An econometric analysis of fiscal policy and monetary policy interdependence: Comparative study between Nigeria and South Africa

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DEDICATION

This research work is dedicated to the LORD JESUS CHRIST and the missionaries who forsook the comfort and pleasures in their cities to serve the LORD JESUS in the jungles and caves of the world.

DECLARATION

I declare that:

"An econometric analysis of fiscal policy and monetary policy interdependence: comparative study between Nigeria and South Africa"

is my own work and all the sources I have used or quoted have been indicated and acknowledged by means of complete references, and that this dissertation has not been submitted by me at any other university**.**

SIGNATURE **DATE**

K.A. SANUSI

April 2019

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TO GOD ALONE, BE ALL THE GLORY!!!

ABSTRACT

Fiscal policy and monetary policy are important macroeconomic tools used to achieve macroeconomic objectives. The dominant objective of fiscal policy is to increase the aggregate output of the economy while the overriding objective of monetary policy is to regulate and control the interest and inflation rates. Conventionally, both fiscal and monetary policies were under the control of the national governments. Consequently, traditional economic analyses were made with respect to both policies to attain the optimum policy mix of the two in order to achieve the broad macroeconomic goals. But more recently, as a result of the transfer of monetary policy control and monetary policy formulation to central banks, there has been a significant and notable structural change in the way in which fiscal and monetary policies interact. There has been a dilemma as regard whether these two policies are complementary, or are substitutes to each other for achieving macroeconomic goals. The issue of fiscal and monetary policies interaction and the idea of complementarity or substitutability for each other comes up only when both fiscal and monetary policies authorities are independent of each other. But when the goals of either of the authority, mostly monetary policy authority, is made subservient to the fiscal authority simply because national government controls the fiscal authority, then fiscal authority solely dominates the policy making and as a result hinder the monetary policy objective. This study revisits the discussion on fiscal and monetary policies interaction by econometrically analyzing the interdependence between fiscal and monetary policies interactions in Nigeria and South Africa. Consequently, the study aimed at estimating the degree of fiscal and monetary policies interdependence in Nigeria and South Africa; analyse the trend of inflation with respect to the degree of fiscal and monetary policies interdependence; and evaluate the dynamic responses between fiscal and monetary policies variables.

In order to achieve the objectives of the study, the study employed a quantitative research methodology. Time series data on nominal consumption expenditure, money supply, government debt, inflation rate, interest rate, tax revenue, output level, and government spending for the period 1981-2016 were adopted for the analysis and simulation was also done within the DSGE modelling. The data were sourced from the World Bank Development indicator (WDI), a publication of World Bank. The study made use of dynamic ordinary least square (DOLS) proposed by Stocks and Watson to estimate the degree of fiscal and monetary policies

interdependence in Nigeria and South Africa while a trend analysis was carried out to examine the trend of inflation with respect to the degree of fiscal and monetary policies interdependence. Dynamic Stochastic general equilibrium model (DSGE) and Bayesian vector autoregressive model (BVA) were used to evaluate the dynamic responses between fiscal and monetary policies variables.

The result of the first model used to estimate the degree of fiscal and monetary policies interdependence showed that the degree of fiscal and monetary interdependence in Nigeria is 0.84 while it is found to be 0.67 in the South African economy. This empirical finding suggests that the degree of fiscal and monetary policies interdependence in both Nigeria and South Africa is greater than 0.5 and closer to 1. This implies that in coordination of fiscal and monetary policies interactions in both economies, central bank is more active and first mover. Put differently, because the degree of fiscal and monetary policies interdependence is greater than 0.5 in both countries, the apex bank enjoys a high degree of autonomy in coordination of fiscal and monetary policies. The implication is that about 84% and 67% of government debt are backed up by fiscal authority in Nigeria and South Africa respectively while remaining percentage is accommodated by monetary authority, and that monetary authorities in both countries fixed their policies ahead and enforce discipline on fiscal authorities. Hence, both economies could be said to be under a low fiscal dominance hypothesis. This is because the zero or low fiscal dominance requires that the degree of fiscal and monetary policies interaction be greater than zero and closed to one as found under the present study.

Also the results of the trend analysis showed that the inflation rate has been consistently higher in the Nigerian economy than in the South African economy, while average annual inflation rate under the study period in Nigeria was 19.6% and 9.1% in South Africa. The empirical findings suggest that though Nigeria has a higher degree of fiscal and monetary policies interdependence than the South African economy, average inflation rate in Nigeria is higher than in South Africa. This result does not find evidence of low inflation being associated with higher degree of fiscal and monetary policies interdependence.

Findings from the dynamic stochastic general equilibrium model (DSGE) and Bayesian vector autoregressive model (BVA) reveal that fiscal and monetary policy interacts with each other in

both the Nigerian and South African economy. Inflation responds to fiscal policy shocks in the form of government spending, revenue and borrowing shocks. Monetary authority's decisions also affect fiscal policy variables. However, monetary and fiscal policies interactions are largely stronger in South Africa than Nigeria.

The empirical results show that the dominant sources of variation in output level in Nigeria are shocks to government debt while shocks to tax, interest rate and government spending are found to be dominant sources of variation in output level in South Africa. Also, output level, government debt and interest rate are important sources of variation in government spending in Nigeria while they are found to be output level, tax revenue and interest rate shocks in South Africa. Government debt and inflation shocks are significant and dominant of sources variation in interest rate in Nigeria while all the variables seemed to be significant sources of variation in South Africa. Tax revenue, government debt and government spending shocks are significant sources of variation in inflation in South Africa, while all the variables are found to be a significant sources of variation in inflation in Nigeria.

The study concludes based on the empirical findings, that monetary policy authorities in Nigeria and South Africa should strive more to maintain the current level of their autonomy given their higher degree of fiscal and monetary policies interdependence. Current level of autonomy can be maintained by ensuring that the fiscal authority plans its inter-temporal budget constraints such that current level of government outstanding debt and its interest would always be offset by future primary surpluses rather than seigniorage. The productive base of Nigeria needs to be awakened as is almost moribound in terms of perfomance. This can be done through elimination of various structural rigidities in Nigerian economy, provision of adequate and modern infrastructure such as good roads, power suppy which aid productive activities, discouraging importation of already inflated products into the country and tax concessions to producers of essential commodities. Meanwhile, though the average level of inflation in South Africa is lower than that of Nigeria, South African inflation rate can still be brought lower given the degree of fiscal and monetary policies interdependence by also further strengthening the productive base of the economy.

Key words: Fiscal Policy, Monetary Policy, DSGE, BVAR

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LIST OF ABBREVIATIONS

ADF: Augmented Dickey Fuller

AIC: Akaike Information Criterion

ANC: African National Congress

BOFID: Banks and other Financial Institutions Decree

BVAR: Bayesian Vector Autoregressive

CBN: Central Bank of Nigeria

COSATU: Congress of South African Trade Unions

CPI: Consumer Price Index

DMB: Deposit Money Bank

DMO: Debt Management Office

DOLS: Dynamic Ordinary Least Square

DSGE: Dynamic Stochastic General Equilibrium

EMU: Economic and Monetary Union

FEVD: Forecast Error Variance Decomposition

FPE: Final Prediction Error

GDP: Gross Domestic Product

HQ: Hannan- Quinn information criterion

IDC: Industrial Development Corporation

IMF: International Monetary Fund

IRF: Impulse Response Function

MPR: Monetary Policy Rate

NBS: National Bureau of Statistics

OECD: Organisation for Economic Cooperation and Development

PP: Phillips Perron

PTA: Policy Target Agreement

RBNZ: Reserve Bank of New Zealand

RDP: Reconstruction and Development Programme

RSA: Republic of South Africa

SACP: South African Communist Party

SAP: Structural Adjustment Programme

SARB: South African Reserve Bank

SC: Schwarz information criterion

VAR: Vector Autoregressive

CHAPTER 1

INTRODUCTION AND BACKGROUND

1.1 BACKGROUND TO THE STUDY

The coordination between fiscal and monetary policies has in recent time taken another dimension in the discussions of the macroeconomic agenda. Monetarists had earlier suggested inconsequential intervention of government and are opposed to unrestricted policies (Nunes & Portugal, 2009:1). Their opponent, the Keynesians, supports interventions (Daly, 2015:2). These submissions by the monetarists and Keynesians have divorced arguments between the two policies (Nunes & Portugal, 2009:1). Consequently, the empirical discussions on the behaviour of monetary policy were just between rules and discretionary performance (Woodford, 1998:119). Fiscal policy was assumed to play unimportant part, while monetarist models supposed the presence of Ricardian management, under which the budget of government was prone to repeated deviations. Any remaining debt is to be financed by means of taxes and inflation tax without interference with monetary policy (Sanusi & Akinlo, 2016:126; Nunes & Portugal, 2009:1; De Resende, 2007:2). Consequently, the fiscal authority is assumed to be good, and slashes in taxes funded by upsurges in debt level is recompensed by surge in taxation at the latter date so as to ensure debt creditworthiness. Under this arrangement, the dispute on the coordination between the fiscal and monetary policies was said to be pointless (Hayo & Niehof, 2014:2).

Sargent and Wallace (1981:1) began a new path in the contemporary macroeconomic theory by viewing the coordination between fiscal and monetary policies as a major important price determination. They argue that government expenditure, which is one of the principal instruments of fiscal policy, could be financed by any or blend of taxes, issuance of new debt and revenue from seigniorage. Fiscal policy rule is long-run in nature; where government builds into its present inter-temporal budget constraints and future fiscal activities (Makochekanwa, 2011:52). For instance, outstanding debt of government could be financed or backed, either in totality or in part by discounted worth of current and future surpluses, while the lingering debt is supported by revenue from seigniorage. It should be noted that the measure of the extent of interdependence between fiscal and monetary policies ranges between 0 and 1(De Resende, 2007:1). If this value is 1, fiscal authority backs entirely all debts. Put differently, fiscal policy accommodates monetary policy.

This means that the monetary authority determines the price-level while fiscal authority conducts its activities such that the issued bonds are financed by future tax revenue. This scenario has been widely regarded to as the traditional Ricardian regime or traditional monetary dominance or zero fiscal dominance (Jalil *et al*, 2013:122; Xiong, 2012:513; De Resende, 2007:2).

In a situation where the value of the measure is zero, monetary authority houses completely all the debts of the governments. The response of monetary policy authority is such that there is rise in current or future seigniorage revenues to fund the newly issued debt. The suggestion is that fiscal authority is indifferent to monetary policy. As a result, neither taxes nor expenditure respond to fluctuations in the debt of government. Hence, money creation had to be used to fund deficits. This condition is regarded as non-Ricardian regime or traditional fiscal dominance (Xiong, 2012:513). The major implication of this is that price-level in any economy does not depend on the growth of money stock only, but also on the proportion of debt financed or backed with money, or the extent to which government bond is financed by future money creation (Fratianni & Spinnelli,2001: 255).

In the meantime, Woodford (1998:120) introduced the concept of Fiscal Theory of the Price Level (FTPL). The FTPL builds on the of Leeper (1991:129) and disagrees with proposition of Sargent & Wallace (1981:3). He proposed that government intertemporal budget equation is a stability condition. Accordingly, Woodford (1998:120) categorized fiscal policy as Ricardian when the authority behaves considerately and the inflationary objective was not hindered. A non-Ricardian situation takes place when chances of insolvency demands that the monetary authority instigates inflationary pressure to deflate government debt (Fry, 1998:516).

For more than a decade now, within the continent of Africa as a whole, there has been a decrease on dependence of government on domestic financing (Adams, 2008:1). There has also been a removal of monetary and fiscal pathologies in the continent (Adams, 2008:1). However, there has been fears on the possibility of the emergence of fiscal dominance. This has been a serious burden for developing economies because of pro-cyclicality of fiscal stance (Sanusi & Akinlo, 2016:127).

This problem is more pertinent and more worrisome in resource-rich countries such as Nigeria. Fiscal deficits have been a major bane of development of the country since the early days of independence. For instance, 41 years out of 50 years computed from 1965 to 2017, fiscal balance of Nigeria were said to be deficits (National Bureau of Statistics, 2015:30; Sanusi & Akinlo,

2016:127). Meanwhile, the situation is not different from South Africa's budget balance position, as the majority of fiscal position has been deficits since her transition in 1994. The situation became worse at the aftermath of the global financial crises and economic recession from 2007 to 2009. The funding of these deficits are however the foremost inflationary sources, most especially if a deficit is monetised. The extent of interdependence between fiscal and monetary policies in Nigeria and South Africa, most especially in the face of fiscal deficit, is the overall objective of this study.

1.2 PROBLEM STATEMENT

The relationship between monetary and fiscal policies has been an important issue widely discussed in the macroeconomic literature (Fahr & Frank, 2010:813; Taylor, 1995:152; Togo, 2007:5; Belke & Dreger, 2011:190; Arby & Hanif, 2010:2). Economists have come up with possible passages in which fiscal and monetary policies relate to each other and have come up with a measure of interdependence. It is worthy of note that the measure of the degree of interdependence between fiscal and monetary authorities in any economy ranges between zero and one (De Resende, 2007:2). Conventional studies on monetary policy have supposed a restricted influence for fiscal policy in affecting monetary policy effectiveness. It is often assumed that the duty of fiscal authority is to determine government's budget, while the monetary authority is free to determine the nominal money supply or nominal interest rate (Barro, 1987:220; Sims, 1994:382; Creel & Le Bihan, 2006:340). The intrinsic connotation by such an assumption is that the monetary authority can manage inflation by means of its control on money supply. In other words, it is the monetary authority that determines seigniorage revenue delivered to the fiscal authority. Thus, monetary policy defines the level of prices, while fiscal policy ensures that the issued bonds are supported by the tax revenue. This scenario has been described as a monetary dominance (Leeper, 1991:131; Sargent & Wallace, 1981:3). Monetary policy that operates in this framework is much more effective because it has the backing of fiscal policy for its monetary targets. In such a situation, inter-temporal government budget constraint is such that current fiscal deficit is equal to discounted value of future surpluses (Keen & Wang, 2013:791). Hence, there is no connection between fiscal deficits and monetary growth and subsequently inflation Consequently, the degree of monetary-fiscal policies interdependence, often denoted as k in the literature, would be 1. The

fiscal authority could be said to back all debt through the control of current and future surpluses to satisfy the government's intertemporal budget constraints (Sanusi & Akinlo, 2016:127).

Similarly, another means by which fiscal and monetary policies relate deals with the condition in which fiscal policy is active and a monetary policy is inactive (Sim, 1994:382). A commonly described situation in the literature is when fiscal authority is completely irresponsive to monetary policy. As a result, fiscal authority does not adjust taxes nor expenditure (both at current period and in future) to variations in the outstanding debt, and as such monetary authority has to back fully all the government's debt. This position has been widely described as fiscal dominance (Aiyagari, & Gertler, 1985:22; Favero, 2002:45; Nawaz *et al.*, 2012:154; Xiong, 2012:515; Sargent & Wallace, 1981; De Resende, 2007:2; Sanusi & Akinlo, 2016). In this situation, the measure of degree of interdependence between fiscal and monetary authority,k, would be zero. An amazing characteristics of fiscal dominance is that monetary policy is made subject to fiscal policy. This implies that if monetary policy is subordinate to fiscal policy, a fiscal deficit would be positively correlated with increase in money supply, in other words, monetary growth (Gallo & Otranto, 1998; Us, 2003:1005; Tanner & Ramos, 2003:5). In other words, positive long-run inflationary impact of money supply can be attributed to fiscal dominance (Jalil *et al* 2013:122). However, in reality, the measure of degree of fiscal policy and monetary policy interdependence is hardly 0 nor 1. Put differently, the real life possibilities lie between the two values. Most of the available studies in the literature have either investigated the presence of fiscal dominance or monetary dominance (Trenovski & Tashevska, 2015: 126).

Existing studies in the literature have focused mainly on determination of incidence and or-else of fiscal dominance. Studies conducted to determine the quantitative measure of degree of monetary-fiscal policies interdependence are quite scanty and unavailable in Nigeria and South Africa. It was De Resende and Rebei (2008:2) that first carried out the quantitative measure of degree of fiscal and monetary policy interdependence in a full fledge specified structural models using Dynamic Stochastic General Equilibrium (DSGE). Existing literature have been accused of lacking adequate empirical tests and merely estimate reduced- form restrictions from non-micro founded models or just estimation of single equation (De Resende & Rebei, 2008:2).

