela's (2020) study found that money supply increased in Lesotho after a shock in the repo rate. Jian-Ye *et al*. (2006) discovered that there was no significant response in money supply after a shock in the short-term interest rate. Therefore, this result bridges the knowledge gap by assessing the effect of the repo rate on money supply in CMA countries.

Furthermore, the IRFs of lending rates graphically portrays that at the earlier stages a a shock in the SA_REPO sharply increases lending rates. This result conforms to the study carried out by Matemilola *et al.* (2015) on the impact of monetary policy shocks on bank lending rates in South Africa. They revealed that the commercial banks adjust by increasing their lending rates in response to contractionary monetary policy shocks. Based on the results derived from this analysis, it can be concluded that a positive shock or increase in the SA_REPO instantaneously increases lending rates of the banks to their customers in the beginning years in CMA countries. Thereafter, the rate at which banks lend to their customers with good credit gradually trends downwards for the remaining periods, albeit in the positive region. The initial finding at early stages also conforms to theoretical expectations and empirical studies of Mishra *et al.* (2014) and Ndikumana (2016) in sub-Saharan African countries which revealed that a contractionary monetary policy (increase of short term interest rates) increases bank lending rates in the earlier periods of the short-run.

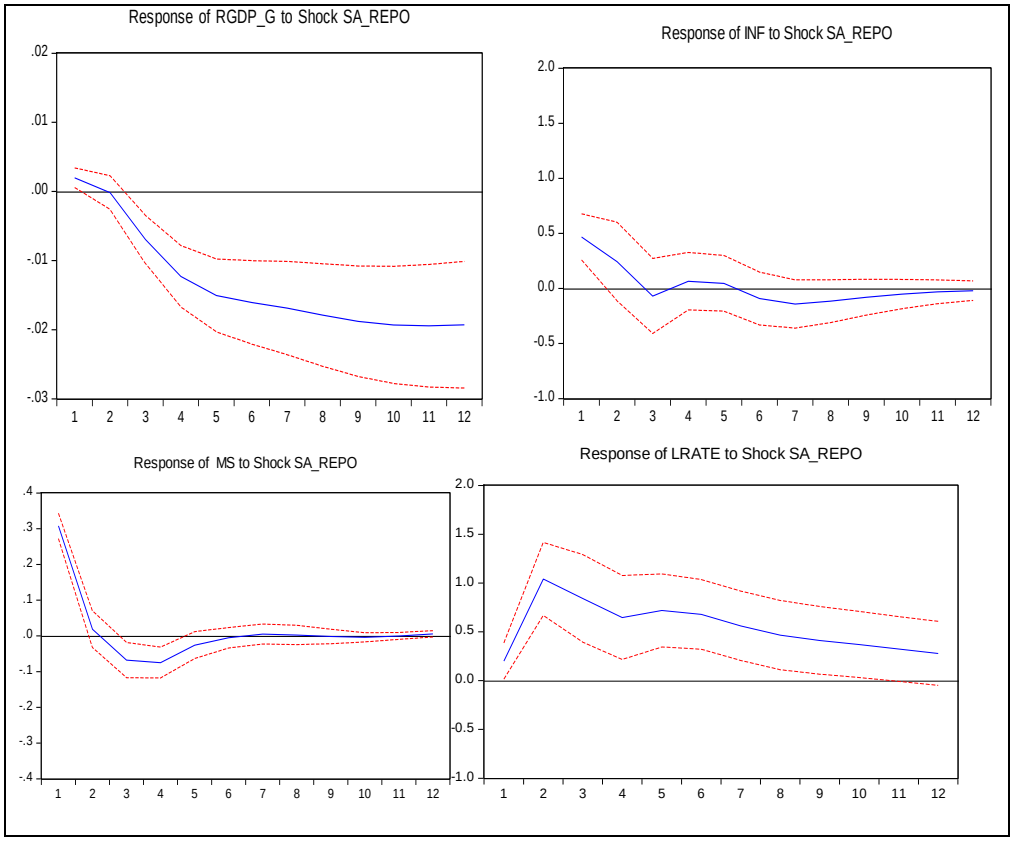


Figure 5.1: Impulse responses of Domestic Variables to Monetary Policy Shocks

5.4.2 Impulse responses of Inflation, Money Supply and Lending Rates to shocks in Real GDP Growth (RGDP_G)

In figure 5.2, the responses of other domestic variables, such as inflation, money supply and lending rates, to RGDP_G shocks are presented. Based on the results derived from the analysis, a structural shock to RGDP_G leads to a sharp increase in the general price level before it trends down steadily and stabilises for the remaining periods. The result at the earlier stages supports the various scholars and the school of thought that, growth causes inflation (Herve, 2017). It is also in line with the empirical findings of Saymeh and Orabi (2013) that revealed a bi-directional causality between economic growth and inflation. According to the study, economic growth causes inflation and vice versa.

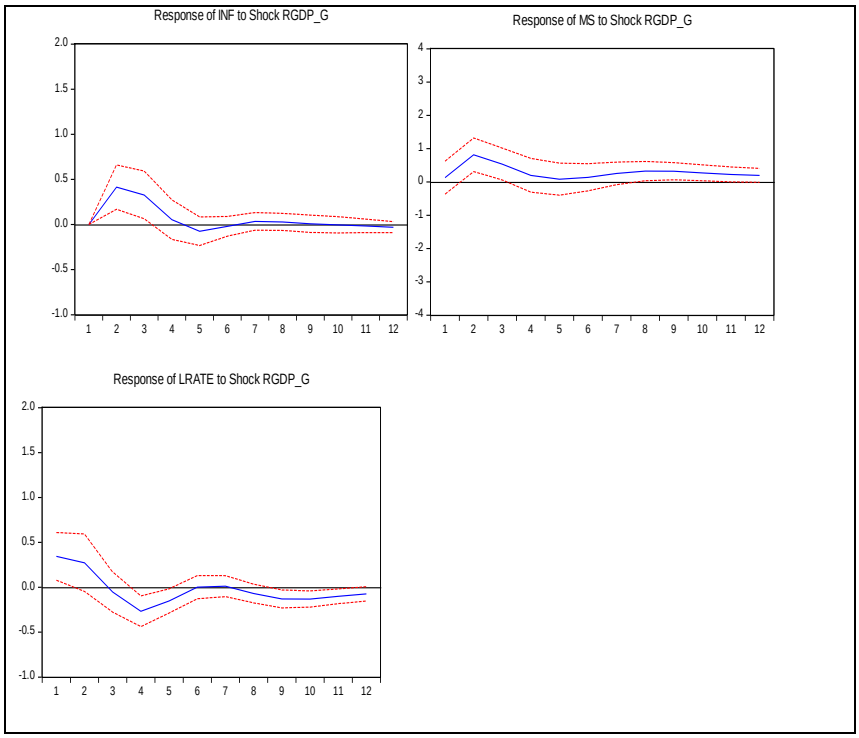


Figure 5.2: Impulse responses of Inflation, Money Supply and Lending Rates to RGDP_G Shocks

Furthermore, after a one standard deviation structural shock is introduced to RGDP_G in the short run period, money supply (MS), as an endogenous intermediate target variable in the model, increases sharply at the earlier stages. Thereafter, it begins to decline steadily and tends to stabilise for the remaining years in the positive region.

The initial result is in line with theoretical expectations which asserts that when there is high economic growth, money supply increases (Nehra, 2015). Dlamini (2018), in a

SVAR framework, observed a different response of an increase in MS after a shock or increase in economic growth, happening after 5 years. However, our finding shows that the increase in money supply occurs in the earlier stages of the short-run. In line with Jian-Ye *et al*.(2006), it can be interpreted that there is a short lag between a shock in economic growth and a change in money supply.

In the same vein, after a shock in RGDP_G the lending rates gradually decline and bottoms out in the short run period. Thereafter, lending rates start picking up until it hits or reaches a stable state and then decrease slightly below the zero-line towards the end of the entire period. The initial decrease in lending rates after a shock in the economic growth in literature conforms to the study of Kamati (2020) in Namibia.

5.4.3 Impulse responses of Real GDP Growth, Money Supply and Lending Rates to shocks in Inflation

Figure 5.3 represents the responses of RGDP_G, money supply and lending rates to a one standard deviation structural shock from inflation (INF). As shown in the figure, inflation expressively retards the economic growth (RGDP_G) of the CMA countries. The figure shows a negative relationship between inflation and RGDP_G. The recent studies by Akinsola and Odhiambo (2017) support that inflation causes retardation in economic growth. Their argument was based on the view that low inflation is a condition necessary for economic growth. This finding conforms to the school of thought which posits that inflationary shocks are detrimental to economic growth (Mallik and Chowdhury, 2001).