Studies on the quantitative measure of degree of fiscal and monetary policy interdependence are not available in Nigeria and South Africa as most studies have mainly examined the interactions among monetary and fiscal variables. This study would be contributing to scarce empirical studies on the analysis of the measure of degree of interdependence between fiscal and monetary policies in the literature at large. Meanwhile, empirical research efforts on estimation of degree of fiscal and monetary policy interdependence which measure the independence of central bank was stirred by traditional economic argument that, if apex bank is free from political pressure interference, the attainment of a lower and more stable inflation would be possible. In other words, an economy with high degree of fiscal and monetary policies interdependence would experience a lower inflation rate. Bade and Parkin (1985:1-36) came up with the first empirical study to examine the association between the degree of fiscal and monetary policies interdependence. They employ annual data for 12 Organization for Economic Cooperation and Development (OECD). Bade and Parkin (1985:1-36) submits that the degree of fiscal and monetary policies interdependence was a noteworthy cause of inflation in the selected countries. Consequently, other studies were motivated in the literature to define the validity or otherwise of the argument that high degree of fiscal and monetary policies interdependence is connected with lower inflation. Alesina (1988) and Alesina & Summers (1993:151-162) used the method of Bade and Parkin (1982:13-52) and included more countries. They established that an opposite relationship between average inflation rates and the level of the degree of fiscal and monetary policies interdependence.

Recent empirical efforts have been largely divergent on the validity of the hypothesis of high degree of fiscal and monetary policies interdependence is associated with lower inflation. For instance, Ornellas and Portugal (2011:1-31) found higher degree of fiscal and monetary policies interdependence in the Brazilian economy than US and Canadian economies but inflation was found to be higher in Brazil during the period under consideration. In other words, Ornellas and Portugal (2011:1-31) could not find evidence of high degree of fiscal and monetary policies interdependence being associated with low inflation rate. Investigation of the validity or otherwise of the proposition that high degree of fiscal and monetary policies interdependence being associated with lower inflation rate has not received considerable research efforts from Africa. As a matter of fact, no empirical efforts could be found on this subject matter for Nigerian and South African economies.

Empirical research on fiscal and monetary policies interactions have increasingly adopted Dynamic Stochastic General Equilibrium Models (DSGE) for analysis. Though DSGE is a more complex model as compared with earlier models such as VAR, DSGE is currently being used by most of the central bankers across the globe for analysing the interaction of monetary policy and fiscal policy. The main reason for this increasing adoption of DSGE modelling by central bankers is the problem associated with previous models like VAR such as the absence of room for policy intervention (Shahid &Waseem, 20161:1-41). However, the use of DSGE, given its importance in evaluating the dynamic interactions between fiscal and monetary policies variables has received considerable attentions in developed countries but has not yet received significant attentions from African countries.

More specifically, the study fills the existing gap in Nigeria and South Africa on this subject matter. Consequently, the following research questions are answered in the course of this study;

- What is the degree of fiscal and monetary policies interdependence in Nigeria and South Africa?
- What is the trend of inflation in respect to degree of interdependence between fiscal and monetary policies for both countries under investigation?
- What are the dynamic responses among fiscal and monetary policies variables shocks for both countries?

1.3 OBJECTIVES

The overall objective of the study is to determine the nature of the relationship between fiscal and monetary policies in Nigeria and South Africa through the application of modern econometric techniques. Specifically, the study is aimed at achieving the following interrelated objectives:

1.3.1 Primary objective

The primary objective of this study is to analyse fiscal and monetary policy interdependence in the Nigerian and South African economies.

1.3.2 Theoretical objectives

In order to achieve the primary objective, the following theoretical objectives are formulated for the study:

- To examine critically theories on fiscal and monetary policy.
- To review various fiscal policies regimes adopted and performance in Nigeria and South Africa.
- To assess the monetary policies regimes adopted and performance in Nigeria and South Africa.
- To evaluate existing empirical studies on fiscal and monetary policies interdependence.

1.3.3 Empirical objectives

In accordance with the primary objective of the study, the following empirical objectives are formulated:

- To examine the degree of fiscal and monetary policies interdependence in Nigeria and South Africa.
- To analyse the trend of inflation in respect to degree of interdependence between fiscal and monetary policies.
- To evaluate the dynamic responses among fiscal and monetary policies variables shocks.

1.4 RESEARCH DESIGN AND METHODOLOGY

The study used a literature review and econometric analysis to achieve the objectives of study. The study made use of a quantitative research design to analyse the interdependence between fiscal and monetary policies variables in Nigeria and South Africa.

1.4.1 Literature review

The literature available on fiscal and monetary policies interactions provides a plethora of knowledge on how fiscal and monetary policies variables interact to influence the performance of an economy. As such, various theories of fiscal and monetary policies were carefully reviewed. In addition, past empirical studies on fiscal and monetary policies were meticulously examined. The

empirical studies provide the empirical efforts so far on the subject matter of fiscal and monetary policies variables interactions.

1.4.2 Study period

The study focuses on the two largest economies in the African continent, namely Nigeria and South Africa. The study covers the period from 1981 to 2016. This is largely informed by notable monetary policy and fiscal policy development in Nigeria and South Africa during this period such as financial liberalisation of financial sector.

1.4.3 Nature of data

The study used annual secondary data to analyse the fiscal and monetary policies interdependence in Nigeria and South Africa. Data on consumption, inflation, outstanding government debt, money supply, government spending, economic growth and tax revenue and interest rate were used for the study. The data were sourced from World Development Indicator (2017), and simulation and calibration were done within a DSGE model.

1.4.4 Model specification

The study made use of three different models to achieve the empirical objective. To estimate the degree of interdependence between fiscal and monetary policies, dynamic least square (DOLS) proposed by Stocks and Watson (1993:783-820) was used. While the dynamic stochastic general equilibrium model (DSGE) was used to assess the dynamic responses between fiscal and monetary policies variables.

The DSGE model was adopted for Nigerian and South African economies. The adopted DSGE model consists of an economy that is made up of a representative consumer, that has infinite horizon; a firm that produces a single final good; a continuum of firms that produce intermediate goods that is monopolistic competitive in nature; a fiscal authority and a monetary authority that regulate supply of money. The last two economic agents are referred to as government. Overall, the model is made up of three types of economic agents which are consumer, firms and government). The DSGE model was chosen because it has a better forecasting power than all other dynamic models and better policy investigations.

The Bayesian vector autoregressive model (BVAR) is also used to evaluate dynamic responses among fiscal and monetary policies interactions. BVAR is a development over the traditional VAR model. The study made use of Normal-Wishart prior distribution. The Bayesian approach proposes a solution to most of the problems associated with the traditional VAR model because it does not consider too much any of the parameters of the model.

1.4.5 Data analysis

Analysis was done largely with E-View 9, MATLAB 2017a, and R2013a. Coding and programming were done with MATLAB with the aid of DYNARE. While simulation analysis was done to test how monetary and fiscal policies variables respond to simulated fiscal shocks, monetary policy shocks and technological shocks. The unit roots test, cointegeration and DOLS estimations were done by E-View 9 and R2013a. Bayesian vector autoregressive was analysed using E-View 9.

1.5 SIGNIFICANCE AND CONTRIBUTION OF THE STUDY

Recent economic actions have justified the essence of assessing the monetary and fiscal policies interactions. Consequent upon the recent economic crisis in which the economies of world were submerged in 2007, many economies of the world have intensified their efforts to map out approaches whereby fiscal incentives could be promoted with the aim to overcome and prevent an economic recession. Fiscal pressure, especially upward pressure, often casts doubt on the capacity of the apex bank to prevent inflation and achieve expected inflation, whether the bank follows an inflation target policy and totally dedicated to the attainment of these targets as is the case with South African economy. The extent to which the monetary authority would be able to control inflation and ensure stability of price is contingent on monetary and fiscal policies behavior, and hence, the discussions on fiscal dominance and monetary dominance are further justified.

In most less developed economies, deficits are financed through money printing. Therefore, monetary policy behaviour of central bank is dependent. Catao and Terrones (2005:529-554) submit that the other means of financing deficits, such as tax come with unbearable political cost and are hard to execute. Furthermore, less developed countries have been largely immersed in debt servicing, therefore, issuance of new debt whether internally or externally is not encouraged as it

is highly costly. The decision to finance the deficits through money creation, consequently raises inflation.

Fiscal policy is an overriding macroeconomic policy instrument commonly adopted in developing countries (Hossain & Chowdhury, 2000). The fiscal decision of Nigeria and South African not only affect their domestic economies; they also shake the economy of neighbouring nations. This is because Nigeria and South Africa are the largest economies on the continent. Understanding how the deficits are financed, either through future surpluses (by means of future increased tax as prevalent under monetary dominance regime) or, through the creation of base money (fiscal dominance) will help Nigeria and South Africa in understanding the determinants of price level in their own economy. Other African countries will also benefit from this due to Nigeria and South Africa's position in the continent.

Furthermore, monetary policy has continued to be emphasized in Nigeria and South Africa due to current inflationary targeting pursuits, while the countries' fiscal policies seem to attract less attention. Especially, the probable effects on the monetary policy that emanates from fiscal policy has not been sufficiently examined because the theoretical or empirical efforts from Nigeria and South Africa in this area have been largely inadequate. Hence, this study.

The study contributes to the current literature on fiscal and monetary policies interaction by quantitatively estimating the degree of fiscal and monetary policy interdependence in Nigeria and South Africa. Existing studies from Nigeria and South Africa have been largely preoccupied with analysis of interactions between fiscal and monetary policies variables with little or no empirical research efforts on estimating the degree of their interdependence. Also, the study largely contributes to scarce empirical efforts on the analysis of the trend of the inflation with respect to degree of interdependence between fiscal and monetary policies variables. Lastly, majority of studies on fiscal and monetary policies interactions in Nigeria and South Africa have largely used ordinary vector autoregressive (VAR) with little efforts on dynamic stochatic general equillibrium model. Hence, this study contributes methodologicaly by using both dynamic stochastic general equilibrium model (DSGE) and bayesian vector autoregressive (BVAR) to analyse the dynamic responses between fiscal and monetary policies variables for Nigeria and South Africa.

1.6 ETHICAL CONSIDERATIONS

It was the responsibility of the researcher to carry out this study in line with the ethical standards of academic research. Hence, ethical guidelines of the university were strictly adhered to**.** The study relied majorly on secondary time series data. Interviewing respondents is not part of the research design of this study. Ethical clearance was obtained from the university.

1.7 CHAPTER CLASSIFICATION

The study consists of the following chapters:

Chapter 1: Introduction and background

This is the introductory chapter; it contains the background to the study, statement of the problem, research questions, objectives of the study, justification of the study, research methodology used and organisation of the study.

Chapter 2: Overview of fiscal and monetary policies

This chapter presents a detailed overview of the political and economic background of Nigeria and South Africa, as well as monetary policy and fiscal policy developments and regimes in Nigeria and South Africa.

Chapter 3: Literature review

This chapter deals with the literature review; interrogating and synthesising both theoretical and empirical literatures.

Chapter 4: Research methodology

This chapter presents an exposition to the research methodology used in achieving the objectives of the study.

Chapter 5: Results and discussion

This chapter deals with presentation and analyses of the data.

Chapter 6: Summary and recommendations

This is a concluding chapter. It contains the summary, recommendations and conclusions of the study.

1.8 SYNOPSIS

This chapter identified and subsequently elaborated upon the introductory issues leading to the study. More specifically, issues such as the background of the study, problem statement, research questions and objectives of the study and the expected benefits from the study. Furthermore, the objective of the study is grouped into primary, theoretical and empirical objectives. The next chapter of the study presents the detailed overview of political and economic background of Nigeria and South Africa, as well as monetary policy and fiscal policy developments and regimes in Nigeria and South Africa that motivated the study.

CHAPTER 2

OVERVIEW OF FISCAL AND MONETARY POLICIES IN NIGERIA AND SOUTH AFRICA

2.1 INTRODUCTION

This chapter presents the fiscal policy and monetary policy environment in Nigeria and South Africa that motivated this study. It is divided into three sections. Section 2.1 gives the summary of political and economic developments in the two countries. It is followed by section 2.2, which highlights the overview of the key fiscal indicators. Section 2.3 examines monetary policy regimes and monetary policy performance in both countries.

2.2 SUMMARY OF POLITICAL AND ECONOMIC DEVELOPMENTS

2.2.1 Nigeria

The modern Nigeria got her 'flag of independence' in 1960 amidst other African nations. However, the democratic system of government was intercepted by a military coup in January1966 (Ayodele & Falokun, 2003:1-560). The country has since then experienced six successful military coups, and a Civil war. The country returned to democratic system of government in 1999 with the adoption of a presidential system of government as adopted at the inception of the second republic in 1979 before the 1983 military coup (Falola & Heaton, 2008:1-243). Nigeria as a democratic nation has been able, peacefully and successfully to hand over power from one democratic government to the other since 1999. The last handover of power witnessed was on 29 May, 2015 where for the first time, a ruling party peaceably handed over power to an opposition party (Afolabi, 2015:42-49).

It is worthy of note that at Nigeria's independence, expectations and hopes throughout the country were great and the capacity for development were boundless (Oko, 2001: 397-410). These were so, because of her abundant resources and her favourable climatic condition which supports variety of agricultural activities. In fact, the developed countries believed in her capacity to champion human and technological civilisation in the continent of Africa (Ogun, 2007:1-200).

Regrettably, the Nigerian economy has remained perpetually underdeveloped. There is massive underutilisation of capitals and other resources. Also, the industry sector of the country is not operating at optimum level (Oko, 2001: 397-410). Despite being abundantly blessed with material and human resources, cost of production remains perpetually high with mounting unemployment (Osigwe, 2014: 1-256). In addition, crude oil is the only natural resource endowment being tapped, and its production has been unfavourably hindered by the crisis in the Niger-Delta area of the country and massive corruption (Osigwe, 2014: 1-256). The International Monetary Fund (IMF, 2002) categorized Nigeria as highly indebted nation with serious problems of servicing the debt despite huge revenue realised from oil. This fact is supported by the current level (2018) of debt stock which is put at $US73 billion (Debt Management Office, 2018). Undoubtedly, these create serious obstacles to national drive for socio-economic and political development.

The peculiar nature of Nigeria's economy since 1970 that is worthy of mention. She heavily depends on petroleum and this is responsible for more than 87 percent of her export and more than 77 percent of the total revenue (NBS, 2015). Volatility in oil as well as prices was also an important feature of the economy in the 1980s.This situation was witnessed again in 2015 (NBS, 2015). Nigeria's development profile shows that endowment of rich and abundant natural resources is not a guaranteed for economic development. Abundant natural resources must be supported with sound macroeconomic policies, purposeful leadership, sound regulatory framework, efficient and functioning judicial system and zero tolerance for corruption (NBS, 2015).

2.2.2 South Africa

The fall of the Soviet Union brought the resolution of many political deadlocks worldwide. For South Africa, 1990 marked the start of political talks to bring full democracy to South Africa (Cassim, 2015:2). South Africa faced enormous political, economic and social challenges and issues of reconciliation and reconstruction. Prior to this period, South African politics were controlled by Afrikaner nationalism (Abedian, 2012:5). Apartheid formally known as racial segregation and white minority rule came into existence in 1960 (Abedian, 2012:5). On 27th of April 1994, after years of struggle and global opposition to apartheid, the ANC gained victory in first democratic election in which everyone could vote irrespective of their colour (Stone, 2006:2*).* Since 1994, the politics of South Africa has been dominated by ANC, in an uneasy alliance with

the South African Communist Party (SACP) and the Congress of South African Trade Unions (COSATU). The peaceful and stable transition of South Africa to democracy was universally recognised as one of the major achievements of the 20th Century *(*Hedley, 2014: 4).

The Reconstruction and Development Programme (RDP), a unified socio-economic plan, was adopted in 1994 so as to transform the economy after several years of the apartheid policy *(*David, 2015:3). The central goal of RDP was to ensure a fair society and entrust equity via re-establishment and economic expansion. The RDP aimed at creating a sound economy and developing human potentials. It also aimed at ensuring fair employment and promotion and ensuring economy at the regional level. The last aim of RDP was to democratise the state and society. These aims were popularly known as the five policy programmes of RDP. More essentially, the policy programmes were aimed at solving various problems of inequality in the economy (Stone, 2006:2). Originally, the 1994 RDP document stated thus "to mobilise all our people and our country's resources towards the final eradication of apartheid and the building of a democratic, non-racial and non-sexist future" (Stone, 2006:2).

Alhough the RDP recorded success in some areas such as social security and welfare system, it however faced serious hitches in several areas such as fiscal and organisational constraint. The hitches could be associated to inefficient public service and lack of state capacity (Cassim, 2015:2). The overall resultant effect of these constraints was the inability of the RDP to deliver the dividends of democracy as was expected. This left South African government in search of alternative economic policies. In 2016, government bureaucracy, restrictive labour laws and inadequate manpower were among the most serious challenges facing the country. However, the banking sector of the country was rated among the best in the world (World Bank Report, 2016). The nation was also ranked among the G-20 (World Bank Report, 2016).