On the other hand, a one standard deviation structural shock from inflation in the earlier stages increases money supply. Although it declines gradually thereafter and bottoming out around the short run period. This finding of the initial increase of money supply is in line with Holod (2000), who found strong evidence that money supply increases in response to positive shocks in price level. Finally, there is also a corresponding sharp increase of lending rates to inflationary shocks in the earlier stages. Specifically, due to the shocks from inflation, lending rates initially increase and gradually decline thereafter and bottoms out in the short run period, albeit in the

negative region before it starts picking up. It tends to gradually increase before reaching the steady state level. The initial increase at the earlier stages shows that a shock in inflation tends to increase the cost of borrowing in the early stages in the CMA economies. This conforms to the study by Galí (2018), which posits that inflation initially increases the cost of borrowing in an economy.

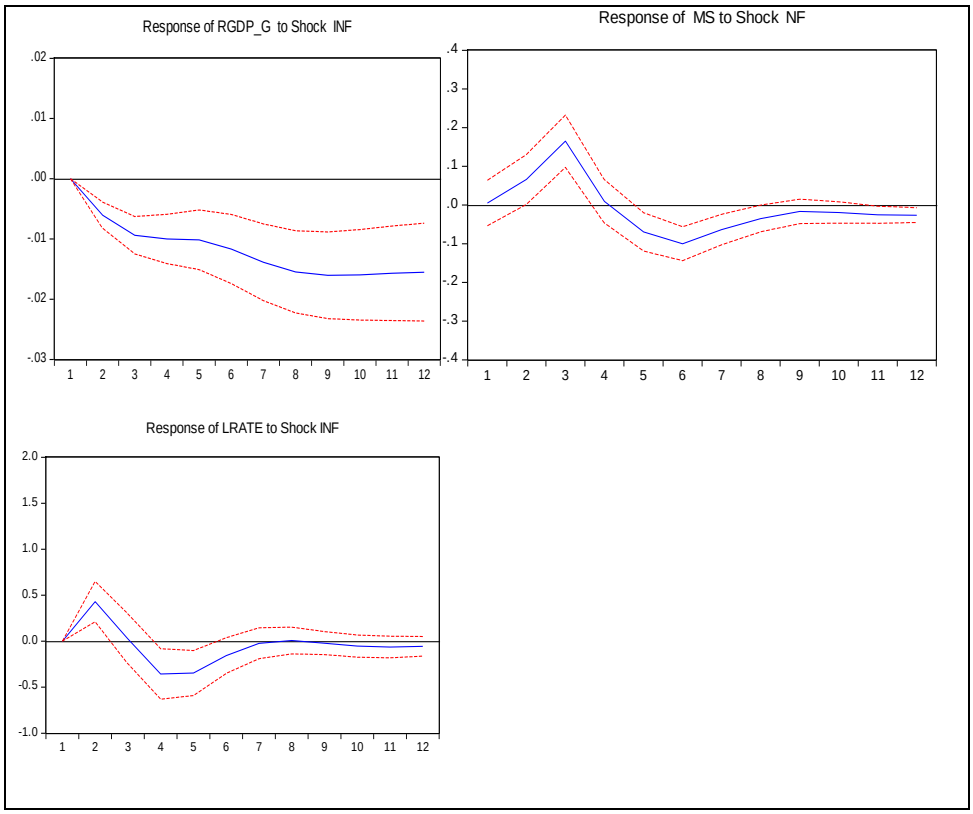


Figure 5.3: Impulse responses of Real GDP Growth, Money Supply and Lending Rates to Inflation Shocks

5.4.4 Impulse responses of Real GDP Growth, Inflation, and Lending Rates to shocks in Money Supply

Given that the pooled money supply for all CMA countries is one of the endogenous variables incorporated in the P–SVAR system, this study investigated its contemporaneous influence on other variables. The study further assessed how innovations in the money supply of the CMA economy affect RGDP_G, inflation, and lending rates in the CMA region. The IRFs graph in figure 5.4 shows that a one standard deviation shock given to money supply initially causes a slight increase in RGDP_G in the earlier stages slightly above the zero-line before it gradually declines

for the remaining periods below the zero line. The initial slight increase in RGDP_G after an increase in money supply conforms to the general theoretical expectations which assert that expansionary monetary policies cause growth in output (Dillner, 2021). Theory also suggests that an increase in money supply reduces the costs of borrowing making loans from banks attractive which increases or incentivises investment and consumer spending thereby ultimately causing growth in output (Jian-Ye *et al.,* 2006).

Furthermore, a shock in the money supply initially leads to a sharp increase in inflation, in the earlier stages. This finding conforms to the theoretical expectations and economic theory which state that an increase in money supply (expansionary monetary policy) leads to an increase in inflation rates (Taylor, 2019). According to Taylor (2019) this connotes to the economic intuition from the quantity theory proponents, which asserts that the price level changes in an economy are proportional to changes in the money stock (Taylor, 2019). In addition, after a one standard deviation structural shock was applied to money supply a slight decline in the lending rates at the earlier stages was observed in figure 5.4. This result is in line with the theoretical assertion which coins that there is an inverse relationship between money supply and short-term interest rates (Mohr and Fourie, 2011). This amplies that an increase in money supply will result in a decrease in lending rates and vice versa.These findings conform to Seleteng (2016) and Saxena (2008).

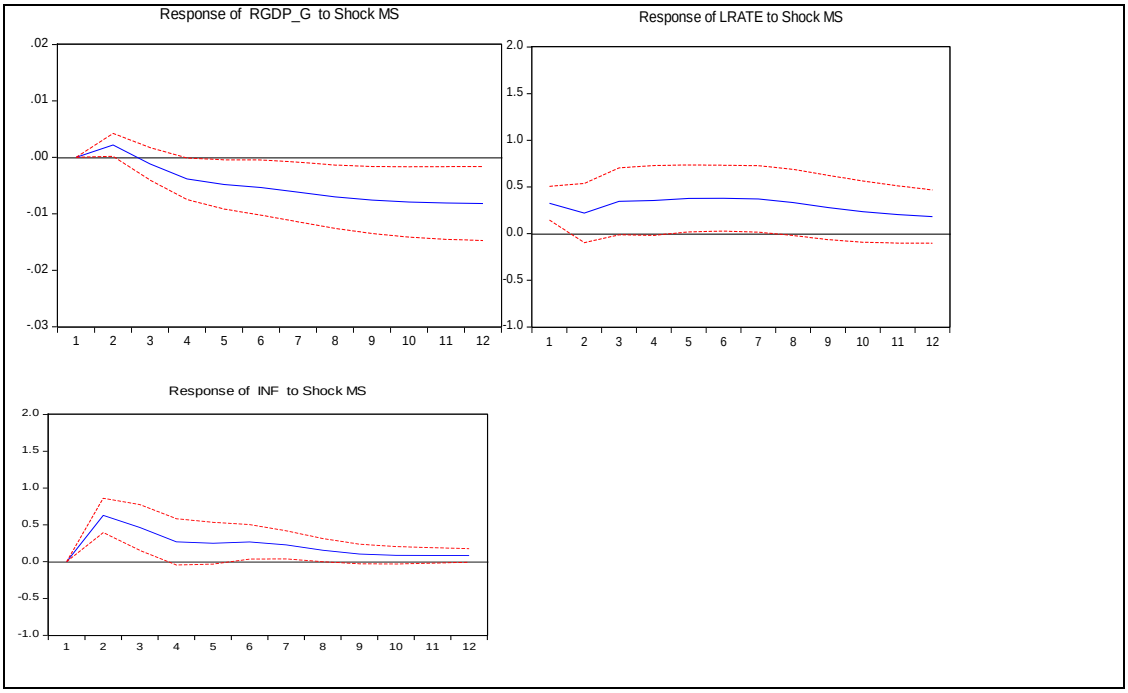


Figure 5.4: Impulse responses of Real GDP Growth, Lending Rates and Inflation to Money Supply Shocks

In conclusion, it can be deduced that the impact of a shock on an endogenous and intermediate target variable, such as money supply, leads to a slight short-lived growth in output which gradually decreases or diminishes for the entire remaining years. Finally, a shock in money supply tends to be inflationary in the early stages. This suggests that in the short-run innovations on money supply are detrimental to the price stability goal in the CMA region since the aim of the leading economy is to maintain inflation within a target band of 3-6%. Hence, as much as the IRFs result reveals that there is a tradeoff between output growth and price stability, economic policy makers in the CMA region must be cautious of the inflationary pressure from expansionary monetary policies (through the indirect influence of money supply).

5.4.5 Impulse responses of Real GDP Growth, Inflation, and Money Supply to Shocks in Lending Rates

Figure 5.5 represents the responses of RGDP_G, inflation and money supply to a one standard deviation structural shock in lending rates. The result in the earlier stages shows that a one standard deviation shock in lending rates drastically decreases

RGDP_G. It then bottoms out within the short run period as it gradually increase steadily thereafter for the remaining years, albeit in the negative region. The reduction in RGDP_G at the beginning years conforms to theoretical expectations which posit that increasing lending rates tends to reduce expenditure because of the increase in borrowing costs (Wang, 2020). According to Wang (2020) this is because high lending rates increase the cost of borrowing, thereby making firms cut off or reduce investment expenditure and consumer spending and ultimately diminishing economic growth in the CMA.