2.3 OVERVIEW OF FISCAL POLICY INDICATORS

2.3.1 Nigeria

An appropriate understanding of the fiscal system of a country demands adequate and coherent explanation on the trend and the pattern of revenue and expenditure over time (Ayodele & Falokun, 2003:20). Nigeria's economy has remained perpetually undiversified from the oil boom days. The

greater share of exports and government revenue has consistently depended on oil (Okonjo-Iweala, 2011:1). Expenditure of government in Nigeria has been fluctuating and highly unstable. The volatility in government expenditure could be associated to the fact that spending of government has been increasing with increase in oil prices and revenue, until 2014 and 2015 declines in oil prices.

Succeeding administrations in Nigeria have continuously recorded high expenditure during oil. The country's loose fiscal policy and fiscal indiscipline aggravated the volatility in prices and revenue. Government revenues from oil and spending increased as oil prices increased (Okonjo-Iweala, 2011:5).

As a result of the fluctuation of expenditure, the fiscal stance of government of Nigeria have been largely in deficits with the exception of 1970s when fiscal positions were surpluses (Sanusi & Akinlo, 2016:125-131). The total budget surplus as a percentage of GDP fluctuated from only 1.5 percent in 1973 to 9.8 percent in 1974 (Okonjo-Iweala, 2011:5; Sanusi & Akinlo, 2016:125-131). The recorded surpluses of the early 1970s were truncated decrease in oil prices at the global market. The total deficit-GDP ratio rose to 7.8 percent in 1978 from 2.0 percent in 1975 because of the inability of the government to adjust its expenditure in response to the declining oil revenue (NBS, 2015).

Capital and recurrent of the federal government were further spiked in the 1980s by the execution of programmes like creation of state and increase in wage (Oko, 2001: 397-410). The newly created institutions required grants and important infrastructures to kick off their operational activities. The resultant effect of this is increase in deficit by up to 5.7 percent of GDP in 1986, and 1993 as well (Ayodele & Falokun, 2003:20). As a result of the falling oil revenue, the gap between declining oil revenues and rising expenditures were financed by means of foreign borrowing and central bank's interventions. Pressures were mounted on the government to cut expenditure because of the unpleasant effects of both sources of financing deficits (Sanusi & Akinlo, 2016:125-131). Financing of the most of the capital expenditures and other infrastructures were halted due to paucity of funds (KPMG Reports, 2015:32).

The return of democratic system in 1999 marked the beginning of another period high expenditures commonly characterised democratic system of government. The oil sector of the economy was

faced with another challenges in 2014 with average daily production falling to 2.2mbpd as against the budget bench mark of 2.38mbpd. On the average, the sector grew only in the first quarter by 5.14% while decline of 6.6 percent and 3.6 percent were recorded in the second and third quarters respectively (DMO, 2015).

The GDP growth rate was projected to be 0.5 percent for 2015 because of the falling prices of oil and challenges of production. An aggregate expenditure of N4.358 trillion was specified in the 2015 budget. This was 8 percent less than the amount for 2014 (DMO, 2015: 11). The more worrisome situation was that recurrent expenditure rose by 6.5 percent while capital expenditure declined by 43 percent. Dejectedly enough, amount expected to expend on debt servicing was proposed to increase. More specifically, debt servicing was proposed to increase by 32.4 percent as against the 20.3 percent in the 2014 budget estimate, (Punch News Paper, 2015).

Conclusively, the deficits' profile of Nigeria has got to an alarming level. The government of Nigeria has been incurring deficits since 1967. The deficits have persistently been increasing and the instant effects are damnable**.** For example, the external debt size as at 2015 was put at USD60billion. Nigeria's external debt rose by $11.77bn between mid-2015 and the mid-2018, (DMO, 2018). Unfortunately, there is no signal that it might decline in subsequent years, especially as the country approaches 2019 which is another election year.

2.3.2 South Africa

At the inception of democracy in 1994, the economy was weak and crisis dominated (South African Act of Parliament, 1994). The budget deficit was said to be historically high in 1994 though with limited exposure to foreign debt (Department of Finance, 1996). The limited exposure to foreign debt was as a result of restricted access to international capital markets prior 1994 (Department of Finance, 1996). The overriding goal of fiscal policy has been to attain and sustain a progressive decline in the budget deficit, reduced government expenses (Department of Finance, 1996). Investment spending was also projected to increase.

Budget deficit that could not be sustained implied cost of borrowing would increase with paucity of funding for essential government programs. However, the budget balance became better as deficit fell 4.8 percent of GDP in 1994 to 0.5 percent by 2005 (IMF, 2010). The aftermath of

budget deficits of the subsequent years made it possible for government to raise her spending without resulting to borrowing. This was partly sequel to improved tax revenue collection. During the worsening economic crisis of 2009, the debt of government increased seriously (Industrial Development Corporation, 2013:10-20). Government had to borrow more in order to finance the increased fiscal deficit.

The economy incurred another huge deficit after 2008/09 and the ratio of debt and GDP was 36.3 percent by 2012/13 (Industrial Development Corporation, 2013:21). After 2000s, government had adopted a counter-cyclical stance. Within the framework of counter-cyclical stance, infrastructural investments, human capital investments, discouragement of importation were seen as important factor for accelerating growth (International Budget Partnership, 2012). The cyclical stance includes stabilisation of expenditures in order to stimulate growth and development (International Budget Partnership, 2012). The level of debt was believed to be viable with various measures being adopted. Consequent upon steady and good budgetary policies, South Africa was able to explore global bond markets with minimum sovereign risk spreads. South Africa was rated second among about 90 countries surveyed in 2012 in terms of transparency and accountability of budget processes (International Budget Partnership, 2012). Nevertheless, Recent rating has not been impressive due to slow growth, increased debt and current account problem.

2.4 MONETARY POLICY REGIMES AND PERFORMANCE

2.4.1 Nigeria

This section of the study examines the various monetary policy regimes in Nigeria and monetary policy performance under various regimes. Monetary policy is an important instrument of economic management and control aimed at attaining certain economic objectives (Nnanna, 2002: 15). Monetary policy intends to achieve the basic macroeconomic objectives which includes full employment, high growth rate, price stability and exchange rate stability. These objectives are known as main goals of monetary policy. The section is divided into the following sub-sections;

2.4.1.1 Monetary Policy Frameworks in Nigeria between 1986 and 2013

The monetary policy framework is commonly referred to various governmental arrangements which enhances the making and executions of monetary policy (Ogun, 2007). As a result, any

meaningful analysis of framework monetary policy is not limited to the confine of central bank (CBN Reports, 2010:50).

Monetary policy management has been described as the mechanism for regulating the supply and cost of money at optimum levels that will ensure the attainment of optimum use of resources, stable price level and high rate of economic growth (CBN Reports, 2010:50). According to Akatu (1993: 325), monetary management in Nigeria is made up of the behaviour Central Bank of Nigeria (CBN) aimed at influencing the availability of volume, direction and the cost of credit in the economy.

The CBN is mandated with the provision of a stable framework for the economic development of Nigeria through effective and transparent implementation of monetary policy as well as the management of the financial sector (Akatu1993:321). Thus, the need to achieve some national economic objectives, the prevailing macroeconomic and socio-political environment and the expediency of the economic situation among other factors have, over the years, determined the particular policy framework adopted in Nigeria.

Numerous factors determine the conduct of monetary policy framework by central bank (Nnanna, 2002:26). These factors include:

- Structural dissimilarities: This is made up structure of the financial system, debt levels and types, trade openness and fiscal restraint, amongst others.
- Indexation Degree: This is associated with economies at various economic integration level integration which need various types of indexation.
- Institutional arrangements: This describes total of institutions that monetary authorities consist of, institutional laws, availability of data and other factors that determine the way in which monetary policy authority responds to changes in macroeconomic conditions.

To set the discussion in perspective, three policy frameworks are identified in Nigeria. They are;

- The exchange rate targeting framework, 1970-1973
- The monetary targeting framework, 1974 – 2001
- The inflation targeting framework, 2002 – 2015

2.4.1.2 The Exchange Rate Targeting Framework, 1970-1973

Nigeria was colonised and ruled by British colonial masters until October 1, 1960, when she gained independence. The dependence on the prevailing economic condition in Britain to manage the Nigerian economy during the colonial government was extended to the post-independence period. The management of monetary activities during the period involved the use of exchange rate, which was fixed at par with the currency of the colonial masters, British pound. The exchange rate part at this period provided a relatively more effective and efficient mechanism for controlling inflation and sustenance of viability in balance of payment (Nnanna, 2002:5).

In 1967, the fixed parity system was interrupted when there was a devaluation of British currency. However, rather than devalue the Nigeria's pound, Nigerian currency was pegged by apex bank to the US dollar with regulation of imports (CBN Reports, 2010:55). The dollar peg was abandoned as a result of global economic crisis of 1970s till1973, when Naira was again pegged to the US dollar. These situations informed the de-facto devaluation of the Nigerian currency despite the fact economic fundamental did not justify the devaluation (Ogun, 2007:193).

The institutional crises of 1966 to 1970 had serious effects on the performance of the economy and altered the trajectory of economic transformation that had begun in the previous years. Public policy in the early 1970s was geared towards legitimising a centralised federal system, entrenching peaceful co-existence and establishing political stability in the country. In the immediate post- civil war era, one strategy of government was concentrated on taking control of the commanding heights of the economy – the strategic sectors, as a means of influencing the pace and direction of economic development (Olaniyi, 2004:275).

The disruption of productive activities by the civil war increased dependency and inflow of petrol-dollars (which were largely monetized due to the quadrupling of oil prices by the OPEC cartel in 1973). It also led to a structural transformation of the economy from its dependency on agriculture to petroleum. A tremendous inflationary trend was experienced in the Nigerian economy from early 1970s, despite huge share of investments in the economy (Ojo, 1992:28).

The monetary authority in Nigeria embarked on restrictive monetary and financial policy during this period in a bid to reduce over-dependency on external sector, as well as to reduce deficit

finance that resulted from civil war prosecution. The monetary policy, at this period, were geared towards restoring the economy by ensuring a healthy balance of payments position, relative price stability as well as sustenance of high real GDP growth rate. The level of growth at this period was 13.18 percent and this rate has not been surpassed since then (Ogun, 2007:35).

2.4.1.3 The monetary targeting framework, 1974 – 2001

The independent conduct of monetary policy in Nigeria especially since 1974 has basically involved monetary targeting. Under monetary targeting, the monetary authority sets the appropriate level of money stock, after which, it observes the actual changes in targeted variables (Anyanwu, 2002:1-230). Then, when the objectives are not being attained, it adjusts its policy instrument (money supply). The monetary targeting policy framework in Nigeria consists of direct and indirect controls (CBN Reports, 2009:30).

- **Direct control, 1974-1992**

As the oil boom continued after the mid-1970s, the role of government in the economy became more pronounced. Moreover, the over-dependence on the crude oil earnings and deficit financing persisted. As a result of these and other factors, the inflationary trend persisted. The Udoji Award of 1974 aggravated the inflationary pressure at the period (Anyanwu, 2002:1-230).

During the 1974 to 1992 period, independent monetary management commenced in Nigeria. The main objective was to enhance rapid and sustainable growth. Thus, interest rate ceilings and credit ceilings were levied on deposit money banks. The sectorial and selective allocation of credits to various sectors of the economy were implemented. Agriculture, manufacturing and construction sectors were preferred first in the selective allocation of credit (Jimoh, 1991:15).

The dominant monetary policy instruments used by the CBN were the credit targeting to the domestic economy and use of low interest rates (Nnanna, 2002: 15). As a result, the monetary authority allocated more credits to the selected (leading) sectors of the economy. This was done to enhance rapid development through credit availability. In an attempt to save the economy from collapse, resulting from severe economic difficulties experienced in the early to mid1980s, the Structural Adjustment Programme (SAP) was adopted in 1986. This was done in order to reform the entire economy (Anyanwu, 2002:1-230). Thus, the dismantling of the direct monetary era,

mainly associated with a fixed system of credit allocation, interest rate regulation and regulation of exchange rate, was embarked upon. The SAP led to various financial sector reforms that was characterised by liberalisation and deregulation of financial system (Ojo, 1992:20). Despite various measures introduced in the economy, the inflation rate during this period remained high. The growth in the real activity was very low compared to the growth in the money supply.

- **Indirect control, 1993 – 2001**

Although SAP was adopted in 1986, the adoption of indirect or market-oriented monetary policy by the CBN required a phased approach. The phased approach for the eventual take-off was slated for 1993. This was necessitated by the need to introduce some institutional, regulatory, technical and administrative measures to enhance the process of monetary policy reforms (Ogun, 2007:80).

Oke (1995:291) hinted that the strategy of SAP was to introduce policies that would increase financial sector competition, enhancing the regulatory power of CBN, advance the structure financial system and combat the financial repression. The introduction of indirect monetary control was subsequently adopted.

The year 1993 (September precisely) championed the elimination of restrictions on credit for banks Likewise, there were various amendments (CBN Decree 25 of 1991, the Banks and other Financial Institutions Decree, BOFID, 25 of 1991; CBN (Amendment) Decree (Number 37, 1998) to give more discretion and autonomy to the bank in the conduct of monetary policy. This thus significantly formed the platform for the pursuit of growth and developmental objectives of price stability amongst others by the CBN (Onyindo, 2000:31).

The operational arrangement for indirect control involves the use of indirect instruments to control and contain the growth of important aggregates. These framework permits the market to determine the interest rates and allocate credit while the monetary authorities target only the monetary base or its components. Among the instruments of indirect monetary policy, open market operation (OMO) is major. Other instruments include reserve requirement, discount window operations and moral suasion (Onyindo, 2000:35).

Unlike the direct control regime, where bank credit was controlled, bank reserve balance is what is being controlled under indirect monetary control. With monetary targeting under the indirect

approach, the CBN aimed at achieving a particular level of base money (or high powered money) which was basically related to the money multiplier by the formula M = mH, where, M is the broad money stock and m and H are money multiplier and high-powered money respectively Oke (1995:293). When the base money is determined, the CBN will then compute the H that needs to be drained from or injected into the banking system to keep money supply growth along the desired path. This level of bank reserves, therefore, serves as the operating target (Jimoh, 1991:17). The difference between the computed optimal level of reserves and actual reserves becomes the target for open market operation within the framework of liquidity management. The discount window then plays the safety valve role by providing the short-run reserve needs of the banking system for meeting short-term liquidity obligations. The market is then left to determine interest rates (Ogun, 2007: 69).

The growth in money supply, M_2, grew rapidly from 19.4 percent in 1995 to 62.2 percent in 2000. The rates were consistently above their projected targets of 10.1 percent and 14.6 percent for 1995 and 2000 respectively (CBN Reports, 2002:25). The growth in monetary stock could be attributed to oil inflows monetization, wages adjustments, and expansionary policy. The average rate of inflation for the period was 19.6 percent - a figure that was above a single-digit target for the macro-economic variable. With 2.91 percent average growth rate of real GDP, the economic performance of the period was rather unimpressive. For instance, rate of inflation was 72.8 percent in 1995, while low inflation target was attained in three years out of nine, between 1993 and 2001 (CBN Reports, 2002:33). The low inflation rate that materialised was attributed to improved agricultural production. Furthermore, growth in real GDP declined considerably from 2.3 percent in 1993 to 0.4 percent in 1999. By 2001, the growth rate was 4.6 percent, a rate that was far below the projected targets of 10 percent (CBN, 2005).

2.4.1.4 Inflation targeting framework, (2002 – 2015)

According to general principle of macroeconomic control under SAP, monetary policy aimed at encouraging liberal financial system for efficient funds mobilisation (Ojo, 1992:18). It was expected that the prevailing economic difficulties would be overcome with this shift to a market-oriented financial system. However, a critical appraisal of the economic performance of the years before 2002 indicated, among other, an unimpressive performance including a severe inflationary

pressure (Omoke & Oruta, 2010: 11). In addition, the growth rates in real GDP in the same period were still below their yearly projections while the share of investment in the GDP remained relatively low. The 72.5 percent rate of inflation in 1995 was and still remains the highest rate of price changes recorded hitherto in Nigeria. Coincidentally, the year 1995 was a period of indirect monetary control (CBN, 2005).

As a result, the CBN modified its development role by preferring price stability to other objectives including output growth. Specifically, the CBN issued a medium-term circular that contained its preparedness to be committed to the pursuit of low inflation rate (CBN, 2002; Omoke & Oruta, 2010: 8). This is consistent with what several countries introduced in the 1990s- measures that focuses on inflation rate stability. This policy is labelled inflation targeting policy.

Inflation targeting is defined as monetary policy arrangements in which apex bank predetermined a target rate of inflation rate and employ all the necessary policies to achieve it. Inflation targeting could be described as the pursuance of a certain inflation rate with or without increase in economic growth. Bernanke, Laubach, Mishkin and Posen (1999:67) submit that countries such as New Zealand, Canada, Israel, U.K, Sweden, Finland among others had used inflation targeting to attain price stability.

The Nigerian experience of inflation targeting is evolving and largely informal. This is because a formal proposal and announcement of the policy would be expected to be made before its implementation. As was the case in New Zealand, which pioneered the inflation targeting policy, the Reserve Bank of New Zealand (RBNZ) set the inflation targets via a Policy Targets Agreement (PTA) between the Reserve Bank and the government. This was done in order to encourage fiscal discipline in the government dealings (Choi, Jung & Shambora, 2003:3).

Prevalence of liquidity overhang was the order of the day in Nigeria (as indicated by the growth in money supply at the rates above the projected rates in most years) since the introduction of SAP. Consequently, the CBN has been treating inflation from monetary perspective which requires the setting of the monetary growth equal or below the desired rate of inflation in order to attain a given level of economic growth. However, maintaining a given level of money stock in Nigeria has been very difficult. Thus, the need for a framework that focuses not only on instruments, but also on goals (CBN, 2003). This agrees with the suggestion by Tella (2004:135), that a more dynamic

approach towards monetary policy formulation and implementation should be adopted in order to grow and develop the Nigerian economy.

Regard the behaviour of macroeconomic aggregates, the results in the few years of inflation targeting are mixed. While the real domestic output growth remained relatively high but unstable, the inflation rate was still high (though it is declining) and double-digit. Monetary growth was about 18.98 percent during the period. The share of investment remained low, compared to the 1970s and 1980s. However, it is too early to make conclusions about the effectiveness or otherwise of the framework.

It is pertinent to note that there are measures to be put in place before such policy can be effective in any economy. These measures include:

- Determination of the precise and definite relationship between rate of price changes and output.
- Estimation of the rate of inflation for target growth rate in the economy.
- Determination of the appropriate measure of inflation for the economy.
- Ascertainment and sustenance of the autonomy of the central bank.
- A commitment to fiscal discipline and agreement to the terms of policy by the fiscal authorities must be sought.

2.4.1.5 Critique

From the foregoing, it can be observed that monetary policy regime in Nigeria has undergone several developments and change, depending on the state of the economy. Despite the development and improvement in successive monetary policy regimes in Nigeria, monetary policy variables have not been impressive. Inflation in the economy remains high and exchange rate has remained largely volatile and deteriorating. It is also worthy of note that the nature of fiscal policy holds serious implications for the optimal performances of monetary policy. This is because fiscal policy influences the inter-temporal solvency of government, and any change of fiscal policy can require changes in monetary policy.

2.4.2 South Africa

The conduct and effects of monetary policy in the middle-income economies such as South Africa vary from one economy to the other (Van den Heever, 1997:1-20). South African Reserve Bank (SARB) which is responsible for the conduct and practice of monetary policy was established in December 1960 (Stals, 1992:1-2). Prior the establishment of SARB, some monetary policy frameworks such as conventional approach to money and credit, conservative Keynesianism had been adopted, most especially from the end of the Second World War. It should be noted that monetary policy conduct during this era was primarily influenced by Keynesian theory and macroeconomic quantification (Stals, 1992: 1-2; Mollentze, 2000:10). Monetary policy aimed at enhancing the capacity of commercial banks for money creation. The Reserve Bank consequently controlled the money stock by regulating the cash reserves (RSA, 1986: A10). The principal monetary policy instruments during this phase were rediscounting and moral suasion. However, discussions in this study consider monetary policy framework and regimes from the establishment of South African Reserve Bank in 1960.

The monetary policy arrangements in South Africa could be classified under five broad frameworks. To set the discussion in perspective, the following policy frameworks are identified:

- Liquid asset ratio-based system with quantitative controls over interest rates and credit, 1960-1981
- Mixed system during transition, 1981–1985
- Cost of cash reserves-based system with pre-announced monetary targets (M3), 1986–1998
- Daily tenders of liquidity through repurchase transactions (repo system), plus pre-announced M3 targets and informal targets for core inflation, 1998–1999
- Formal inflation targeting, 2000

2.4.2.1 Liquid asset ratio-based system with quantitative controls over interest rates and credit, 1960-1981

The monetary policy under this framework is discussed under two different phases:

- **The Technical Committee approach**

Monetary policy framework in this era was initially influenced by the reactions of the Gurley & Shaw and Radcliffe Committee in United Kingdom to the 1950s Monetarists. Gurley and Shaw (1961:56) and the Radc1iffe Committee were of the opinion that money, though a financial instrument does not possess special features that would make money supply changes play a role in defining the behavior of economic events. Technical Committee in 1961 was appointed in South Africa to advise the monetary authorities in respect of making desirable changes to the extant banking laws and building societies. The report of the committee was published in 1961 and the reports laid significant foundation for the Banks Act of 1965. The report of the committee was seen as a new monetary policy approach because it was in conflict with conventional and the revolutionary approaches (Gurley & Shaw, 1961:62).

The Banks Act of 1965 came up with collective legal financial conditions for all the players in financial systems (Truu, 1968: 121). The banks' liabilities were nevertheless from the common statutory financial requirements for all banking institutions. The Act also gave privileges for near-banks to be brought under the watch-light of monetary policy of the reserve bank. In addition, the liquid asset being held by financial institutions was further narrowly defined down. As such, the Reserve Bank could vary as the occasion demand the percentage of liquid assets that all them monetary banking institutions had to observe in relation to their liabilities (SARB, 2011). It should be noted, however, that as laudable as the recommendation of the committee, they did not recommend monetary targets adoption which was at variant to the position of the monetarists.

- **The use of direct monetary control measures**

This period was greatly influenced by Keynesian thought and views. In other words, fiscal policy was the main macroeconomic tool used in the pursuit of macroeconomic objectives (Svensson, 1997:1122). While monetary policy would also play a supportive role. This however was in sharp contrast to the previous post world perspective that monetary policy should serve majorly perform an accommodating function. Stals (1997) described the application of this policy as demand management method under which monetary policy would be used to reduce demand when the economy was inflationary and to stimulate demand when the economy is recessionary. Nevertheless, the idea that the supply of money and interest rate should play a supportive role continued to dominate. The resultant effect was that South Africa adopted direct instruments such as credit ceilings towards the end of 1960s. The consequence of this was the scarcity of credit from

banks and building societies. The direct monetary controls adopted by the Reserve Bank included ceilings on bank credit to the private sector, deposit rate control, foreign exchange control and outright control of hire-purchase and consumer credit (RSA, 1984: 147).

The use of indirect approach of controlling money supply such as open-market was strongly discouraged. Debt control and its financing could also impede the attainment of monetary policy objective. The bank rate was fixed, rediscounting rate and Interest rates were all fixed and hardly changed (Mollentze, 2000:13). The South Africa's financial markets were still underdeveloped and evolving. Market-related control measures had to be discouraged.

2.4.2.2 Mixed system during transition, 1981–1985

This period was characterised with significant changes in monetary policy as it was in most economies. The conduct and practice of monetary policy changed majorly from direct control method to market-based monetary policy (ABSA Bank, 1995:20). The Keynesian demand management approach was dropped however. This was as a result of the argument that demand management approach had promoted instability and volatility in the economy (De Wet, Jonkergouw & Koekemoer,1995:560). De Kock (1979) described the theoretical foundation of the first interim report on exchange rate as a combination of conventional Keynesian demand approach and realistic monetarism. During this period, the Reserve Bank vigorously pursued active short-term stabilization policy. However, majority of the recommendations of the committee were not put into consideration (Meijer, 1997a:5). The monetary authorities purposely began to adopt interest rate variability according to the dictates of invisible hand. Consequently, direct controls measures were gradually being replaced by more market-oriented measures (RSA, 1984: 148).

2.4.2.3 Cost of cash reserves-based system with pre-announced monetary targets (M3), 1986–1998

At the early period of this phase, the endorsements of the De Kock Commission were adopted. The committee also came up with market oriented framework which aimed at enhancing attainment of monetary policy objectives (RSA, 1986: A10).

Reserve Bank (1986) adopted precise growth rates for all monetary aggregates. The rationale for adoption of monetary targeting was to augment monetary policy so as to control inflation. The De

Kock Commission suggested that the instruments such as debt management, policy accommodation, and intervention in global exchange markets. The adoption of these instruments were to be reinforced by other instruments such as quasi-market instruments. The central objective was to curb inflation for larger part of this era. Apex bank deliberately pursued policy to cut interest in order to boost investment in order to speed up the rate of growth.

By 1990, the Reserve Bank began the pursuits of single monetary objective which was to sustain and maintain the external competitiveness of Rand (SARB, Annual Economic Report, 1991: 33). It should however be noted that the external value of a currency is influenced by global economic events which sometimes are not within the control of the domestic monetary authorities. Nevertheless, noticeable success was recorded in this regard as a result attainment and sustenance monetary discipline (Stals, 1992: 1-2 and ABSA Bank, 1995: 3).

2.4.2.4 Daily tenders of liquidity through repurchase transactions (repo system), plus pre-announced M3 targets and informal targets for core inflation, 1998–1999

New monetary policy framework was adopted by the Reserve Bank in 1998 with daily tenders of liquidity through repurchase transactions. Guidelines for money supply were still being proclaimed, but they were not prominent in monetary policy formulation. (Casteleijn, 2003:5; Aron, & Muellbauer, 2001a:8; Aron, & Muellbauer, 2000:13). Emphasis were placed on transparency with the belief that it would increase monetary policy credibility and attainment of price stability.

2.4.2.5 Formal inflation targeting, (2000-2015)

Attainment and sustenance of stability of price has been unanimously recognized as the main goal of monetary policy. There was however contention on how it could be attained. The contention has remained largely unsolved (Van der Merwe, 2004:1). Several countries have assumed inflation targeting as a strategy for attaining price stability. It is on record that it was New Zealand that first implemented this strategy in 1990. This move was followed by other notable countries such as Australia, Brazil, Canada, Chile, Mexico, Sweden and the United Kingdom (Carare & Stone, 2003:12).

In 2000, South Africa announced the adoption of formal inflation targeting as the monetary policy framework. Prior this period, "informal inflation targeting" was already being applied by the South African Reserve Bank. There was emphasis on the attainment of price stability there was no specification of time frame over which this would be achieved (Mboweni, 2004:2).

SARB was able to bring down inflation to lower levels during the practice of informal inflation targeting. For instance, CPI that was moving around 15 per cent by the end of 1980s and the beginning of 1990s came down as low as 5 per cent in 1999 (Van der Merwe, 2004:8). The question is why did the monetary authorities adopt formal inflation targeting despite substantial achievements of informal inflation targeting.

- **Reason for adoption of formal inflation targeting**

According to Reserve Bank (2000), formal inflation-targeting as a monetary policy framework was adopted because of the following reasons:

- Uncertainties about the monetary policy stance commonly associated with informal inflation targeting. For instance, Van der Merwe (2004:10) argued "the growth in money supply and bank credit extension in the 1990s was above the guidelines of the authorities for a considerable period. In these circumstances the public expected an increase in short-term interest rates. However, in analysing the situation, the authorities realised that the high growth in the monetary aggregates was mainly due to structural changes in the economy resulting to a large extent from the liberalisation of the financial system. Contrary to general expectations they accordingly did not apply more stringent monetary policy measures."
- Formal inflation targeting ensures effective and efficient coordination between monetary policy and other economic policies given that the target is not at variant with other macroeconomic objectives.
- Increased monetary discipline and central bank's accountability associated with formal inflation targeting. This is because during formal inflation target, clear targets are set and apex bank must meet the targets by necessity. In case of any deviation between actual inflation rate and the target rate, convincing explanations must be offered by the apex bank.
- Formal inflation targeting directly or indirectly affect inflationary expectations. This in turns ensures reduction in inflation as long as the targets are perceived to be credible by the public.

- **Assessments of formal inflation targeting in South Africa**

Like many middle income countries, South Africa also suffered the effects of rising global oil prices in early 2000s (Van der Merwe, 2004:11). South Africa however was able to withstand the effects than many other countries. Consequent upon the adoption of inflation-targeting, interest rate has been more stable.

Though monetary policy committee was still using money supply as policy variable, it was not prominent again it was in the 1980s and 1990s. SARB began to shift its attention to gradually strengthening of foreign reserve holdings. As a result, SARB was able to finance easily the current-account deficit by means of foreign direct investment and other inflows. The balance of payments significantly improved and there was increase in the value of rand in early 2000s.

The inflationary forces were lowered by exchange rate appreciation and this trend was also notable in the 2005-2006 period and again 2009-2010 periods and high level of reserve accumulation. It should be noted that there must be an efficient communication to all concerned parties when adopting inflation targeting as a policy. Consequently, SARB was always communicating its policy direction to all the concerned parties

It must be noted that appropriate econometric models which is made up of important policy variable are important aspect of an inflation targeting framework. The apex bank often makes available to the public the models used to forecast and predict monetary policy variables. IMF report South Africa (2007) states that reduced inflation and lowering real interest rates were all notable effects of inflation targeting in South Africa. The growth rate had been more steady until recently when it entered recession in 2018. Remarkably, South Africa was rated as largest economy in Africa in GDP terms in 2015. However, problem of unemployment and poverty incidence are still high.

2.4.2.6 Critique

From the foregoing, it can be observed that monetary policy regimes and performances in South Africa have undergone several developments and change like that of Nigeria. Unlike Nigeria, monetary policies variables have been relatively better compared to Nigeria. The value of the Rand has been relatively stable. However, inflation in the economy has been gradually increasing and

average price level could be said to be relatively unstable compared to what it was in early 2000s. Recent upsurge in corruption trend in the country could be said to be undermining the performance of monetary policy variables and largely contributing to their deterioration.

In addition, the current increase in inflation in the economy has contributed to a significant fall in the value of the rand. High inflation discourages foreign investments by wiping out the benefits of high interest rates to foreign investors. Current account deficit is also among factors perceived to contribute to dismal performance of monetary variables in South Africa. The deficits in the current account becomes bigger when capital outflow is less than capital inflow. In addition, the inability of monetary authority to guard the economy against the external shocks and imbalances contributed significantly to woes of Rand. For instance, 26 percent of the value of the Rand were lost in six months after the Chinese economic crisis of 2015. This occurred because Chinese's apex bank suddenly devalued Yuan which altered the way it was traded with other currencies.

2.5 SYNOPSIS

This chapter revealed the political and economic development in both Nigeria and South Africa. The chapter also gave insight into fiscal and monetary policies development in both countries. It is evident from the fiscal profile of Nigeria that her deficits have reached a level of deep concern to many and the deficits profile in South Africa has been growing upwardly, and the public especially the researchers and policy makers, are beginning to be worried. On the other hand, looking at the growth rate of inflation and the relative exchange rate stability, monetary policy management in South Africa seem to be better than that of Nigeria, especially with the adoption of inflation targeting in South Africa.

The next chapter of this study provides in-depth insights into the theoretical and empirical literature. Existing related theories on fiscal and monetary policy are reviewed. In addition, empirical studies on this subject matter were synthesised to provide clear understanding of the state of knowledge on the subject matter of fiscal and monetary policy interactions.

CHAPTER 3

LITERATURE REVIEW

3.1 INTRODUCTION

This chapter specifically reviews theoretical and empirical issues on the relationship between fiscal and monetary policies interdependence. Section 3.2 presents the conceptual clarification of the study while Section 3.3 deals with theoretical issues on the Keynesian and Monetarists perspectives of fiscal policy. Section 3.4 reviews relevant theories on monetary policy. Section 3.5 provides detailed review of empirical studies, while section 3.6 provides the synopsis of the chapter.

3.2 CONCEPTUAL CLARIFICATION

3.2.1 Fiscal policy

Fiscal policy can be described as the usage of spending and taxation to impact the economy (Giavazzi & Pagano, 1990:75-111). Governments classically employ fiscal policy to stimulate sustainable growth and lessen poverty (Alesina & Perotti, 1995:205-248; Baxter & King 1993:315-334). When the government alters the levels of taxation and spending, it affects aggregate demand and the level of economic activity. Fiscal policy can be used to stabilize the economy over the course of the business cycle. The principal fiscal policy variables include government expenditure, revenue, debt, and deficits (Alesina & Perotti, 995:205-248).