Moreover, in the early stages a shock applied to lending rates revealed a sharp decline and a downward impact on inflation. The economic intuition in the earlier stages of an initial decline in inflation is in line with theoretical and general exepectatons that higher short-term interest rates curb inflationary pressure in an economy (Wulandari, 2012; Seleteng, 2016). Furthermore, a shock introduced to lending rates causes a sharp decline and a downward impact on money supply. For instance, money supply declined in the early stages below the zero-line but subsequently bottoms out in the early stage of the short run, albeit in the negative region and starts picking up thereafter increasing gradually. It then reaches its maximum in the positive region and gradually stabilises albeit with decreasing tendencies slightly above the zero-line. Given this result, lending rates can be used as a measure by policymakers to control money supply in the economy. This view conforms to Umeora (2010). Overall, it can be concluded that a one standard deviation structural shock given to LRATE (increase in the lending rates of commercial banks) had a significant impact on the performance of the CMA region. This conforms to the conventional theoretical assertions of other authors such as Ikhide and Uanguta (2010) and Seleteng (2016).

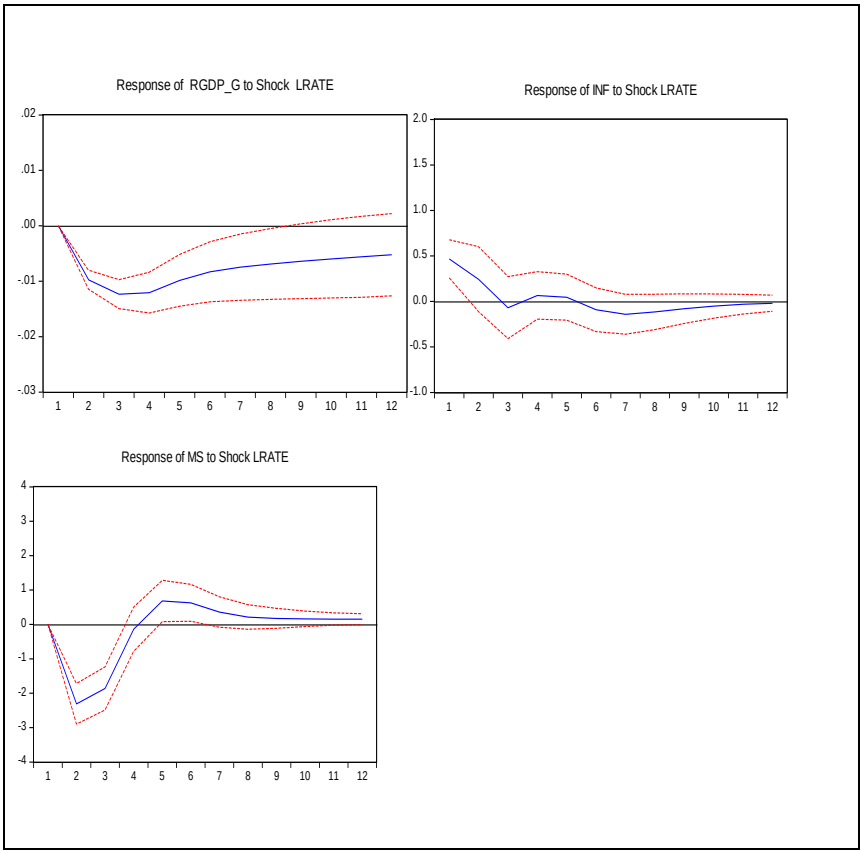


Figure 5.5: Impulse responses of Real GDP_G, Inflation and Money Supply to Lending Rates Shocks

5.4.6 Impulse Responses of Domestic Variables to Commodity Price Shocks

Figure 5.6 represents the impulse responses of real GDP growth, inflation, money supply and lending rates to a one structural standard deviation shock in global commodity prices.

The IRF graph showing the response of RGDP_G to a shock in COMM_PRICES revealed that in the earlier stages a one standard deviation shock in global COMM_PRICES initially leads to a slight decrease in RGDP_G. Thereafter, there is a slight short-lived increase and gradual decrease before it becomes stable for the remaining years. The conclusion is that in the initial stages an external shock from COMM_PRICES reduces RGDP_G.

The economic intuition and recommendation derived from the revealed short-lived decrease in RGDP_G following a shock in COMM_PRICES is that the CMA countries must be cautious of off setting forces from global commodity price shocks. Thereafter, an increase before a gradual decrease with stabilising tendences commenced was also observed in the early stages. This short-lived slight increase might be connected to the fact that the CMA countries traded more among themselves rather than with the outside world. In addition, it might be connected to the fact that the region is a small open economy that may not fully target global export production but liberalises and prefers intra-regional trade. Hence, their inability to reap the maximum benefits or take advantage of an increase in global commodity prices. These views are in line with the findings revealed by Wei and Lahiri (2019) on the impact of global commodity prices in a trading bloc. Mapuva (2014) and Mlambo (2019) also highlighted the effect of global prices on the challenges and prospects for regional integration among the SADC countries.

Moreover, the shocks from commodity prices led to an initial sharp decline in the general price level or inflation (INF) which bottoms out around the short run period. It was observed that domestic prices (inflation) start trending upwards or picking up thereafter and tend to stabilise, albeit with decreasing tendencies until it reaches its steady state level. The economic intuition deduced from the initial result portrays that at an earlier stage of the short-run period global commodity prices significantly reduces inflation in the CMA.

The introduction of a one standard deviation shock on commodity prices also showed that in the earlier stages there is not much noticeable reaction in money supply, albeit in the negative region.

Furthermore, the lending rates also shows a sharp decline in the earlier stages after a one standard deviation shock is applied on commodity prices. However, lending rates gradually trend upwards until it hits its steady state level. Overall, it can therefore be inferred that innovations in global commodity prices had both positive and negative impacts on the macroeconomic performance of the CMA countries.

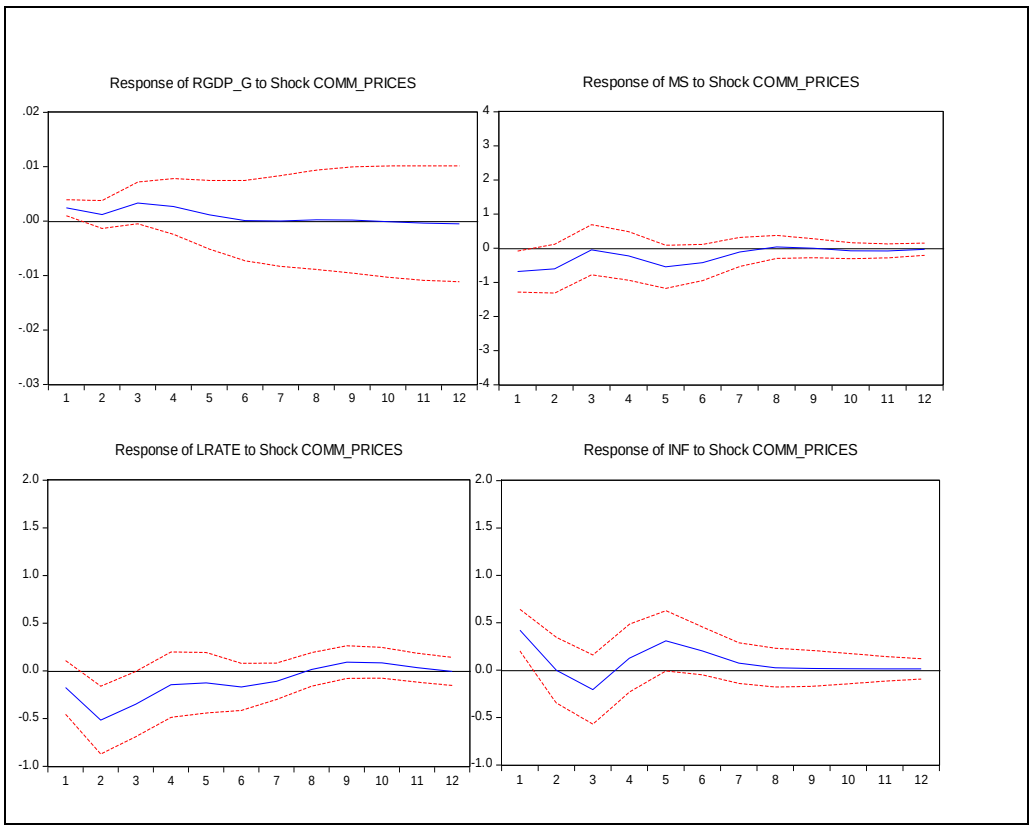


Figure 5.6: Impulse responses of Domestic Variables to Commodity Price shocks

5.5 ANALYSIS OF VARIANCE DECOMPOSITIONS

The variance decomposition reports what proportion of a shock or innovation to a specific variable is associated with its own shock or those of other variables in the model over a given period of time (Kamati, 2020). Herve (2017) highlights the importance of a shock in revealing the variations among the variables. First, it helps in

validating the results from IRFs. Secondly, as related to this study, the variance decomposition assists in determining the relative percentage of shocks to all the variables in assessing the real impact of monetary policy shocks of the anchor country on the economic performance of the CMA countries. Lastly, it will further help to reveal the significant impact of the external shocks on the domestic variables in the model. Tables 5.6 to 5.11 are extracted from the full sample variance decomposition results of all the variables which show the short-run and long-run contributions of shocks of all the variables in the model. The maximum lag proposed by the information criterion is a lag length of three (3). In line with the IRFs, this study adopts a maximum sample of 12 periods (years) in the variance decomposition analysis. The 12 periods connote 12 years since we are using annual data. To determine the impact of shocks when variables contemporaneously influence others, and for uncomplicated interpretation, these 12 years are separated into four-time frames or quarters (3yrs, 6yrs, 9yrs and 12yrs). In line with Kaboro *et al.* (2018) the first three quarters represent the short-run, and the peg of 12yrs demarcates the long-run period.