There are two basic types of fiscal policy:

Expansionary fiscal policy: Expansionary fiscal policy is the most widely used type of fiscal policy. The government either increases spending or reduces taxes and can possibly change both. The idea is to stimulate aggregate demand. This invigorates demand which makes businesses to efficiently function and create jobs. Expansionary fiscal policy is normally adopted during economic recession to stimulate the economy out of recession (Giavazzi & Pagano, 1990:75-111; Giavazzi & Pagano, 1996:75-111).

Contractionary fiscal policy: This involves reduction in government expenditure and increase in government taxes or revenue. This is mostly adopted when the economy is overheated or inflated. In order to keep the economy at the sustainable path, government expenditure can either be cut, or taxes raised or combination of both (Giavazzi & Pagano, 1990:75-111; Giavazzi & Pagano, 1996:75-111).

3.2.2 Monetary policy

Monetary policy can be defined as set of measures and actions deliberately and consciously developed by monetary authority on behalf of government to influence the volume, the cost and the direction of credit in the economy (Sims & Tao, 2006:54-81). Monetary policy is one of the prime policies by the authority regularly influence the speed and course of economic activities (Sims & Tao, 2006:54-81; Clarida, Galı & Gertler,1999:1661-1707).

Monetary policy is spelt out by the central bank. It embroils control of money supply and interest rate. Monetary policy is used government of a country to realize macroeconomic intentions such as inflation, consumption, growth and liquidity. The types of monetary policy available to central banks include:

Expansionary monetary policy: This involves lowering the cost of credit in order to increase the volume of money in the economy. When monetary authority lowers the cost of credit by reducing the monetary policy rate (MPR), the rate at which investors and business owners access loans through the deposit money banks (DMBs) increases. This consequently stimulates the level of economic activities in the economy (Sims & Tao, 2006:54-81).

Contractionary monetary policy: This involves raising the cost of credit in order to increase the volume of money in the economy. When monetary authority raises the cost of credit by increasing the monetary policy rate (MPR), the rate at which investors and business owners access loans through the deposit money banks (DMBs) decreases. This consequently contracts the level of economic activities in the economy. This is mostly adopted when an economy is over-heated (Sims & Tao, 2006:54-81).

Fiscal and monetary policy interdependence: The dependence of monetary policy and fiscal policy on each other is known as fiscal and monetary policy interdependence (Canzoneri, Cumby

& Diba, 2001: 1221-1238; De Resende,2007:1-36). However, within the contest of this study, fiscal and monetary policy interdependence is seen as to what extent is monetary policy depends on fiscal policy. In other words, to what extent is the principal objective of monetary policy inhibited or constrained by fiscal policy.

3.3 FISCAL POLICY THEORY

3.3.1 The Keynesian perspective of fiscal policy

Keynesians consider that the economy is intrinsically unsteady and they believe markets do not adjust swiftly to equilibrium level (Keynes, 1936). As a result, Keynesians do not believe in the proposition of quantity theory of money (Angeriz & Arestis, 2007:863-884). Keynesians assumed that economy is subject to serious fluctuation and regular unpredictability. Keynes′ theory recommended that dynamic policy would be useful in controlling the economy. The Keynesians proponents argued that governments must tackle economic problems in the short-run instead of relying on market forces to solve the problem in the long run, because "in the long run, we are all dead" (Keynes, 1936).

Keynesians rely primarily, on the roles of fiscal policy to soothe the economy (Kitschelt & Streeck, 2004,1-34). Conversely, they argue that if a monetary policy is to be retained, then fiscal policy must be conducted so that an independent monetary authority is not forced to adopt an extreme policy of ease or restraints. In addition, fiscal policy must provide required stimulus when aggregate demand departs too far in either direction from the full employment level (Taylor, 1993:195-214).

3.3.2 The monetarist view on fiscal policy

Monetarism is a school of thought that argued that supply of money can be used to influence the level of economic activities (Sellon & Weiner, 1996:5-24). This school of thought was led Milton Friedman and summarize that uncontrolled money expansion produces inflation, and hence the main duty of monetary authority should be to sustain and attain price stability (Friedman, 1968: 16).

They argue that nominal GDP is mainly determined by supply of money in the short run and the price level is a major determinant in the long run (Friedman & Schwartz, 1963:1-860). They are of opinion that regulation of money must not be abandoned to the choice of central bankers. The apex bank must maintain money supply that would equate the growth rate of real GDP, while keeping the price level constant.

Conclusively, monetarists do not believe in government intervention and have much faith in free markets and as such conclude that fiscal policy is counterproductive and highly inefficient (Friedman, 1968: 16). As a matter of fact, they posit that where fiscal could be a bit useful, monetary policy would definitely function better. Unchecked intervention of government only inhibits the efficient functioning of free markets and promote bureaucratic tendencies. Automatic stabilisers are believed to be capable of stabilising the economy (Friedman & Schwartz, 1963:1-860).

Monetarists view pure fiscal policy as an impotent cure, not only for unemployment resulting from minor recessions, but also for inflation. Suppose, for example, that taxes increased to reduce excess aggregate demand; of course, the purpose of this policy is to reduce disposable income, thereby decreasing consumption expenditure (Selgin &White, 1994:1718-1749). If however, the government holds expenditure constant, a tax increase will mean that fewer government bonds will be sold to the private sector (Taylor, 1995:151-170). This in turns will cause the price of bonds to rise and the interest rate to decline. Those institutions and individuals who would have bought these government bonds now hold funds in an amount that is exactly equal to the increase in taxes**.** If they lend these funds to business firms or to households, the resulting expenditures will indirectly offset the decrease in consumption (Sabatè, Gadea, & Escario 2004:309-331). Monetarists raise another serious objection to fiscal policy based on the fact that such fiscal policies as tax increases or decreases are legislated to cure temporary deviations from internal balance and are therefore temporary themselves (Us, 2004:1003-1013).

3.4 MONETARY POLICY THEORY

The core and foundation of contemporary postulations in both fiscal and monetary policy theories is quantity theory of money. Any meaningful discussion on monetary theory begins and ends with

adequate and sufficient exposition of quantity theory of money. This section of the study is devoted to critical discussion on quantity theory of money.

3.4.1 Background to quantity theory of money

Quantity theory of money is one of the earliest economic theory (Pigou, 1917:38-65). The theory however has undergone substantial modification, explanation, revision, and addition in the late 17th and 18th centuries, the theory was unified with the mainstream of conventional monetary position (Pigou, 1917:38-65). The quantity theory served as major conceptual framework in the analysis and the interpretation of financial events during this period (Walsh, 2001:1-27). Championed by leading and foremost scholars such as Karl Brunner, Philip Cagan, Milton Friedman among others, the succeeding monetarists continue to explicate quantity theory supposition but not entirely different from the position of the earliest proponents (Samuelson, 1956:3-21). However, the quantity theory has been seriously and vehemently challenged. As controversial as it was then, the quantity theory is believed to have generated greatest debate than other topics in monetary economics and the contentions had not significantly reduced. (Samuelson, 1956:3-21; Panico, 1997:61-86). Some of the issues raised in the earliest debate still appear in the contemporary disagreements between the monetarist and post- Keynesian schools of thought (Angeriz & Arestis:863-884).

3.4.2 Quantity Theory of Money

The historical foundations of the theory broadly consisted of a hypothesis that the stock of money equals price multiplied by real income to be combined with a concept of velocity (Friedman, 1968:1-17). However, these components can each be given a number of different meanings which must be made to correspond. The theory states money value is determined largely by changes in its quantity (Friedman, 1968:1-17). An increase in the volume of money would raise the price level and vice visa (Friedman & Schwartz, 1963a:32-64). The quantity theory of money according to Friedman & Schwartz (1963b) consists of the following sets of interrelated propositions.

The proportionality proposition: This proposition argues that that price would always change by equal change in money supply. The proposition comes from the belief that people would want to hold cash for transactions needs (Bewley, 1983:1485-1504). This is because the cash holders

consider the purchasing power as more important than the nominal money value, the price level would therefore be equal in proportion to the quantity of money required to sustain the real balances (Blanchard, 1990:779-835; Bohn, 1991:249-266; Boschen & Mills, 1995:24-44).

Causal proposition: Another important postulation of the quantity theory is that the causality runs from money supply to price level and not the other way (Friedman & Schwartz, 1963b). Hence money is seen as an active variable while price is perceived to be a passive variable (Friedman, 1968:1-17). The implication of this is that the proportionality condition between money and prices is taken as an equilibrium condition created by automatic stabiliser (Brock, 1974:750-777). For the automatic stabilisation to surface, nevertheless, there is need for transmission channels from money to price level. Monetarists were able to identify two major channels through which impulses are transmitted. They are *direct expenditure* and *indirect* interest rate mechanisms (Cagan, 1956:25-117). The direct channels can be defined as the process by which the effect of change in money supply is transmitted to the price level through previous impacts on the demand for goods. The major link here is that the nature of relationship between spending rate, and the differences between actual and desired real balances. Changes in spending rate is the means by which actual real cash balances would be adjusted to the liquidity preference of people (Blanchard, 1990:779-835). Cash holders would have more money than their liquidity preference, this would make them want to eliminate the remaining through spending. Because economy is operating at optimum level, upsurge in spending would induce prices. The direction runs directly from money to spending and consequently to prices (Calvo & Guidotti, 1993:667-668).

On the contrary, the indirect channels can be defined as the process by which changes in money supply affects spending and prices indirectly through the previous effect on the interest rate (Friedman & Schwartz, 1963a:32-64). Here, an increase in money supply induces interest rate to fall. A fall interest rate causes upward pressure on investment, and as a result, increase investment spending causes upward pressure on prices (Calvo & Guidotti, 1993:667-668).

The neutrality proposition: A third proposition states that, except for transitional adjustment periods, monetary changes exert no influence on real economic variables, for example., total output, employment, and the product-mix (Friedman & Schwartz, 1963a:32-64). These variables, it is argued, are determined by basic non-monetary conditions such as tastes, technology, resource

endowments, and rates of technical substitution between factor resources. As the quantity of money in no way alters these fundamental conditions, it follows that monetary changes are neutral in their long-run effects on real variables (Brock, 1974:750-777). In brief, money is thought to be merely a veil, obscuring but not affecting the operation of real economic forces. Note, however, that the neutrality postulate, like the proportionality postulate, refers only to long-run equilibrium (Clarida, Galı & Gertler, 1999:1661-1707). During the short-run transition to equilibrium, monetary changes very definitely can have non-neutral effects on real variables (Friedman & Schwartz, 1963a:32-64). For example, during the transition period there may be wealth-distribution effects stemming from the failure of some cash holders to get their pro rata share of additional money and from the impact of unanticipated price-level changes on the real value of fixed dollar financial claims. These distribution effects will alter the composition of demand and thus the structure of production. Moreover, some commodity and factor prices may adjust more swiftly than others may do, thereby altering relative prices (market exchange ratios) and thus relative quantities of real variables (De Gregorio, 1993:271-298). The quantity theory does not deny that money changes may influence resource allocation in the transition period. What it does claim, however, is that these non-neutral effects are temporary and that they will vanish in long-run equilibrium when the economy has adjusted fully to the monetary change (Friedman, 1968:1-17).

Monetary theory of the price Level proposition: The neutrality proposition states that changes in the quantity of money affect only the price level. This proposition however is not sufficient to rule out the possibility that non-monetary variables may also be important determinants of price (Friedman & Schwartz, 1963b). An additional condition must be invoked. Accordingly, a fourth postulate states that the price level itself tends to be influenced predominantly by changes in the quantity of money. The implication is that price level instability stems principally from monetary rather than non-monetary disturbances (Friedman & Schwartz, 1963b). Thus, inflation and deflation are largely attributed to the erratic behavior of the money stock rather than to non-monetary causes originating in the real (commodity) sector of the economy. It should be noted that the fourth postulate refers to the general price level and not to relative prices, i.e., relationships among the prices of individual commodities (market exchange ratios) (Friedman, 1968:1-17). Quantity theorists readily admit that non-monetary influences for examples, technological progress and productivity change, crop failures, embargoes, and other disruptions in the supplies

of food and raw materials; monopoly power excise taxes and the like-can directly affect relative prices (Selgin &White, 1994:1718-1749). However, they argue that such non-monetary influences induced changes in the prices of some commodities, which are often likely to be balanced by opposite changes in the prices of others, leaving the average price level unchanged (Selgin &White, 1994:1718-1749). They hold that it is usually monetary shocks, not real-sector disturbances that exert the dominant effect on the general level of prices (Fuhrer, 1996:1183-1209)

Exogeneity principle: Another proposition of quantity theory is that the stock of money is influenced and determined by supply factors (Friedman & Schwartz, 1963b). The principle meant that money quantity is an independent variable, if otherwise and influenced by the demand, the proponents would not be able to justify that money supply is an important determinant of price (Friedman & Schwartz, 1963a). However, exogeneity principle deals more with nominal money stock rather than real money stock (Friedman, 1968:1-17). The real stock of money is assumed to be an endogenous variable influenced by the level of demand (Geweke, 1986:1-22; Fuhrer, 1996:1183-1209). Quantity theorists had maintained from the time immemorial that stock of money is largely influenced by other variables that are non- demand in nature (Clarida, Galı & Gertler, 1999:1661-1707). By this, they meant that nominal stock of money is exogenous in nature (Friedman, 1968:1-17). During the gold standard era, stock of money was assumed to be mainly determined by past and current account balance and gold production. However, after paper money was introduced, money stock was assumed to be determined mainly and exogenously by central bank (Goodhart, 1994:139-187).

This interpretation of the central bank as the exogenous controller of the money stock, it should be pointed out, assumes the existence of stable links between the base of high-powered money created by the central bank, and the deposit and bank note money generated by the commercial banking system (Goodhart, 1994:139-187). These stable links are necessary, if the total money supply is to behave exactly as its exogenously determined component, the monetary base. Generally, quantity theorists have argued that these stable links exist (Boschen & Mills, 1995:24-44). Quantity theorists also have employed the notion of stable linkages to minimise the problems that money substitutes may pose for monetary regulation and control. The quantity theory has never denied that near-moneys may influence spending and prices just as money do (Hoffman, Rasche & Tieslau, 1995:317-339). What the theory has denied, however, is that the volume of money

substitutes can expand or contract independently of the volume of money and thus act as an autonomous influence on the price level (Goodhart, 1994:139-187). Instead, money and money substitutes are thought to be related via a stable link so that variations in the former will be accompanied by roughly proportional variations in the latter.

3.4.3 The Keynesian challenge to the quantity theory

Keynes (1936) propounded analysis of income and expenditure which was seen as another way to interpret nominal changes in income. Keynes vehemently opposed the quantity theory which was delivered to him by Marshall and Pigou, and of which he had initially made some contributions. Keynes did not see the quantity theory as a policy tool and its theoretical assumptions were also rejected by him (Keynes, 1924: 65; 1930:146-54). Keynes opposed quantity theory based on three reasons. His fundamental opposition to quantity theory can be abridged in three suggestions:

- He opposed the two assumptions which the stable velocity depends on

Keynes believed that assumptions of price flexibility and optimality are unrealistic. Keynes argued that prices could be upwardly flexible but downwardly rigid due to several institutional factors in the economy. Also, Keynes (1936) believed assumption of full employment is false as there will always be certain level of involuntary unemployment in the economy. The quantity theorists believed that output is mainly influenced by employment and that economy would be constantly at equilibrium, then output level would remain unchanged at the equilibrium level (Keynes, 1924: 65). Keynes opposed this assumption that economy would always operate at optimal but rather argued suboptimal level is highly possible in the economy

- Empirically, prices would be taken as inflexible (Keynes, 1930:217-230). Keynes (1930:217-230) divided economy into two components: the real and monetary sectors of the economy. He argued that real factors determine the employment and output level while monetary sector determines prices. Keynes argued that money was just a veil and plays no part in determination of output and employment. Keynes (1930:217-230) argued that transaction desire cannot be the only reason why people demand for money. This argument could be regarded as Keynes second opposition to quantity theory. Keynes (1936:1-257) argued that demand for money was largely speculative rather than transitionary.

- Keynes argued that demand function has the form of liquidity and hence assumption of velocity constancy is not valid. This is fundamental for the first two propositions. Total liquidity preference at zero interest rate is essential for the first proposition. Complete liquidity preference when the interest rate is at the orthodox level justify the reasons why Keynes saw the quantity equation of being incapable for formulating policy or for forecasting fluctuations in the short run.

In summary, Keynes (1936:1-257) did not accept quantity theory on three grounds. He opposed conditions required for velocity to be invariant. Thus, the submission on assumption of proportionality could not be valid. Also, conjecture that transitionary need is the main reason why people hold money was rejected. lastly, Keynes believed that output level cannot be taken to be constant.

3.4.4 The Keynesian theory of money

Theory of money, propounded by Keynes, is known as liquidity preference theory. Nonetheless, the title did not capture all his contributions to discussions on money theory. Out of all the major functions of money, store of value function, standard of deferred payment function and its function as medium of exchange were duly accepted by Keynes. Thus, he came up with three major reasons for money demand which are transitionary purpose, the precautionary motive and the speculative motive (De Vecchi, 1995:15). This forms the major bedrock in the discussion of money demand.

The major contribution of Keynes to the discussion on money demand is in speculative demand and the consequent liquidity preference proposition. Speculative demand for money connects both interest rate and the demand for money. Keynes argues that interest rate is determined in the money market as opposed to loanable funds market. Consequently, Keynes (1936:1-257) believed that nobody would hold money except for its income generating or earning capacity. Keynes was of the opinion that people would only part with money if the reward of doing so is high. As a result, theory of money by Keynes depends on function of interest rate as a price of being willing to part with cash. The major objective of Keynes was to challenge assumption of stability of full employment steadiness. Keynes believed that since interest rate determines saving, consumption, and investment, flexibility in interest rate would never guarantee full employment.

In the analysis of Keynes, money could not be said to be a veil concealed in the real sector operation. He argued that interest rate is a prime determinant of money demand. The balance of supply and demand for money in turns determine interest rate which consequently affects the real economic variables. Keynes (1936:1-257) resolved that interest rate determines speculative demand for money and that the relationship is indirect and unstable.

Keynes (1936:1-257) expresses the rate of interest as a degree of the refusal of people with cash balance or money to do away with their control over their liquidity. It can be defined as the price which balances the quantity of cash available with desires to hold wealth in liquid form. Therefore, liquidity preference, in the analysis of Keynes (1936:168), is a probable or practical tendency, which determines the money quantity that would be held by the public when the rate of interest is assumed. Keynes (1936:1-257) contended that everyone does not possess similar expectations about the future interest rates. Demand for money increases as interest rates decline because of the future expectation about the interest rate.

With fall in current interest rate, increasing number of people expect that interest rates would experience future increase, the resultant effect is increase in speculative demand for money balances rather than bonds (Keynes, 1936:1-257). This conclusion is in conformity with Keynes' personal degree of acceptance methodology to expectations but is at variance with the commonly held views of a diversified portfolio as a logical reaction to uncertainty. Attempts to explain a downward sloping money demand function, as a result of transactions demand responding to the interest rate, overcame the unappealing aspects of Keynes' approach, but only by abandoning any place for speculative balances and interest expectations in monetary theory (Baumol, 1952: 545–556; Tobin, 1956, 241–247).

In summary, Keynes' theory restates money demand theory as being composed of transaction, precautionary, and speculative needs. Consequently, Keynes (1936:1-257) documented the essence of money as a store of value, a standard of deferred payments, and a medium of exchange. Keynes' investigation of the elements that influence the speculative demand for money creates the presence of nonlinear association between the speculative demand for money and the rate of interest, principally because of the presence of uncertainty. Therefore, monetary variables determine the rate of interest instead of real factors alone as contended by classical economists.

The classical dichotomy is eradicated, and steadiness at full employment level of resources would be unattainable because what determines decisions about businessmen's investment are not similar to what determines decisions of consumers about saving and consumption (Keynes, 1936:1-257).

3.4.5 The monetarist revival of the quantity theory

The Keynesian revolution overwhelmed the traditional quantity theory and for a long time, its acceptance was so complete that it could not be challenged (Woodford, 2001:669-728). There was however a change of thinking with the rapid monetary growth and high rate of inflation in1970's (Woodford, 2001:669-728). Friedman (1977a:365-387) adopted an empirical method to the quantity theory and submits that the quantity theory is a simplification that alters the desired real balances and deals with outcomes of actions triggered by prior changes in supply of money. He articulates that the greater proportion of changes in level of prices was induced by change in money supply. This analysis has been known as the modern quantity theory. The modern quantity theory could be said to be developed by Cambridge formulation of the quantity theory (Friedman, 1977a:365-387; Friedman, 1977b:293-335).

The modern quantity theory is concerned with the determination of the money income incorporating prices and output as contained in Cambridge cash balance formulation of the quantity theory (Kohlscheen, 2014:69-96). Both traditional quantity theorist and modern quantity theorist view money as an asset, looking at the demand for money in terms of an exercise in portfolio selection (Woodford, 2001:669-728). However, the range of assets considered in this portfolio selection exercise differs considerably between the two. Friedman (1977a:365-387), at the forefront of the modern quantity theory, outlines a stable demand for money and its determinants. In doing so, Friedman (1977a:365-387) distinguishes between different uses for money; as an asset and as a factor of production, by considering separately the demand for money of ultimate wealth holders and of business enterprises.

Friedman (1977a:365-387) said that the demand for money was determined by several variables. The first according to Friedman (1977a:365-387) is total wealth in its capacity as a budget constraint in determining resources available for distribution among different assets. Given difficulties in measuring total wealth, income tended to be used as a proxy for it, but Friedman preferred a concept of permanent income. This is because Friedman (1977a:365-387; 1977b:293-

335) believed nominal income is too prone to year-to-year fluctuations and because he believed that permanent income provided a more realistic base for consumption. Secondly, he considered the division of wealth between non-human and human forms. This is particularly relevant because non-human wealth is more liquid and human wealth tends not to be readily realisable into non-human wealth borrowing on the collateral of earning power is limited (Goodhart, 1994:139-187). Hence the higher the ratio of non-human to human wealth the higher the demand for money is likely to be. The third variable is the expected rates of return on money and other assets. The modern quantity theory sees money as being a substitute for a wide range of other assets and so it must consider the net yield attached to money and these other assets (Kohlscheen, 2014:69-96). Money will have a convenience yield and a negative yield equal to the rate of inflation and perhaps net charges or interest if it is held on deposit.

The yield of other assets will consist of currently paid yields and the possibility of a capital gain (Yun, 1996: 345–370). Arbitrage between these assets will tend to equalise the yields at the margin so that the interaction of these factors will affect the demand for money. Finally, Friedman mentions various other factors determining the utility attaching to services rendered by money to those rendered by other assets. He included variables such as expectations on future degree of economic stability and variability of the rate of inflation. Friedman (1977a:365-367) showed that the demand for money depends on a whole range of factors which change gradually. Hence a stable demand for money is asserted. The importance of this point stems from the fact that the supply of money was capable of extreme volatility. An independent supply of money and demand for money is posited so that money stock changes were seen to have an impact on the economy (Friedman, 1977b:293-335). It is of interest, therefore, to note that the transmission mechanism suggested by the modern quantity theory is similar to that of the traditional quantity theory except that it involves a much wider range of assets in the course of adjustment. Consider then a rise in the money stock. People now have excess money balances and they seek to get rid of them as the yield to money at the margin is now lower (Fahr & Frank, 2010:812-840).

Consequently, they move into other assets. By doing so the prices of these assets rise and the yield falls at the margin, so that different assets are now preferable. This process is deemed to continue until the net yield of all types of asset (including money) is equalised. Part of the extra money will be held and part of it will have been channelled into financial assets and commodities. Through

this adjustment process, the money that was channelled into commodities will lead to prices rises. Hence modern quantity theory is the empirical declaration that changes money demand proceeds to be the outcome of actions produced by initial changes in money supply while changes in the money supply could take place without changes in demand (Zha, 1997:26-23).

3.5 EMPIRICAL STUDIES

Earliest studies on monetary policy believed that fiscal policy does not significantly affect monetary policy. It is believed the duty of fiscal policy is to determine government's budget and monetary authority should determine the money supply and interest rate. The deduction from this assumption is that monetary authority should exercise control over the monetary base so as to manage inflation. This also implies that seignieorage is determined by monetary authority. Consequently, price would be determined by monetary authority while fiscal authority would ensure that government budget is balanced. This is termed monetary dominance (Leeper, 1991:129-147; Sargent and Wallace, 1981:1-17). Under this arrangements, deficits could not provoke future inflation.

On the other hand, there could also be a condition in which fiscal policy is active while monetary policy is passive. The inherent connotation is that the fiscal policy determines surpluses and deficits with no worrying for budget balancing. When tax revenue and debt are inadequate to finance government's expenditure, creation of money is often used to finance deficit. This is called fiscal dominance hypothesis.

The first empirical study that sets the ball rolling on how monetary policy behaviour could be hampered by balancing of budget constrain was carried out by Sargent and Wallace (1981:1-17). They came up with idea of “unpleasant monetarist arithmetic” which represents an attempt to use monetary policy for disinflation in a model of fiscal dominance as if it were a model of monetary dominance. By “unpleasant monetarist arithmetic”, they described the ineffectiveness of monetary policy when there is fiscal dominance. By implication, fiscal dominance hinders the efficacy of monetary policy in attaining its overriding objective.

Meanwhile, Kuttner (2002:1-31) submits that discussion on fiscal and monetary policy interactions could be classified under three research fields. This he argues responsible for majority of empirical

efforts on this discussion. The first set of empirical studies on this research field deals with effects of fiscal policy on monetary policy goals. The second is concerned with the consequences of interactions between fiscal and monetary authorities while the third set deals with the effects of fiscal and or monetary policy on output level and demand.

There has been an increasing study on the fiscal dominance analysis though the evidence has been largely contentious. Limited empirical efforts are from Nigeria and South Africa. Joines (1986:329-351) carried out an extensive review of the empirical studies on fiscal dominance and submits that there is high level of contention on fiscal dominance analysis. Meanwhile, this conclusion has remained largely unchanged. In other words, evidence on fiscal dominance is still largely debatable and controversial. Aiyagari and Gertler (1985:19-44) investigates the amount of government debt that is backed by fiscal policy. The amount was regarded as an extent to which monetary policy accommodates fiscal policy. De Resende (2007:1-36) utilised panel data to investigate fiscal dominance hypothesis and he concludes that fiscal dominance degree was higher in developing countries than emerging and developed economies. The submission of De Resende (2007:1-36) was earlier corroborated by Fry (1998:521-529) as he also found that fiscal dominance is more prevalent in developing economies. In the same vein, Favero and Spinelli (1999:43-71) examined the relationship between money growth and deficit in Italy. They found that growth of money is largely influenced by deficits, confirming the hypothesis of fiscal dominance. This position was further confirmed in Italy by Frattiani and Spinelli (2001:252-272). They present a longer record of fiscal dominance and money growth. They argued fiscal dominance has been a serious threat to monetary policy in Italy. Another study from Italy by Gallo & Otranto (1998:252-272) reached the conclusions, but in particular argued that monetary growth is influenced by investment. This is consistent with findings of Zoli (2005) and Sabaté *et al.* (2004:309-331).

On the contrary, evidence of fiscal dominance could not be established by Melitz (1997:20-35). He investigated 15 European Union countries and OECD from 1960 to 1995. He argued that monetary policy becomes tightened during fiscal indiscipline. This submission suggests existence of monetary dominance. This position was corroborated by Favero (2002:1-30). Evidence of monetary dominance was also established in US by Favero and Monacelli (2003:1-28). Tanner & Ramos (2002:1-21) followed the techniques of Bohn (1998:946-964) and made use of traditional VAR model to make a distinction between monetary dominance and fiscal dominance. They

argued that if there is positive relationship between primary surplus and liabilities, then there is monetary dominance. If otherwise, there is fiscal dominance. Tanner and Ramos (2002:1-21) finds evidence in favour of monetary dominance in Brazil.

However, Canzoneri *et al.* (2001:1221-1238) state that under monetary dominant era, the relationship between primary surplus and liabilities may not always be positive. Canzoneri *et al.* (2001: 1221-1238) therefore came up with new method to test the relationship between primary surplus and liabilities. They submit that if primary surplus does not suffer autocorrelation problem, fiscal dominance hypothesis would be a negative relationship between surplus and liabilities. If otherwise, positive relationship would amount to fiscal dominance instead of monetary dominance.

Us (2004:1003-1013) investigates the dynamics of inflation using Vector Auto-regression (VAR) analysis in Turkish economy, the study shows that inflation comes mainly from the increases in public sector spending financed by creation of money base. They submit that political misconduct and fiscal indiscipline are responsible for increased government spending and consequently leading to inflation. This suggests the existence of fiscal dominance in Turkish economy. Empirical studies in Greece also corroborated this position. For instance, Lazaretou (1995:28-50) established the evidence of positive association between public spending and seigniorage during the study period.

Uncontrollable expenditures of government were associated with incessant fiscal imbalances which mostly lead to fiscal dominance burden. Studies from Zimbabwe had recognised unnecessary expenditures of government as the singular cause of fiscal deficit which is funded by seigniorage, thereby provoking inflation (Makochekanwa, 2011:49-59). This position was supported by Bajo-Rubio *et al*. (2009:525-539). They argued that sustainability of fiscal policy promotes fiscal dominance. Similarly, Agha and Khan (2006:1-20) using co-integration analysis suggest inflation is associated with fiscal imbalances and other deficit financing sources. The VECM results depicts that inflation was caused by government borrowing and fiscal deficits.

Keen and Wang (2013:789:793) made use of DSGE model to examine the relationship government debt and monetary policy in Portugal. The finding shows that apex bank is passive as it attempts to accommodate government debt. Meanwhile, some studies have extended consequences of fiscal dominance to discussion of exchange rate performance. Kohlscheen (2014:69-96) explored the

effects of monetary policy shocks on the exchange rates of Brazil, Mexico and Chile. The result shows that exchange performance is worsened by fiscal dominance regime. Kopits (2000:1-16) examines the relationship between the economic crisis and government deficit and consequently inflation. He concludes that fiscal indiscipline makes the economies vulnerable to economic crisis. In other words, fiscal dominance worsened the impact of external economic crisis on the domestic economy. Daniel (2001:293-308) corroborates this claim as he finds that exchange rate crisis is worsened in economy experiencing fiscal dominance. In the same vein, Tugba (2007:1-71) investigates the impact of fiscal dominance on the efficacy of inflation targeting regime with evidence from Turkish. The results show that presence of fiscal dominance hampers performance of inflation targeting in Turkey.

Barro (1987:221-247) could not find any evidence in support of fiscal dominance for United Kingdom during the period 1701–1918. However, He establishes that there exists positive association between military spending and growth of money. This empirical position was subsequently supported by Bohn (1998:949-964), Canzoneri et al. (2001:1221-1238), Ballabriga and Martínez-Mongay (2003: 246–272) and Fragetta and kersanova (2010:855–879). In EU countries, Afonso (2008:313-334) could not also find evidence of fiscal dominance. Creel and Le Bihan (2006:338-360) further confirm this position in some European countries. They argue that monetary dominance rather than fiscal dominance was predominant over the study period. Jalil, Tariq and Bibi (2013:120-126) argue that the positive long run inflationary impact of money supply in the economy can be attributed to fiscal dominance in Pakistan.

Another line of argument on the discussion on fiscal dominance is that both monetary policy and fiscal policy would respond to ensure balancing of budget constraints. In other words, it is the price level at the equilibrium that would respond to balance surpluses and liabilities (Woodford, 1995:117-154). This scenario is called fiscal theory of the price level (FTPL). The proposition means that neither monetary equilibrium nor budget constraints balance is needed to manage price level. Most of the cases of failure of monetary policy to curtail inflation is associated with fiscal indiscipline (Sims, 1994:381-399).

As earlier mentioned, fiscal theory of price level, that is, fiscal view of inflation is often tested in the literature by examining the relationship or correlation between inflation and fiscal deficits

(Mehdi & Reza, 2011:223-228). Onwioduokit (1999:1-16) examined the direction of causality between inflation and fiscal deficits in Nigeria with the help of Granger Causality approach. He observes uni-directional causality from fiscal deficit to inflation. This finding is further corroborated by Ogunmuyiwa (2008:558-580), Omoke and Oruta (2010:52-60), Oladipo and Akinbobola (2011:1-8) and Chimobi and Igwe (2010:52-60).

In a similar study, Bakare, Adesanya and Bolarinwa (2014:120:134) investigated the relationship among budget deficit, money supply and inflation in Nigeria between 1975 and 2012. They employed co-integration technique and Error Correction Model. They conclude that there exists association between budget deficit, money supply and inflation in Nigeria while evidence of causality is also established. However, the study could not not establish the fiscal deficit interactions on growth of monetary base in Nigeria. Ebiringa (1998:1-90) examined the effect of deficit on performance of macroeconomics in Nigeria. He could not find evidence of significant relationship between growth in public sector deficit as percentage of GDP and inflation. The study summarises that creation of monetary base may not always be associated with higher inflation. Forni et al (2009:561) provided evidence on the macroeconomic effects of fiscal policy in the Euro area within DSGE model. They argue that revolutions in fiscal policy has significant effects on macroeconomic variables.