5.5.1 Variance Decomposition of Commodity Prices

Table 5.6 depicts the variance decomposition of global commodity prices and shows the various contributions of each of the variables in the model. Based on the results, it was revealed that the contribution of money supply (MS) shocks to commodity prices remained insignificant for the entire periods. For instance, the contributions attributed to money supply varied from 0.184% in the first period, 0.328% in the second period, 0.345% in period three and 0.342% in the fourth period respectively. Other variables in the model, such as the South African repo rate (SA_REPO), real GDP growth (RGDP_G), inflation (INF) and lending rates (LRATE), accounted for tiny variations in commodity prices. Specifically, the contribution of the SA_REPO ranged from 1.492% in the first period to 3.150% in the second period, 2.157% in the third period and 2.086% in the fourth period respectively. The commodity price shocks (COMM_PRICES) accounted for the highest variations to its own shocks ranging from 94.073% after the first period to 92.556%, 89.489% and 89.164% in periods two, three and four, respectively.

The shocks from the real GDP growth (RGDP_G) and inflation (INF) persistently accounted for tiny increasing contributions to the variations in commodity prices. The increasing contribution from RGDP_G ranged from 0.951% in the first period to 3.041% in period four. Similarly, shocks from INF accounted for about 1.646% in the first period to around 3.638% in the fourth period to explain the variations in commodity prices.

Lending rates, on the other hand, accounted for 1.654% fluctuations in commodity prices in the first period, 0.130% in the second period, 2.934% in the third period and 1.729% in the fourth period. Given the above contributions from each of the variables in explaining the variations in commodity prices, it can therefore be concluded that global commodity prices accounted for the major contribution to its own shocks while the contributions from other variables were marginal or very small. This result is consistent with the apriori expectations, and the assertion that shocks are propagated from the global market to the CMA economy and not in reverse. The reason can be linked to the fact that the CMA economy is a small, open market economy that cannot strongly affect the global market economy.

Table 5.6: Variance decomposition of commodity prices

Period	Standard Error	Shock COMM_PRICES	Shock SA_REPO	Shock RGDP_G	Shock INF	Shock MS	Shock LRATE
3	0.128	94.073	1.492	0.951	1.646	0.184	1.654
6	0.149	92.556	3.150	1.834	2.002	0.328	0.130
9	0.182	89.489	2.157	2.614	2.461	0.345	2.934
12	0.198	89.164	2.086	3.041	3.638	0.342	1.729

5.5.2 Variance Decomposition of South African Repo Rate

Table 5.7 illustrates the SA_REPO variance decompositions. The table explains that in the first period, both inflation and real GDP growth shocks did not significantly account for the variations in the SA_REPO. Furthermore, other variables such as money supply, lending rates and commodity prices also contributed marginal proportions towards the variations in SA_REPO. Jointly, money supply, lending rates

and commodity prices accounted for about 4.204% while SA_REPO shocks accounted for about 95.649% of its own shocks in the first period. In the second, third and fourth periods, SA_REPO continued to account for much of the variations in its own shocks. The marginal contribution of commodity prices of 1.269% in the first period and 1.786%, 2.758%, 1.972% also from the second to the fourth periods in that order shows that external shocks cannot affect the monetary policy tool of the anchor economy. This corresponds with the apriori expectations as SA_REPO is exogenously determined by the SARB.

During similar periods (that is period two to period four), an inflation shock accounted for 1.147%, 1.164% and 2.019% respectively, while a money supply shock accounted for 1.621%, 1.660% and 2.197% in explaining the variations in SA_REPO shocks. The small contributions of both inflation and money supply might be connected to the fact that they are target variables that are indirectly influenced by monetary authorities. In addition, from the second period to the last period lending rates also contributed small proportions to variations in SA_REPO. For example, lending rates shock contributed 2.074%, 2.702% and 2.893% in that order. The real GDP growth shock did not contribute significantly in the second period to the variations in SA_REPO. However, a small proportion of the variations in the SA_REPO were attributed to RGDP_G shock in the third and fourth periods. Specifically, marginal contributions of about 2.617% and 1.457% were attributed to the shocks in RGDP_G in the third and fourth periods in explaining the variations in SA_REPO. The above contributions from each of the variables in explaining the variations in SA_REPO reflect that the repo rate accounted for the major contribution to its own shocks while the contributions from other variables were marginal. This result is also consistent with the apriori expectations, and the assertion that monetary shocks from SA are propagated to the CMA economy and not the other way.

Table 5.7: Variance decomposition of SA_REPO

Period	Standard Error	Shock COMM_PRICES	Shock SA_REPO	Shock RGDP_G	Shock INF	Shock MS	Shock LRATE
3	0.320	1.269	95.649	0.070	0.077	1.520	1.415
6	0.438	1.786	92.821	0.551	1.147	1.621	2.074
9	0.562	2.758	89.099	2.617	1.164	1.660	2.702
12	0.636	1.972	89.462	1.457	2.019	2.197	2.893

5.5.3 Variance decomposition of Real GDP Growth

Table 5.8 reflects the contribution of all variables included in the framework to the variations in real GDP growth. The real GDP growth or real economic growth (RGDP_G) captures the economic performance of the CMA countries. Therefore, the table reveals how a shock in each of the variables contributes to the fluctuations of the economic performance of the CMA region.

Based on the results derived, it was revealed that shocks from the anchor country's primary monetary policy tool account for the highest variations in RGDP_G. Specifically, the SA_REPO shock accounts for 54.534%, 54.021%, 47.510% and 45.356% in the first, second, third and fourth periods in explaining much of the variations in the economic performance of the CMA region. These contributions from the anchor country's monetary policy shocks are an indication that the monetary policy instrument that is the SA repo rate is effective in contributing to changes in the economic growth of the region. This result corresponds with the one derived under the IRFs. In addition, an inflationary shock also contributes significantly to the variations in RGDP_G from the first period to the fourth period. Specifically, a shock in inflation contributed 3.234%, 2.886%, 4.470% and 3.554% after the first, second, third and fourth periods respectively in explaining the variations in RGDP_G. This is an indication that prices stimulate changes in growth of output in the CMA region. This result conforms to the one derived under the IRFs.

Moreover, both money supply shocks and lending rates shocks showed a small contribution in explaining the variations in the economic performance of the CMA region. Specifically, the results reveal that money supply shocks contribute 1.395%,

1.775%, 2.681% and 3.636% respectively from the first period to the fourth period in causing variations in RGDP_G. Whilst, in the similar periods lending rates accounted for 1.515%, 1.328%, 2.972% and 2.712% in explaining changes in RGDP_G. Lastly, apart from its own shocks which accounted for 31.904%, 30.759%, 36.078% and 38.578% after the first, second, third and fourth periods in that order, the shock from the global commodity prices also contributed significantly in explaining the changes in economic performance (RGDP_G) of the CMA countries. In the first period commodity prices contributed 7.418%, whilst 9.231%, 6.289% and 6.164% from the second period to the fourth period respectively were attributed to it in causing changes in RGDP_G.

This is expected as global shocks are always deemed to impact the domestic economy and not the other way around. Hence, determining that the findings of this study are rooted and supported by both empirical and theoretical review. Therefore, as a policy recommendation in the short-run, the region should be cautious of external shocks and formulate a policy capable of protecting or cushioning the adverse effects of global shocks as well as shocks from the anchor country's monetary policy.