Hughes and Weymark (2005:1-21) employed regressions analysis using instrumental variables to examine monetary and fiscal policies interactions in the UK and the euro area. They find evidence of substitutability of monetary and fiscal policies interaction in the UK, while complementarity was observed in the euro area. Kirsanova *al*. (2005:532-564) also find and advocate the complementarity between fiscal and monetary policies variables. Reade and Stehn (2007:1-15) made use of cointegrated VAR to investigate the interaction of monetary and fiscal policy and how it impacts on public deb sustainability in the United States in 1960-2005. They recognise fiscal policy as an important instrument to debt sustainability. This empirical submission is consistent with findings by Daly (2015:1-20), Daly & Smida (2016:1-16) and Muscatelli *et al*. (2004:1-39).

Bianch &Ilut (2017:1-44) show that the rise and fall of US inflation can be explained by a change in the balance of power between the monetary and fiscal authorities. When the fiscal authority is the leading authority, fiscal imbalances generate long-lasting and persistent increases in inflation

and the monetary authority loses its ability to control inflation. The effects of these shocks last as long as agents expect the fiscal authority to prevail in the future. Therefore, if the monetary authority tries to dis-inflate without the backing of the fiscal authority, inflation barely moves. However, the moment that the fiscal authority accommodates the central bank's behavior, inflation quickly drops, the economy enters a recession, and the debt-to-GDP ratio starts increasing. These features characterized the events of the early '80s and can therefore be rationalized by the change in the policy mix itself. “

Using a Markov switching approach to inflationary issues in monetary and fiscal policy interactions, under a rational expectations model in which policy switch is allowed, Cekin (2013:1-56) concluded monetary and fiscal policies switch is a necessary condition for monetary policy to ensure stability of prices as deficit shocks would be prevented from transmitting to inflation.

Choudhri and Malik (2012:1-46) made use of small Scale DSGE model for Pakistan is to analyse monetary policy. Choudhri and Malik (2012:1-46) assumed that the monetary policy is passive. The empirical findings suggest changes in government expenditures crowds out of private investment and changes in money supply does not significantly cause inflation, but they do have an important impact on output. This is conformity with the empirical submission of Coenen and Straub (2004:1-37)

Ellison and Tischbirek (2014:199-217) investigate if purchases of long-term government debt, could accelerate short-term interest rate policy using a DSGE model. Their empirical findings suggest that unconventional monetary policy plays a significantly important role assuming the apex bank is bothered about interest rate volatility. Punzo and Rossi (2016:12-16) made use of NK-DSGE model to determine how government purchases affect monetary and debt financing. They are of the opinion that reallocation is greater in the money financed fiscal stimulus than the debt financed fiscal stimulus.

Monetary and fiscal policy actions are not designed for just any sake than primarily to influence economic outcomes. Their interactions often have an important and off course sometimes contradictory impacts on macroeconomic policies and outcomes. Dungey and Fry (2010:1-30) were curious about the possible outcomes of monetary and fiscal policy actions in economy. Hence, they adopted SVAR model to investigate the monetary and fiscal policy outcomes in

Australia. The empirical results show that government expenditure impacts induce a much larger rise in government revenue, thus resulting in a fall in the debt to GDP.

Chatziantoniou, Duffy and Filis (2014:1-35) argue that empirical studies on interaction between fiscal and monetary policy outcomes on stock market developments are scanty and hence were motivated to employ SVAR analysis to determine the monetary and fiscal policy shocks effects on stock market performance in selected European countries. Their empirical position states that both fiscal and monetary policies affect performance of stock markets. Using Markov-switching to estimates policy rules for the United States, Davig and Leeper (2009:1-41) also support the evidence of fiscal and monetary policies switching. Dosi, Fagiolo and Roventini (2015:166-189) examined the effects of fiscal and monetary policies on income distribution. They concluded that both policies should complement each other to stabilise the economy. The empirical results also state that negative effects of severe fiscal rules are overstated by passive monetary policy and this may worsen income disparity.

Jin (2013:1-26) examined the interactions among debt maturity management, monetary and fiscal policies using a DSGE model. His empirical conclusions show that the debt maturities do not significantly influence monetary and fiscal policy interactions. He however submits that longer average maturities of debt magnify the effects of monetary policy shocks on prices of bond. Ojeda-Joya and Guzman (2017:1-24) investigated the impacts of consumption shocks on GDP employing a panel analysis. They argue government consumption shocks are habitually accompanied by tightening of monetary policy. They also concluded that consumption shocks generate higher multipliers in developing countries.

Gnocchi and Lambertin (2013:1-30) examined the interaction between committed monetary and discretionary fiscal policy by means of Markov-Switching. Empirical findings show that there is lack of commitment on the part of fiscal authority. This lack of commitment was believed to generate a steady-state level of debt that would be determined by time-consistency problem. They are of the view that fiscal indiscipline promotes tax rates volatility and inflation. Adam an Billi (2008:1376-1388) reassess the effects of inflation traditionalism in affecting fiscal policy and taxation. Their empirical clarification reaffirms the roles of policy timing in affecting inflation. DSGE model in an open economy with monetary and fiscal policy in a continuous time framework

was developed by Hayo and Niehof (2014:1-33) to analyse the interdependence between monetary and fiscal policy during financial crisis. The contagious effects to bond markets and real markets were analyzed under different types of monetary and fiscal policy. They find evidence that the cost of inflation under the modified Taylor rule prevents the crisis most, however, we find no evidence for supporting either spending or austere fiscal policy. Depending on the inter-connectness of markets, spending policy causes a crisis on the bond market instead of preventing the crisis on the stock market. They, however, could not find evidence that financial market crisis will affect the monetary and fiscal policy interdependence. Dixit and Lambertini (2000:1-28) and Gali and Perotti (2003:533-572) nonetheless establish that monetary and fiscal policy interdependence is affected by financial market crisis.

Gonzalez-Astudillo (2013:1-51) made use of Bayesian methods for nonlinear state-space models to estimate the policy rules with time-varying coefficients, endogeneity and stochastic volatility, empirical results show that there is important persistence in policymaking with fiscal policy being slightly more persistent than monetary policy and that there is also a degree of direct interactions between policies given by a positive estimated correlation between latent factors. They also find evidence that monetary policy switches more frequently than fiscal policy and the former loosens during recessions. There is also evidence that taxes have effects on output and but the effects are attenuated with respect to a pure fiscal regime.

Ehelepola (2014:1-27) provides empirical evidence on welfare maximizing optimal monetary and fiscal policy rules in Sri Lanka using a DSGE model. A standard Taylor rule type monetary policy reaction function where the nominal interest rate responds to inflation deviations and output gap was employed, and a fairly simple fiscal policy reaction function in which tax revenue depends on the level of total government liabilities are used. In order to conduct welfare analysis, equilibrium solutions to the model are approximated up to second order accuracy. He proposes the monetary and fiscal policy rules that are optimal within a group of implementable and simple rules for the Sri Lankan economy.

Philippopoulos, Varthalitis and Vassilatos (2015:175-188) investigated monetary and fiscal feedback policy rules in a New Keynesian model under a non- opened economy. Their empirical conclusions states that the monetary authorities should be concerned with inflation while the fiscal

authorities should be ready to adjust to changes in debt level. They find evidence to support the view that price stability should be the key concern of monetary authorities.

The 2007/2008 global financial economic crisis has awakened the discussion on the role of monetary and fiscal policy in fighting recessions or economic crisis. Most of the recent empirical studies submit that spending of government could be effective in fighting or combating financial crisis. Devereux (2010:1-40) examined the role debt and deficits in an economy with zero bound on nominal interest rates. His empirical evidence establishes that wealth effects of deficits induces macroeconomic response or adjustments in ameliorating the effects of global financial crisis. They argued that spending financed by deficits would be more expansionary in nature than tax finance. He concludes that during liquidity trap, reduction in tax would be more potent than when there is no liquidity trap. Following the thoughts of Hayo and Niehof (2014:1-29) on the role of monetary and fiscal policy in fighting recessions or economic crisis, Valdivi and Pérez (2015:140) investigated the effectiveness of fiscal and monetary policy coordination during the 2007-2010 global crisis using a DSGE model. The results show that fiscal and monetary policies shocks have unfavourable impacts on price stability and economic growth during crisis.

Ornellas and Portuga (2011:1-31) investigate the fiscal and monetary interaction in Brazil with the aim of estimating degree of fiscal and monetary policies interdependence with the use of a DSGE model. They submit that the of degree of fiscal and monetary policies interdependence in Brazil is lower when compared with U.S. and Canada. Nonetheless, the level of inflation was found to be higher in Brazil than U.S. and Canada despite higher level of fiscal and monetary policies interdependence in Brazil. This empirical conclusion could not substantiate the hypothesis of higher degree of fiscal and monetary policies interdependence being associated with lower inflation as argued by Bade and Parkin (1985:1-36), Alesina (1988) and Alesina and Summers (1993:151-162).

In another study, Mwabutwa, Bittencourt and Viegi (2013:1-39) investigated the response of monetary policy in short run to aid inflows in Malawi using a DSGE model. The empirical evidence from their works suggest that there is an evidence that monetary policy responds favourably to aid inflows. Evidence of Dutch Disease could not be found in Malawi because of evidence of association between aid inflow and currency depreciation.

Hohberger and Herz (2012:1-41) analyzed macroeconomic responses of current account to different shocks. Their results indicate inconsistent monetary policies make economy vulnerable to shock and leads volatility in exchange rate which aggravated the current account conditions. They argue that stability in macroeconomic variables is associated with fiscal response to the current account. However, attempting to stabilise the current account by means of fiscal policy causes output to vary significantly in the short run.

Valli and Carvalho (2010:1-115) in attempt to broadening implementation of fiscal policy stretched the works of Coenen *et. al.* (2008) and Christoffel *et.al.*(2008). Valli and Carvalho (2010:1-115) assume a fiscal policy that aim at stabilizing the debt level in an open economy. The empirical findings suggest that macroeconomic response to output growth worsened inflation. While the response of growth of money to the exchange rate shows inflation variability was less worsened.

3.6 SUMMARY AND CONCLUSION

This chapter of the study reviews the theoretical issues on monetary and fiscal policies interactions. The Keynesians' view and monetarists' views of fiscal policy were first examined. The quantity theory of money was examined. Its propositions, assumptions and consequently its criticisms were examined. The Keynesian's theory of money, consequently, was evaluated. The theoretical expositions show that neoclassical theorists see interest rate as being determined by real variables. While Keynesian linked theory of money and interest rate to the real and monetary sectors of the economy. The chapter of the study reviews existing empirical studies on fiscal and monetary policy interactions. The overall pictures that emerge show that analysis of the degree of fiscal and monetary policy interdependence has received significant attentions in developed economies. It has however not received adequate attentions from Africa. Hence, this study. The next chapter presents the research methods adopted to achieve the empirical objectives of the study.

CHAPTER 4

RESEARCH METHODOLOGY

4.1 INTRODUCTION

This chapter focuses mainly on the methodology adopted in this work. This chapter has four sections. The theoretical framework is presented in section 4.1. The model specification procedures and derivation for the degree of interdependence between fiscal and monetary policy is given in Section 4.2. Section 4.3 presents the model for dynamic stochastic general equilibrium (DSGE) to determine the interactions between fiscal and monetary policies. Bayesian Vector Autoregressive (BVAR) is presented in Section 4.4 to serve as robustness checks on interactions between fiscal and monetary policy variables.

4.2 THEORETICAL FRAMEWORK

Orthodoxly, the studies on fiscal and monetary policy interactions connects fiscal policy and monetary policy through a government's budget constraints. This expedites the understanding of the implications of monetary policy actions for government's fiscal activities as well as the implications of the primary surplus for government liabilities. Looking at a government's budget constraints, which includes the roles of the central bank in the following equation:

$$B_{t-1} = T_t - G_t + {}^{B_t}/_{1+i_t} + M_t - M_{t-1} \quad (4.1)$$

Where B_t connotes debt obligation, T_t stands for revenue from tax, G_t represents governments expenditure, i_t represents interest rate, M_t signifies base money or the central bank's liabilities. Equation (4.1) basically means that the debt of government must be funded by the primary surplus, $T_t - G_t$, and new issues by the government, $\frac{B_t}{1+i_t} + (M_t - M_{t-1})$

Note that $(M_t - M_{t-1})$ is the variation in central bank owned liabilities. Rearranging equation (1) gives the subsequent expression for total liabilities of government:

$$M_t + B_t = T_t - G_t + \frac{B_t}{1+i_t} + M_t \quad (4.2)$$

Following equation (4.2), there are three ways to finance for the current deficit or debt, the primary surplus, the seigniorage and new debt issues. In order to expedite the discussion in real terms, all the expressions are scaled by nominal output, signified by $p_t y_t$, where $p_t$is the price level and y_t is the real output.

After some manipulations of the budget constraint, the constraint equation can be represented thus:

$$\frac{M_{t-1}+B_{t-1}}{p_t y_t} = \left[\frac{T_t - G_t}{p_t y_t} + \frac{M_t}{p_t\, y_t}\frac{i_t}{1+i_t}\right] + \frac{1}{(1+i_t)}\left(\frac{M_t + B_t}{p_t y_t}\right) \quad \text{(4.3)}$$

Note that the last term on the RHS in Equation (4.3) can first be multiplied and then divided by the $p_{t+1}y_{t+1}$, yielding:

$$\frac{M_{t-1}+B_{t-1}}{p_t y_t} = \left[\frac{T_t - G_t}{p_t y_t} + \frac{M_t}{p_t\, y_t}\frac{i_t}{1+i_t}\right] + \left(\frac{y_{t+1}/y_t}{1+i_t}\right)\frac{1}{p_t/p_{t+1}}\left(\frac{M_t + B_t}{p_{t+1}y_{t+1}}\right) \quad \text{(4.4)}$$

Equation (4.4) shows that the ratio of liabilities to GDP at the beginning of the period t, equal the sum of the primary surplus and ratio of seigniorage to GDP, and the discounted value of the future total liabilities.

The discount factor, $\left(\frac{y_{t+1}/y_t}{1+i_t}\right)\frac{1}{p_t/p_{t+1}}$ is the ratio of real output growth to the real interest rate. If the total liabilities to GDP is written as: $w_t = \frac{M_{t-1}+B_{t-1}}{p_t y_t}$,

the primary surplus to GDP is written as: $s_t = \frac{T_t - G_t}{p_t y_t}$

Seigeniorage to GDP as , $\theta_t = \frac{M_t}{p_t\, y_t}\frac{i_t}{1+i_t}$

and discount factor as $\alpha_t = \left(\frac{y_{t+1}/y_t}{1+i_t}\right)\frac{1}{p_t/p_{t+1}}$.

Then Equation 4.14 can be written as

$$w_t = s_t + \theta_t + \alpha_t w_{t+1} \quad \text{(4.5)}$$

If Equation (4.5) is iterated forward, and the expectations conditional on period t are taken, Equation (4.6) is obtained.

$w_t = s_t^* + E_t\left[\sum_{j=t+1}^{+\infty}\left(\prod_{k=t}^{j-1}\alpha_k\right)s_j^*\right]$ ……………………………………………………………(4.6)

Given a consolidated government sector, the total surplus must be the sum of s_t and θ_t. Canzoneri *et al*. (2001) represent this primary surplus as s_t. Here, s_t^* is denoted by $s_t+\theta_t$.

Equation (4.6) offers many suggestions about the ways government's inter-temporal budget can be balanced. First, the sequence $\{s_t^*\}$ and endogenously satisfy Equation (4.6)

Canzoneri *et al.* (2001) outline monetary dominance in such a way that $\{s_t^*\}$ is accountable for balancing the government inter temporal budget constraint. Second, within the sequence $\{s_t^*\}$, only $\{s_t\}$ is determined exogenously by the fiscal policy authority. However, $\{\theta_t\}$ adjusts to make sure that $\{s_t^*\}$ is constant. Third, although the total liabilities $M_{t-1} + B_{t-1}$ are pre-set at the end of the period -1 , their real value w_t is determined by real output y_t and the price level p_t. So, even when $\{s_t\}$ and $\{\theta_t\}$ are both independently determined, y_t or p_t should balance Equation (4.6). Fiscal dominance regime is described by the second and third possibilities.

4.3 MODEL SPECIFICATION

In order to estimate the degree of fiscal and monetary policies interactions in the Nigerian and South African economies, the following model procedures consist of the private and the government sectors.