Table 5.8: Variance decomposition of real GDP growth

Period	Standard Error	Shock COMM_PRICES	Shock SA_REPO	Shock RGDP_G	Shock INF	Shock MS	Shock LRATE
3	0.513	7.418	54.534	31.904	3.234	1.395	1.515
6	0.684	9.231	54.021	30.759	2.886	1.775	1.328
9	0.780	6.289	47.510	36.078	4.470	2.681	2.972
12	0.983	6.164	45.356	38.578	3.554	3.636	2.712

5.5.4 Variance decomposition of Inflation

Table 5.9 represents the variance decompositions of inflation spanning from the first to the fourth period. This table shows that all the variables in the model significantly contribute to the factors responsible for explaining the variations in the general price level in the CMA countries. Basically, apart from its own shocks, the two exogenous variables account for the highest shocks that cause changes to inflation in the CMA region. For example, a shock in global commodity prices increasingly accounts for

11.502%, 26.488%, 29.987% and 30.376% in the first, second, third and fourth periods respectively. This consistent increase for the entire periods is an indication that a shock from commodity prices causes changes to inflation in the CMA region. Hence, it can be concluded that external shocks contribute in influencing the price stability of the CMA countries.

The significant contribution of the SA_REPO in the entire periods is also an indication that the anchor country's monetary policy shocks contribute to explaining the variations in inflation. It is also an indication that the anchor country's monetary policy instrument is effective in reducing the variations in inflation in the region. This result corresponds with the IRFs presentation which showed that an increase in the SA repo rate significantly causes a change in inflation in the CMA economy. The shocks from money supply and lending rates, on the other hand, show a further significant contribution in explaining the variations in the general price level. The contributions of these two variables, lead to some changes in inflation. That is, an increase in money supply leads to an increase in inflation. This result conforms to the IRFs result and it is in line with theoretical expectations.

In a related development, lending rates shocks increasingly contribute to the variations of inflation ranging from 3.133% in the first period to 3.629% in the fourth period. This result conforms to theory and past empirical studies. Since lending rates is one of the variables that is indirectly influenced by monetary authorities, its increase or decrease has a significant effect on inflationary rates in the CMA economy. For instance in the CMA an increase in lending rates reduces inflationary pressure. An increase in the lending rates increases the cost of borrowing, which reduces spending and also, diminish the total money in circulation, and hence, decrease inflation, and vice versa (Kashima, 2017). Finally, real GDP growth contributes significantly to the variations that are explaining the changes in inflation. As the economy is growing, inflation rates also are believed to increase (Wang,2020). This is the view expressed by the monetarists that growth causes inflation, and inflation causes growth (Wang, 2020).

Table 5.9: Variance decomposition of Inflation

Period	Standard Error	Shock COMM_PRICES	Shock SA_REPO	Shock RGDP_G	Shock INF	Shock MS	Shock LRATE
3	0.927	11.502	10.488	6.581	65.411	2.885	3.133
6	0.311	26.488	8.417	5.671	53.592	2.331	3.501
9	0.411	29.987	8.194	5.443	50.545	2.222	3.609
12	0.456	30.376	8.376	5.655	49.797	2.167	3.629

5.5.5 Variance decomposition of Money Supply

Table 5.10 indicates the variance decompositions of money supply. Similar to what was obtained under the variance decompositions of real GDP growth, the results in the table revealed that the shocks from the anchor country's monetary policy instrument (SA_REPO) account for the highest variations in money supply, followed by its own shocks. Precisely, the SA_REPO shock accounts for 38.691%, 37.021%, 36.667% and 36.263% in the first, second, third and fourth periods in explaining much of the variations in the quantity of money supply in the CMA region, while money supply shocks account for about 36.158%, 33.070%, 31.980% and 31.283% of its own variations over the same periods. The contributions from the anchor country's monetary policy shocks are an indication that the monetary policy instrument (SA_REPO) is effective in influencing money growth in the region. This means that an increase in the SA_REPO significantly causes the variations of money supply (i.e. reduce money supply) as also indicated by the IRFs graph.

An inflationary shock also contributes tremendously to the variations of money supply across the four periods. This ranges from 6.257% in the first period to 6.066% in the second period, 6.240% in the third period and 7.218% in the fourth period, respectively. This is an indication that changes in prices stimulate changes in the growth of money supply in the CMA region. This result conforms to the one derived under the IRFs which revealed that in the short-term a shock in inflation significantly causes changes in money supply.

Lending rates and real GDP growth also contribute significantly to the variations of money supply for the entire periods. The tremendous impact of lending rates on money

supply conforms to past empirical studies like Borio and Gambacorta (2017) and Altavilla *et al*. (2018). The authors assert that lending rates determines changes in the demand for bank loans (loanable funds) which ultimately affects changes in the money supply in the economy. This is because, commercial banks create money through loans (Altavilla *et al*., 2018). The IRFs results showed that there is an inverse relationship between lending rates and money supply. Finally, the contribution of real GDP growth shocks to the variations of money supply is in line with growth theory that an increase in real GDP growth will lead to a significant impact on money supply (Kashima, 2017). This result also corresponds with the one derived under the IRFs.

Table 5.10: Variance decomposition of Money Supply

Period	Standard Error	Shock COMM_PRICES	Shock SA_REPO	Shock RGDP_G	Shock INF	Shock MS	Shock LRATE
3	0.025	1.098	38.691	8.802	6.257	36.158	8.994
6	0.393	2.025	37.021	8.075	6.066	33.070	13.743
9	0.486	3.636	36.667	7.995	6.240	31.980	13.482
12	0.548	3.664	36.263	8.292	7.218	31.283	13.280

5.5.6 Variance decomposition of Lending Rates

Table 5.11 denotes the contribution of commodity prices, SA repo rate, real GDP growth, inflation and money supply to the variations in lending rates. The table reveals how a shock in each of the variables contributes to the fluctuations of the lending rates in the CMA countries. Based on the results derived, it is observed that a shock from the SA_REPO accounts for the highest contribution to the fluctuations in lending rates across the entire periods. For instance, it shows a 74.654% contribution to the variations in lending rates in the first period. In the second period, it shows approximately 72.536%, and then 65.656% in third period and finally about 66.320% in the fourth period. This result agrees with the results from IRFs, and previous findings showing that any monetary policy adopted by the monetary authorities in the anchor country will initially cause an immediate significant change in the lending rates of all the CMA countries (Seleteng, 2016). This is also in line with the view expressed by

Matemilola *et al*. (2015) who revealed that commercial banks immediately adjust their lending rates in response to monetary policy shocks.

At the same time, the global shocks, as captured with commodity prices, have a significant impact on the lending rates of the CMA region. In the first period, the result revealed that the shocks from global commodity prices account for a 9.524% variations in lending rates. In the second, third and fourth periods, the shocks from global commodity prices account for about 10.050%, 9.521% and 8.819% respectively in the variation of lending rates. This confirms the impact of global shocks on the domestic economy, and it is an indication that shocks are rapidly spread to the domestic market from the global market.

The table further reveals that lending rates' own shock accounts for about a 12.431%, 10.867%, 14.240% and 12.641% variation in its own shocks in the first, second, third and fourth periods respectively. Real GDP growth shock on the other hand contributes to the variations of lending rates only in the second, third and fourth periods. In a similar way, inflation shocks contribute to the variations of lending rates in the second, third and fourth periods.

Finally, a shock in money supply accounts for about 2.493%, 1.509%, 2.124% and 3.040% of the variations in lending rates for periods one, two, three and four, respectively. Given the above scenario and the various contributions from each of the variables, it can therefore be concluded that the shocks from SA_REPO account for the largest proportion of the fluctuations of lending rates in the CMA countries. This shows the effectiveness of monetary policy on lending rates. Hence, as a policy recommendation, the monetary authorities should be cautious of the types of policy formulations as well as implementing policies that will be more effective in stimulating bank lending rates growth in the CMA countries.

Table 5.11: Variance decomposition of Lending Rates

Period	Standard Error	Shock COMM_PRICES	Shock SA_REPO	Shock RGDP_G	Shock INF	Shock MS	Shock LRATE
3	0.316	9.524	74.654	0.523	0.375	2.493	12.431
6	0.439	10.050	72.536	1.868	3.170	1.509	10.867
9	0.558	9.521	65.656	2.534	5.925	2.124	14.240
12	0.627	8.819	66.320	3.325	5.855	3.040	12.641

5.6 CONCLUSION

The main aim of this study, as identified in chapter one, has been to investigate the impact of shocks from the anchor country's monetary policy on the economic performance of CMA economies. This chapter presented the Panel-SVAR methodology's estimated results used to analyse the policy shocks and interpreted the generated results. Before the Panel-SVAR model's estimation, the lag length tests were conducted along with the different residual diagnostic tests, such as the serial correlation, heteroscedasticity, and normality test. The study also conducted block exogeneity tests.

Furthermore, the analysis of the impulse responses and the variance decompositions generated from the estimated results was presented. Although the Panel-SVAR was estimated in levels, the lag order selection criteria were employed to select the optimum lag length. The lag length results chose lag 3 for the optimum lag. The results from the block exogeneity tests when SA_REPO and COMM_PRICES are treated as exogenous shows that all variables in the model have a significant impact on economic growth, which is a proxy for economic performance in the CMA. The results from the impulse response analysis and the variance decomposition indicate that the global shock has an effect on the CMA economies. In addition, the one standard structural shock from the SA_REPO has a significant negative impact on the economic performance, that is economic growth (real output growth), of the CMA countries. For instance, the real GDP growth contracted for the entire periods because of restrictive monetary policy from the anchor country. Therefore, the results derived from both the IRFs, and the variance decomposition are acceptable, and in many cases, reveal

standard results. The findings derived from the diagnostic tests confirm that the Panel-SVAR is suitable and consistent and does not face the threat of non-normality, or of serial correlation of the residual or of heteroscedasticity.

CHAPTER 6 FINDINGS, RECOMMENDATIONS AND CONCLUSION

6.1 SUMMARY OF THE STUDY

Monetary policy is instrumental and plays an important role in stimulating economic performance indicators, such as real output (RGDP) growth, and stabilising prices in the economy. The CMA countries, also referred as the LENS, have pegged their currencies to the ZAR or the South African Rand. This implies that CMA countries have partially surrendered their rights of operating an independent monetary policy system to form a monetary union, led by South African monetary authorities. This study investigated the impact of shocks from the anchor country's monetary policy on the economic performance of CMA economies. The study covers six chapters beginning with chapter one that introduced the study.

In chapter one, the background, aim and objectives, problem statement and significance of the study were specified. The study gives justification for why there is a lack of monetary policy autonomy on the part of LEN countries and the absence of a joint central bank for policy coordination might increase their vulnerability to adverse shocks. Hence, it became imperative to investigate the impact of monetary policy shocks on the entire CMA.

The study went a step further in chapter two to review the theoretical literature and empirical studies which underpin the study. This includes taking account of the criticism of the theories which form the bedrock of the study. The theory in which this study is rooted is the Keynesian theory. The Keynesian theory helps in validating the theoretical framework, which is constructed from the traditional Keynesian theory. Moreover, the chapter reviews empirical studies, both in developing and developed countries on the impact of monetary shocks on economic performance. The empirical studies also helped us in identifying the research gap which was filled by this study. The incorporation of the real GDP growth variable as an important indicator of economic performance, differentiates this study. The empirical studies conducted also helped us to inform and validate the methodology chosen in the succeeding chapter.

Chapter three dealt with the historical background and formation of the CMA countries' currency union. The chapter also dealt with a comparison of the CMA with other fully-developed monetary unions. The chapter discussed the performance variables included in the study and concluded with a brief discussion on the monetary policies in the CMA region.

Chapter four factored in the Panel-SVAR methodology employed in the study. This chapter outlined the research approach and design. It went on to describe the sources of data collection and gave a justification for using panel data. In the chapter, the econometric technique and statistical tests used to answer the research aims and objectives were properly discussed and justified.

Chapter five discussed the results of the lag length selection tests that were carried out. The chapter went on to interpret the results of the other statistical tests, such as the diagnostic tests and block exogeneity tests. The estimated results from the IRFs and variance decompositions were also interpreted and discussed in an attempt to answer the objectives of the study.

Conclusively, chapter six summarises up the major findings of the study. The whole essence of this chapter is to enlighten policymakers regarding matters arising from unanticipated monetary policy shocks on the performance of CMA economies.

6.2 KEY FINDINGS

Given that members of the CMA have partially surrendered their rights for independent monetary policy formulation because of the agreement, interest rates and other variables in these countries tend to co-move in the same direction with those of SA. This implies that the SA_REPO, which is a key policy tool of monetary policy, also becomes a driver of monetary policy for the rest of the CMA region. The ripple effect of such a monetary relationship in the CMA economies is that an unanticipated change in the SA_REPO is expected to significantly affect the performance of the entire CMA region. However, the impact of South Africa's unanticipated monetary policy shock has remained unresolved, especially in the CMA economies. While some studies revealed a positive impact of monetary policy shocks on the economy, others revealed a negative impact. Based on these divergent views, it is vital to carry out a study

concerning the impact of monetary policy shocks on economic performance in the CMA countries. This is because, such a study will play a pivotal role in assisting monetary authorities in designing effective monetary policy in the CMA region.

The extensive review of the existing body of literature revealed that, in the CMA region, there are few studies that have been conducted compared to other monetary unions in other developing and developed countries, which have assessed the implications of the anchor country's monetary policy shocks on another country. The major findings derived from this study suggest that a monetary policy shock (unexpected or temporary increase) in the South African repo rate (SA_REPO) has a significant and negative effect on the economic performance (real GDP growth) of CMA countries. The findings further reveal that the anchor country's restrictive monetary policy causes the real GDP growth to contract in the short-run.

Since the unexpected increase or shock in the SA_REPO seems to have a negative effect on the economy, shocks from the anchor country can be concluded to have a negative impact on the CMA economies. These results revealed that if policies are not implemented to cushion or offset this negative impact on regional economic growth (real GDP growth), the performance of the CMA region might continue to worsen. Furthermore, shocks from the anchor country's monetary policy were observed to drastically reduce inflation in the short-run. Hence, restrictive monetary policy will assist in reducing inflation and stabilising prices in CMA countries.

These findings show that the effect of restrictive monetary policy (increase in the SA_REPO) from the anchor country on the economic performance of the CMA region is stronger and more effective than an expansionary monetary policy (indirect increase of money supply). These findings are in harmony with Ikhide and Uanguta's (2010) findings that the repo rate is the main monetary policy instrument in South Africa. Moreover, in line with Ikhide and Uanguta's (2010) results, this study found that an increase of the repo rate causes an increase in the lending rates in the short run . This is expected as commercial banks adjust their lending rates in line with the interest rates fixed by the reserve banks. This view is in line with Matemilola *et al.* (2015) who revealed that commercial banks adjust their lending rates in response to monetary policy shocks.

6.3 CONTRIBUTIONS TO LITERATURE

It is interesting to note that from the reviewed literature there was no clear evidence which explains the impact of monetary policy shocks from the anchor country on performance variables, such as real GDP growth, in the CMA region. There was also a gap in literature on the impact of external shocks, such as commodity prices, on the performance of CMA economies. The findings of this study revealed that real GDP growth of CMA economies responds negatively to a shock in the anchor country's monetary policy. The results from the study also revealed that including global commodity prices in SVARs averts the price puzzle problem as identified in the recent study of Seoela (2020).

6.4 RECOMMENDATIONS

A key implication from the results of this dissertation is that policymakers in LEN countries must implement additional policy measures to circumvent the negative impact of South Africa's monetary policy on their economies. Based on the findings derived from the discussed results, the study suggests that it is vital for the monetary authorities and policymakers to formulate policies toward cushioning the effect of unanticipated monetary policy shocks from the anchor country as well as global shocks.The CMA region must build a safety net to cushion the effects of global shocks. The anchor country's monetary authorities should look inward and formulate policies towards stimulating the entire CMA economy in order to circumvent worsening economic performance in the region.

CMA economies are urged to deliberate on the establishment of a common pool of reserves which will assist some of its members who form part of their integrated group and might need assistance due to shocks that might have hit their economies. In addition, policymakers should institute proper performance-enhancing policies that are capable of stimulating the economy.

6.5 LIMITATIONS OF THE STUDY

This study's main aim and objective was to investigate the impact of the anchor country's monetary policy shocks on the performance of the CMA region. Although the study has successfully achieved its objectives, like previous studies, it has its limitations. The first constraint was the inability of the study to capture the SACU (Southern African Customs Union) revenue due to lack of data. The SACU revenue could act as a cushion for the participant countries of the CMA in order to limit or offset the effect of the shocks. This is because the CMA economies are also members of the SACU and the revenue they receive can help to shield them from potential shocks from the anchor country. Differences in country standards and financial institution developments pose a limitation for most countries in the CMA. Moreover, some member economies of the CMA are yet to adopt uniform accounting and financial reporting standards. In addition, the inability of the data source to keep annual records of the repo rate (releasing only monthly and quarterly data) was also a limitation for this study. Nonetheless, this challenge was overcome by employing a form of frequency conversion using E-Views software to convert the data, a process supported by the literature and other studies such as Kutu and Ngalawa (2016) and Ocran (2012).

Overall, these identified challenges do not appear to have significantly compromised the study's results, as the aim and objective of the study have been achieved.

6.6 SUGGESTIONS FOR FURTHER RESEARCH

Regional integration is at the forefront of many countries, therefore research in this area should be ongoing. Firstly, there are aspects that remain uncovered in the CMA region, such as the inclusion of the SACU revenue in the analysis. Further analysis on the impact of demand and supply shocks, which this study did not cover, also needs to be carried out. Future studies can also assess whether the South African monetary policy creates a conducive investment climate which attracts foreign and domestic investment to promote economic performance of CMA countries.

Lastly, the debate on what monetary policy can accomplish and what it cannot in terms of output growth and stabilising prices is becoming more complicated. Hence, there is a need for further research in this area.

6.7 GENERAL CONCLUSION

The objective of the study was to investigate the impact of the anchor country's monetary policy shocks on the CMA's economic performance. The study specifically used IRFs, and variance decompositions derived from the Panel-SVAR model to fulfil the objectives of the study. The study focused on the shock of the SA repo rate on performance variables, such as real GDP growth, inflation, money supply, and lending rates. The findings reveal that shocks on the main monetary policy tool of the anchor economy have a negative impact on real GDP growth, reduces inflation, decreases money supply, and increases lending rates in the entire CMA region.

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APPENDIX A

Figure5.2a Panel-SVAR Lag Length test

VAR Lag Order Selection Criteria

Endogenous variables: COMM_PRICES SA_REPO RGDP_G INF MS LRATE

Exogenous variables: C

Date: 04/19/22 Time: 14:55

Sample: 1980 2019

Included observations: 148

Lag	LogL	LR	FPE	AIC	SC	HQ
0	1850.4172	NA	3163.574	25.08672	-25.20823	- 25.13609
1	1086.3526	1455.8552	0.168833	15.24799	-16.09855	- 15.59357
2	927.4989	289.7986	0.032170	13.58782	-15.16744	- 14.22962
3	756.1072	298.7774*	0.005193*	11.75821*	-14.06687*	-12.69621*

* 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

Figure 5.3a Panel-SVAR Diagnostic Tests

Figure5.3.1: Normality Tests

VAR Residual Normality Tests

Orthogonalization: Estimated from Structural VAR

Null Hypothesis: residuals are multivariate normal

Date: 04/19/22 Time: 15:16

Sample: 1980 2019

Included observations: 152

Component	Skewness	Chi-sq	Df	Prob.
1	0.2548	3.1228	1	0.6104
2	-0.0742	8.2405	1	0.2918
3	0.1568	1.8136	1	0.3217
4	-0.9748	4.8065	1	0.8712
5	-0.0382	1.9621	1	0.7432
6	-2.0256	7.2411	1	0.6942
Joint		3.1272	6	0.3410

Component	Kurtosis	Chi-sq	Df	Prob.
1	2.6478	4.4021	1	0.7824
2	3.8895	9.5842	1	0.9733
3	2.5885	4.4321	1	0.2314
4	1.5536	1.1232	1	0.3215
5	3.3671	7.1324	1	0.4247
6	1.8019	2.0612	1	0.5832
Joint		4.4042	6	0.7453

Component	Jarque-Bera	df	Prob.
1	4.4024	2	0.6467
2	9.5852	2	0.2135
3	4.2474	2	0.8758
4	1.5321	2	0.7865
5	7.1802	2	0.6432
6	2.0617	2	0.5021
Joint	5.4019	12	0.3429

Figure5.3.2 Serial Correlation Tests

VAR Residual Serial Correlation LM Tests

Null Hypothesis: no serial correlation at lag order h

Date: 04/19/22 Time: 15:06

Sample: 1980 2019

Included observations: 152

Lags	LM-Stat	Prob
1	348.5184	0.2137
2	229.2481	0.2712
3	205.3343	0.2431
4	217.0206	0.3126
5	244.3215	0.5391
6	161.7806	0.3128

Probs from chi-square with 36 df.

Figure5.3.3

VAR Residual Heteroskedasticity Tests: Includes Cross Terms

Date: 02/19/22 Time: 01:39

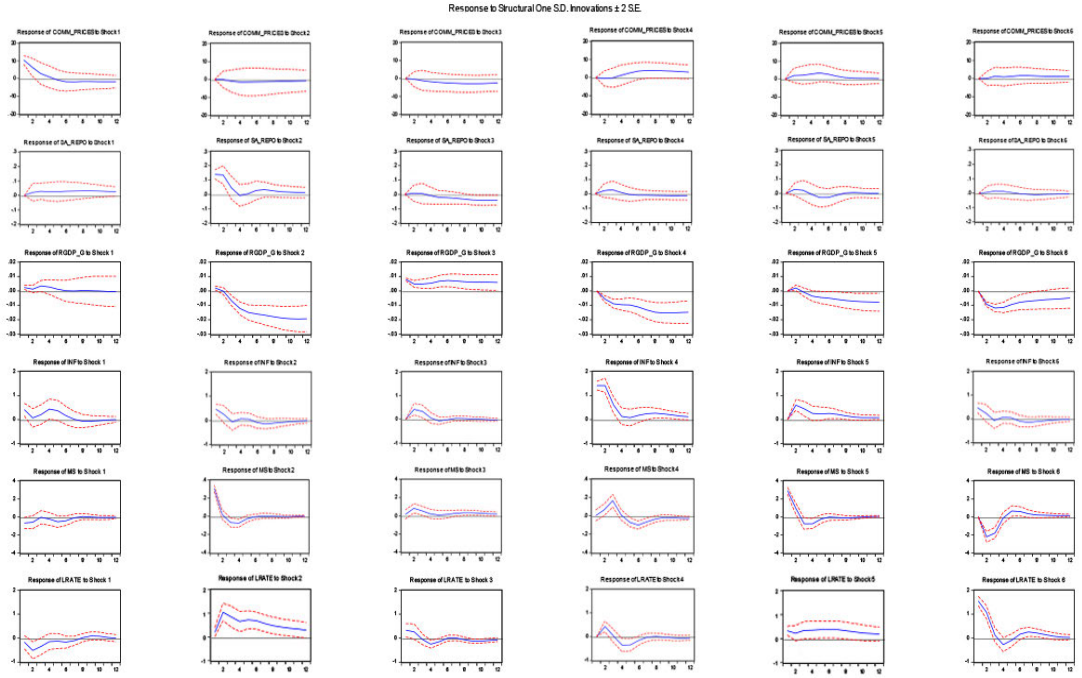
Sample: 1980 2019

Included observations: 152

Joint test:

Chi-sq	Df	Prob.
2113.826	504	0.6531

Figure 5.4: Panel-SVAR Full Sample results of impulse response functions for all variables



Variance Decomposition of COMM_PRICES:

Period	S.E.	COMM_PRICES	SA_REPO	RGDP_G	INF	MS	LRATE
1	0.033522	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.122514	93.89289	2.915854	1.786981	0.325372	0.177314	0.901579
3	0.128322	94.07318	1.491845	0.951474	1.645584	0.183931	1.653985
4	0.138165	86.58214	6.437024	3.246798	3.430593	0.191998	0.111446
5	0.136057	82.73014	7.616719	3.508414	4.850030	0.276962	1.017734
6	0.148967	92.55556	3.149947	1.834472	2.002404	0.328084	0.129532
7	0.159891	77.94478	8.466080	4.144348	7.019701	0.334197	2.090893
8	0.168474	84.51432	0.803841	4.393008	7.848817	0.336225	2.103788
9	0.181873	89.48870	2.157480	2.614166	2.460512	0.344736	2.934405
10	0.184182	87.56472	3.472787	4.816337	0.921243	0.353312	2.871601
11	0.189334	87.81041	5.744735	2.990256	1.303345	0.357882	2.793371
12	0.197570	89.16445	2.085612	3.041101	3.637814	0.342071	1.728951

Variance Decomposition of SA_REPO:

Period	S.E.	COMM_PRICES	SA_REPO	RGDP_G	INF	MS	LRATE
1	0.048006	1.778340	98.22166	0.000000	0.000000	0.000000	0.000000
2	0.147940	1.223951	94.51958	0.067190	0.077984	3.122701	0.988594
3	0.320213	1.26947	95.64916	0.069678	0.076529	1.520361	1.414801
4	0.368739	5.32145	90.93372	0.068834	0.484978	1.077988	2.113029
5	0.413290	4.95672	87.65772	0.084785	1.809942	3.235471	2.255361
6	0.437700	1.78557	92.82147	0.551353	1.147109	1.620935	2.073562
7	0.483729	3.22145	87.28979	1.524063	2.297885	2.247861	3.418950
8	0.526053	2.78380	89.13744	2.235576	1.352316	2.912952	1.577915
9	0.561974	2.75782	89.09946	2.616784	1.164202	1.659598	2.702135
10	0.590676	0.27481	90.08925	0.905769	3.760499	3.490964	1.478707
11	0.613787	0.20139	88.19290	3.187977	2.310086	2.346991	3.760655
12	0.636025	1.97243	89.46243	1.456856	2.018571	2.196785	2.892927

Variance Decomposition of RGDP_G:

Period	S.E.	COMM_PRICES	SA_REPO	RGDP_G	INF	MS	LRATE
1	0.550103	8.621390	10.56568	80.81293	0.000000	0.000000	0.000000
2	0.471952	8.059130	43.05304	43.87206	4.527997	0.450309	0.037463
3	0.512866	7.417670	54.53393	31.90410	3.233993	1.395099	1.515207
4	0.534054	11.32012	54.81375	28.58742	2.154769	1.745348	1.378592
5	0.645461	13.02872	55.95186	24.78748	3.876332	0.825641	1.529966
6	0.683578	9.230840	54.02146	30.75885	2.885552	1.775044	1.328253
7	0.690823	8.558360	53.04947	34.01752	2.484642	0.731050	1.158957
8	0.745716	7.191102	54.69669	32.49548	2.851961	1.704656	1.060112
9	0.780168	6.289010	47.51002	36.07771	4.470316	2.681369	2.971574
10	0.862173	8.113420	46.99478	35.68182	3.672764	2.661551	2.875664
11	0.876283	8.161833	48.42959	34.31743	2.655938	2.647789	3.787424

12	0.983185	6.16373	45.35591	38.57832	3.554083	3.636406	2.711550

Variance Decomposition of INF:

Period	S.E.	COMM_PRICES	SA_REPO	RGDP_G	INF	MS	LRATE
1	0.783288	5.689066	9.145824	13.63800	71.52711	0.000000	0.000000
2	0.585260	6.842195	12.47318	7.420913	71.34801	1.880956	0.034745
3	0.926526	11.50181	10.48839	6.581346	65.41050	2.885161	3.132792
4	0.086858	17.05911	9.521493	6.451168	61.12809	2.613505	3.226633
5	0.216820	22.57656	8.770674	6.000699	56.77272	2.468578	3.410768
6	0.311249	26.48791	8.417324	5.670651	53.59245	2.330640	3.501015
7	0.362816	28.48704	8.304899	5.525724	51.98070	2.284500	3.417136
8	0.390505	29.46369	8.231230	5.473648	51.13753	2.248553	3.445348
9	0.411051	29.98703	8.194182	5.442606	50.54536	2.222319	3.608502
10	0.426783	30.27727	8.213821	5.456234	50.17604	2.202233	3.674401
11	0.440691	30.38845	8.275328	5.536103	49.95521	2.186195	3.658713
12	0.455866	30.37603	8.375529	5.655469	49.79654	2.167110	3.629312

Variance Decomposition of MS:

Period	S.E.	COMM_PRICES	SA_REPO	RGDP_G	INF	MS	LRATE
1	0.261072	0.393140	0.053590	15.91128	10.64182	73.00017	0.000000
2	0.276240	1.465419	19.69606	12.14692	7.196601	47.75938	11.73561
3	0.025442	1.098148	38.69088	8.801647	6.256972	36.15844	8.993912
4	0.221856	1.072207	37.33487	8.290526	5.934196	34.93920	12.42900
5	0.262999	1.112007	37.68159	8.178839	6.162664	34.46206	12.40283
6	0.393022	2.025491	37.02094	8.074979	6.065550	33.07021	13.74282
7	0.440609	3.065699	36.82614	8.059612	5.961169	32.49964	13.58773
8	0.468158	3.481335	36.73766	7.995892	6.041433	32.17302	13.57065
9	0.486051	3.635521	36.66692	7.994593	6.240356	31.98025	13.48235
10	0.505942	3.698811	36.48776	8.088593	6.520456	31.75752	13.44685
11	0.526444	3.691957	36.32816	8.204809	6.881154	31.52234	13.37157
12	0.547586	3.664216	36.26279	8.291577	7.217767	31.28336	13.28028

Variance Decomposition of LRATE:

Period	S.E.	COMM_PRICES	SA_REPO	RGDP_G	INF	MS	LRATE
1	0.473958	2.305283	94.57518	0.213572	0.041557	0.099081	2.765327
2	0.131571	5.927028	84.36374	0.123275	0.175597	0.178584	9.231775
3	0.315512	9.524412	74.65375	0.522698	0.374687	2.493252	12.43120
4	0.368154	4.163907	80.69535	0.625497	0.532550	0.998815	12.98388
5	0.416346	6.236302	77.00844	0.133679	2.911546	1.228082	12.48195
6	0.438944	10.04993	72.53647	1.867543	3.170359	1.508647	10.86705
7	0.485661	6.519918	73.94553	1.517513	4.193933	1.113495	12.70961
8	0.525149	6.618800	70.71132	2.190872	5.163927	1.773030	13.54205
9	0.558385	9.520592	65.65624	2.533925	5.924761	2.124342	14.24013
10	0.585056	8.155506	67.21517	2.797508	4.480301	4.338315	13.01319
11	0.606507	9.087216	60.82702	3.066916	6.996889	3.195278	16.82668

12	0.627280	8.818703	66.32031	3.324718	5.855058	3.040451	12.64075

Factorization: Structural

VAR Granger Causality/Block Exogeneity Wald Tests

Date: 03/12/22 Time: 02:27

Sample: 1980 2019

Included observations: 148

Dependent variable: COMM_PRICES

Excluded	Chi-sq	df	Prob.
SA_REPO	62.33386	3	0.2037
RGDP_G	14.54994	3	0.1522
INF	19.84473	3	0.9102
MS	42.15274	3	0.6120
LRATE	60.46580	3	0.7810
All	117.4468	15	0.0782

Dependent variable: SA_REPO

Excluded	Chi-sq	df	Prob.
COMM_PRICES	11.20028	3	0.0107
RGDP_G	30.55871	3	0.2302
INF	3.874056	3	0.2754
MS	55.64048	3	0.7903
LRATE	93.92808	3	0.8791
All	296.4001	15	0.0728

Dependent variable: RGDP_G

Excluded	Chi-sq	df	Prob.
COMM_PRICES	37.43287	3	0.0000
SA_REPO	27.18418	3	0.0001
INF	278.7088	3	0.0000
MS	77.92017	3	0.0000
LRATE	12.73747	3	0.0003
All	694.7395	15	0.0000

Dependent variable: INF

Excluded	Chi-sq	df	Prob.
COMM_PRICES	12.66133	3	0.0054
SA_REPO	19.37470	3	0.0002
RGDP_G	15.40724	3	0.0015
MS	5.692426	3	0.0076
LRATE	15.36011	3	0.0015
All	104.8089	15	0.0000

Dependent variable: MS

Excluded	Chi-sq	df	Prob.
COMM_PRICES	15.96759	3	0.0012
SA_REPO	29.81778	3	0.0000
RGDP_G	139.5838	3	0.0000
INF	20.74790	3	0.0001
LRATE	35.81602	3	0.0000

All	445.5119	15	0.0000

Dependent variable: LRATE

Excluded	Chi-sq	df	Prob.
COMM_PRICES	8.444694	3	0.0377
SA_REPO	104.1175	3	0.0000
RGDP_G	26.99915	3	0.0000
INF	3.569559	3	0.3119
MS	66.45323	3	0.0000
All	321.0115	15	0.0000

APPENDIX B

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

24 May 2021

Mr Theron Shumba (214585025)
School Of Acc Economics&Fin
Pietermaritzburg

Dear Mr Theron Shumba,

Protocol reference number: 00011881
Project title: Monetary policy shocks and macroeconomic performance in regionally integrated Common Monetary Area economies

Exemption from Ethics Review

In response to your application received on , your school has indicated that the protocol has been granted **EXEMPTION FROM ETHICS REVIEW.**

Any alteration/s to the exempted research protocol, e.g., Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through an amendment/modification prior to its implementation. The original exemption number must be cited.

For any changes that could result in potential risk, an ethics application including the proposed amendments must be submitted to the relevant UKZN Research Ethics Committee. The original exemption number must be cited.

In case you have further queries, please quote the above reference number.

PLEASE NOTE:
Research data should be securely stored in the discipline/department for a period of 5 years.

I take this opportunity of wishing you everything of the best with your study.

Yours sincerely,

[redacted]

Prof Josue Mbonigaba
Academic Leader Research
School Of Acc Economics&Fin

APPENDIX C

Kim N Smit Editorial Services

Declaration of Professional Editing

09 May 2022

This letter serves to confirm that Theron Shumba submitted a dissertation to myself for editing. The dissertation is entitled, '**MONETARY POLICY SHOCKS AND MACROECONOMIC PERFORMANCE IN REGIONALLY INTEGRATED COMMON MONETARY AREA ECONOMIES**'.

The following aspects were edited:

- Spelling
- Grammar
- Consistency of layout
- Sentence structure
- Logical sequencing
- References (Reference checking involves proofreading and perhaps some editing with regards to the simple formatting of the references into the referencing style required i.e. changing the order of the elements - author, date, title, series, place, publisher, journal, volume, issue, pagination etc.)

My involvement was restricted to language use and spelling, completeness and consistency, referencing style (in-text), and formatting of headings and captions. I did no structural re-writing of the content and did not influence the academic content in any way. The content and formatting of the final document submitted for examination remains the responsibility of the student.

Should you have any further queries, please do not hesitate to contact me.

Kind regards,

[redacted]

Kim Smit

Tel: +27 (0)78 493 6554 Email: kimnsmit@gmail.com
Member of the Freelance panel for the University of South Africa
Member of the Freelance panel for the University of Pretoria

APPENDIX D : TURNITIN REPORT

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by Theron Shumba

Submission date: 11-May-2022 05:55PM (UTC+0200)
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