4.3.1 Private sector

The economy is characterised by homogeneous consumers with infinite horizon and perfect foresight about the future. The representative consumer aims at:

max$\{c_t, n_t, m_{t,} b_t\ k_t\}\sum_{t=0}^{\infty}\beta^t\ \mu\left(c_t, {}^{m_t}/_{p_t}, 1-n_t\right)$………………………………………….. (4.7)

where $\beta \in [0,1]$ is the subjective discount factor and μ is firmly increasing and concave in all arguments. It satisfies the Inada conditions and twice differentiable. Note that in every period, consumer chooses consumption (c_t), labour,(n_t), and the immediate next- period holdings of

capital (k_t), money (m_t), and nominal one government debt (b_t). The aggregate price is denoted by (p_t).

The real money balances are included to show that the utility function depicts the ease of using money in implementing transactions. Because this model is made up of government liabilities, the study follows Woodford (1995) in understanding m_t as the holding of the monetary base by the consumer. The model assumes instantaneous utility function that is both logarithmic and inseparable:

$$\mu\left(c_t, {}^{m_t}/_{p_t}, 1 - n_t\right) = ln\,(c_t) + \gamma ln\left({}^{m_t}/_{p_t}\right) + \theta ln(1 - n_t) \quad \text{.....} (4.8)$$

Where γ and θ are parameters that capture the proportional importance of real money holdings and leisure. The consumer's maximising constraint is subject to a no-Ponzi game condition and to the sequence of budget constraint in

$$c_t + {}^{m_t}/_{p_t} + {}^{b_t}/_{p_t} + k_t = w_t n_t + r_t k_{t-1} + \frac{m_{t-1}}{\pi_t p_{t-1}} + i_{t-1}\frac{b_{t-1}}{\pi_t p_{t-1}} - \tau_t \quad \text{.....} (4.9)$$

Where τ_t is the lump-sum tax, ${}^{p_t}/_{p_{t-1}}$ is the gross inflation denoted by π_t, i_{t-1} is the nominal interest rate on debt which is determined in previous period $t-1$ and paid in period in t, w_t is the wage rate, and r_t is the return on capital between periods $t-1$ and t. In equilibrium, the absence of arbitrage profits will require r_t to equal the real gross interest rate

${}^{i_{t-1}}/_{\pi_t}$. The first order conditions for the representative of the consumer's constraints function:

$${}^{1}/_{c_t} = \beta\left({}^{i_{t-1}}/_{\pi_t}\right)\left({}^{1}/_{c_{t+1}}\right) \quad \text{.....} (4.10)$$

$${}^{m_t}/_{p_t} = \gamma c_t\, {}^{i_t}/_{(i_t - 1)} \quad \text{.....} (4.11)$$

Equation (4.10) represents the Euler equations for consumption and Equation (4.11) specifies demand for money as a function of consumption and the money's return. These two conditions are the essential requirements to derive the study model's implications for the total price level.

4.3.2 Government

Government spends an exogenous amount of resources, G_t in every fiscal period. Government expenditures could be financed by imposition of lump-sum tax τ_t, or by issuing money (M_t), and by increasing total debt (B_t). The government is also faced with a no-Ponzi- game situation and to a active budget constraints.

$$G_t + (i_{t-1} - 1)\frac{B_{t-1}}{P_t} = \tau_t + \left(\frac{M_t - M_{t-1}}{P_t}\right) + \left(\frac{B_t - B_{t-1}}{P_t}\right) \quad \text{(4.12)}$$

If Equation (4.12) is iterated forward, assuming that government's no –Ponzi game condition denotes the intertemporal budget constraints, then:

$$i_{t-1}\left(\frac{B_{t-1}}{P_t}\right) = \sum_{j=0}^{\infty}\frac{\tau_{t+j}}{R_t^{(j)}} + \sum_{j=0}^{\infty}\frac{M_{t+j} - M_{t+j-1}}{P_{t+j}R_t^{(j)}} - \sum_{j=0}^{\infty}\frac{G_{t+j}}{R_t^{(j)}} = \mathcal{T}_t + \mathcal{S}_t - \mathcal{G}_t,$$

Where $R_t^{(j)} = \Pi_{h=1}^{j} r_{t+h}$ is the j periods – ahead discount factor, and $\mathcal{T}_t$, $\mathcal{S}_t$ and $\mathcal{G}_t$ are the present value of receipts from tax, seigniorage revenue, and expenditure of government respectively. It is assumed that present value of government's budget constraint holds with equality. The government follows a long run fiscal rule that requires itself to generate large adequate primary surpluses (δ backing of fiscal policy) to back or finance a constant proportion of the currently outstanding debt. Assuming a sequence of prices $\{i_{t+j}, p_{t+j}\}_{j=0}^{\infty}$ and primary stock of nominal debt B_{t-1}, δ backing of fiscal policy is a sequence $\{G_{t+j}, \tau_{t+j} B_{t+j}\}_{j=0}^{\infty}$ so that for all t:

$$\mathcal{T}_t - \mathcal{G}_t = \delta i_{t-1}\frac{B_{t-1}}{P_T} \quad \text{(4.13)}$$

Where $\delta \in [0,1]$. In other words, the fiscal rule of government is planned such that a constant fraction of (δ) of the outstanding debt of government, including the interest payments, is financed or backed by the present discounted value of current and future primary surpluses. Consequent upon the fulfilling the government intertemporal budget constraints, then equation (4.14) is written as:

$$\mathcal{S}_t = (1 - \delta) i_{t-1}\frac{B_{t-1}}{P_t}, \quad \text{(4.14)}$$

By implication, since $\delta \in [0,1]$, Equation (4.13) connotes that a constant fraction $(1 - \delta)$ of the current outstanding debt is backed or financed by both present discounted value of current and future seigniorage revenue. The likely fiscal regimes are connoted by the fraction of δ of the debt that is backed by the primary surplus. Since $\delta \in [0,1]$, a set that is continuum and restricted by two polar cases is obtained as follows:

Case (1): where $\delta = 1$, all the debt of government is financed by the current value of the primary surplus. Under this situation, the fiscal controller is completely dedicated to varying its flow of surplus so that it is in total agreement with the current value of the issued bonds. As earlier stated, this situation refers to a monetary dominance (De Resende, 2007:1-36).

Case (2): where $\delta = 0$, it is evident that the total debt is paid by the monetary authority. Under this arrangement, the principal and interests of a newly issued bond is paid by means of seigniorage. By implication, the fiscal authority is insensitive to monetary policy such that government taxes and expenditures do neither react nor respond to changes in the government's debt stock. This is known as fiscal dominance (Aiyagari & Gertler, 1985: 19-44; De Resende, 2007:1-36).

It is possible to see that parameter shows the preferences of the government as regards the finance of the debt. Thus, the fiscal strategy in κ is a rule that can parameterise the conduct of the government. The parameter δ to be estimated in this study is the degree of fiscal and monetary policy interaction or interdependence. The value of the parameter δ is the value that arises from the interaction between fiscal and monetary authorities in a steady organized set up.

4.3.3 Equilibrium

The equilibrium for this economy is defined in such a way that it corresponds to a price system that allocate resources amongst a representative consumer, firm and government policy. Both consumer and firm representative aim at maximising their constraints given the specific government policy. Meanwhile, government budget is constrained by the price system and the choices of firms and consumers. The equilibrium systems also mean the market clearing system (De Resende, 2007:1-36).

The price level is determined by the equilibrium in the money market as:

$M_t = m_t$ …….. (4.15)

From Equation (4.12), money supply can be written as:

$\frac{M_t}{P_t} = \frac{i_t}{i_t - 1}\left[(1 - \delta) i_{t-1} \frac{B_{t-1}}{p_t} + \frac{M_{t-1}}{p_t} - \sum_{j=1}^{\infty}\left(\frac{M_{t+j}}{p_t R_t^{(j)}} \frac{i_{t+j}-1}{i_{t+j}}\right)\right]$…….. (4.16)

Following the equilibrium condition in Equation (4.15) and money demand Equation (4.10), Equation (4.16) yields

$$\gamma c_t = (1 - \delta) i_{t-1} \frac{B_{t-1}}{P_t} + \frac{M_{t-1}}{P_t} - \sum_{j=1}^{\infty}\left(\frac{M_{t+j}}{p_t R_t^{(j)}} \frac{i_{t+j} - 1}{i_{t+j}}\right)$$

By means of the recursive nature of the Euler Equation (4.10) to find expression for the infinite sum,

$\sum_{j=1}^{\infty}\left({M_{t+j}}/{P_{t+j}} R_t^{(j)}\right)\left(\left(i_{t+j} - 1\right)/i_{t+j}\right)$, in terms of current consumption and algebra process yields:

$P_t = \frac{(1-\beta)(M_{t-1} + (1-\delta) i_{t-1} B_{t-1})}{\gamma c_t}$ …….... (4.17)

Equation (4.17) defines the total price level as being influenced by consumption and of the beginning lag one period stocks of money and debt. Ayegari & Gerler (1985:28) used a similar expression for the price level. Alternatively, since $M_{t-1} + (1 - \delta) i_{t-1} B_{t-1} = M_t + (1 - \delta) B_t$, the price level can be written as a function of end of period stocks of money and debt:

$p_t = \frac{(1-\beta)[M_t + (1-\delta) B_t]}{\gamma c_t}$ ……...(4.18)

Equations (4.17) and (4.18) are somewhat similar, but empirical analysis of Equation (4.18) does not need interest rate data. Irrespective of either of the two equation, either of the models imply that price level depends not only on stock of money, but rather the proportion of outstanding debt that is financed by printing of money which is the degree of interdependence between monetary policy and fiscal policy denoted as δ.

Consequently, in order to obtain the estimate of the degree of monetary and fiscal policy interdependence δ, Equation (4.18) can be written as:

$$M_t = \frac{\gamma}{(1-\beta)} C_t - (1 - \delta) B_t \quad \text{.....(4.19)}$$

Where $C_t \equiv p_t c_t$ denotes the nominal private consumption. The empirical equivalent of Equation (4.19) can then be written as:

$$M_t = \alpha + \rho_1 C_t + \rho_2 B_t + e_t, \quad \text{.....(4.20)}$$

Where α is an intercept, $\rho_1 = \frac{\gamma}{(1-\beta)}$, $\rho_2 = -(1 - \delta)$

It should be noted that δ is recorgnised from the coefficient on the stock of debt. Since all the variables M_t, C_t, and B_t are endogenous in this model, the OLS estimation of Equation (4.20) produce biased and inconsistent parameter estimates under condition of covariance-stationary. However, if the measures of M_t, C_t, and B_t are I(1), Equation (4.20) presents cointegrating relationship, consequently, Equation (4.20) produces super-consistent estimates (Phillips & DurLauf, 1986:473-495).

This approach is superior to the other two approaches that can be used in obtaining the degree of fiscal and monetary policies interdependence because it does not require the computation of the present discounted values of $\mathcal{T}_t$ and $\mathcal{G}_t$ that require the infinite future values for taxes and government expenditure. In order to estimate the Equation (4.20), the study makes use of the DOLS method proposed by Stock and Watson (1993:783-820). The dynamic OLS (DOLS) version of Equation (4.20) is given as:

$$M_t = \alpha + \rho_1 C_t + \rho_2 B_t + \sum_{s=-k}^{k} \xi_{1,s} \Delta C_{t-s} + \sum_{s=-k}^{k} \xi_{2,s} \Delta B_{t-s} + e_t, \quad \text{.....(4.21)}$$

Where $\xi_{j,s}$ for $j = 1, 2$ and $s = -k, -k+1 \ldots\ldots\ldots, k-1, k$ are constants coefficients

4.4 DYNAMIC STOCHASTIC GENERAL EQUILIBRIUM MODEL (DSGE)

In order to obtain the various macroeconomic shocks in response to fiscal and monetary policy interactions, the Dynamic Stochastic General Equilibrium Model (DSGE) is constructed for an open economy for both Nigerian and South African Economy. The DSGE modelling is made up

of the behaviour of the three different economic agents, namely, the household, the firms and government.

4.4.1 Household

The DSGE model consists of household who aims at maximising the expected present discounted value of total utility during her lifetime conditioned by inter-temporal budget constraints:

$$U = E_0 \sum_{t=0}^{\infty} \beta^t \left(\frac{C_t^{1-\sigma_t}}{1-\sigma_c} + x \frac{G_t^{1-\sigma_g}}{1-\sigma_g} - \frac{N_t^{1+\emptyset_n}}{1+\emptyset_n} \right) \quad (4.22)$$

Where $\beta = 1/(1+\rho)^t$ connotes the household discount factor and $\beta \in (0,1)$, σ is defined as the inverse of inter- temporal elasticity of substitution in consumption, $\emptyset$ is defined as inverse of labour supply elasticity with respect to real wage and x measures the relative weight on consumption of public goods. While C_t, G_t, and N_t are the aggregate variables in the objective function and they connote private consumption, government spending and labour supplied respectively. The budget constraint function of the household is given as:

$$P_t C_t + P_t G_t + E_t\left[Q_{t,t+1} D_{t+1}\right] + T \leq D_t + (1+\gamma_t) W_t N_t \quad (4.23)$$

Where $Q_{t,t+1} = 1/(1+r_t)$ is the one period ahead stochastic discount factor, r_t connotes the nominal interest rate, T stands for taxes and γ_t is the income tax rate. W_t i the nominal wage rate. D_t represents the nominal portfolio, P_t is the CPI. C_t is the aggregate consumption index which is made up of domestically produced goods $(C_{H,t})$ and imported goods $(C_{F,t})$, and G_t is the consumption of public goods. There is inherent assumption that both goods are produced by monopolistically competitive firms.

$$C_{H,t} = \left[\int_0^1 C_{H,t}(i)^{\frac{g-1}{\varepsilon}} di\right]^{\frac{g}{\varepsilon-1}} \text{ and } C_{F,t} = = \left[\int_0^1 C_{F,t}(i)^{\frac{g-1}{\varepsilon}} di\right]^{\frac{g}{\varepsilon-1}}$$

$$P_t C_t = \int_0^1 \left[P_{H.t}(i) . C_{H,t}(i) + P_{F,t}(i) . C_{F,t}(i)\right] di$$

The FOCs produces a forward looking open economy IS curve as indicated in Equation (4.24):

$$\hat{y}_t = E_t(\hat{y}_{t+1}) - E_t(\Delta g_{t+1}) + \alpha(\varpi - 1)(\rho_{c\cdot} - 1)\hat{c_t^{\cdot}} - \frac{1}{\sigma_\alpha}\left(\check{r}_t - E_t\left[\pi_{H,t+1}\right]\right) \quad (4.24)$$

σ_α is defined as $\frac{\sigma}{(1-\alpha)+\alpha\omega}$, and $\omega = \sigma\gamma + (1-\alpha)(\sigma\eta - 1)$.

Parameter η denotes the substitution elasticity between domestic goods and foreign goods, α captures the proportion of domestic consumption allotted to foreign goods (degree of openness). While γ reflects the substitution elasticity between the goods produced in different foreign countries. Endogenous variables in the DSGE modelling are defined as follows:

Output $\hat{y}_t = \ln\left(\frac{y_t}{\hat{y}_t}\right) = y_t - \bar{y}$,

Where $\bar{y}$ denotes the steady state values of y_t

Government spending $g_t = \ln\left(1 - \frac{G_t}{Y_t}\right)$

Domestic inflation is given as $\pi_{H,t} = \ln\left(\frac{P_{H,t}}{P_{H,t-1}}\right)$

The IS curve for the open economy which is forward looking is given as:

$$\tilde{y}_t = E_t\lfloor y_{t+1}\rfloor - E_t\lfloor \Delta g_{t+1}\rfloor - \frac{1}{\sigma_\alpha}\left(r_t - E_t\lfloor \pi_{H,t+1}\rfloor\right) \quad (4.25)$$

Where $\tilde{y}_t = \hat{y}_t - \hat{y}_t^{\,n}$ and $\check{r}_t = \hat{r_t} - \hat{r_t^n}$

$\hat{y}_t^{\,n}$ and $\hat{r_t^n}$ connote the natural rate of output and nominal interest rate. They are the equilibrium level of output and interest rate in the absence of nominal rigidities are described in Equations (4.26) and (4.27):

$$\hat{y}_t^{\,n} = \frac{(1+\emptyset)}{(\sigma_\alpha + \emptyset)}\hat{a}_t - \frac{(\sigma - \sigma_\alpha)}{(\sigma_\alpha + \emptyset)}\hat{c}_t^{\bullet} \quad (4.26)$$

$$\hat{r_t^n} = \sigma_\alpha(E_t\,[\hat{y}_{t+1}^n] - \hat{y}_t^{\,n}) + \sigma_\alpha\alpha(\omega - 1)(\rho_{\hat{c}} - 1)\hat{c}_t^{\bullet} \quad (4.27)$$

Where $\hat{a}_t$ is defined as the log of technological progress, A_t.

4.4.2 Firms

The model assumes a continuum of similar monopolistically firms. The firms produced differentiated products using a linear technology defined as:

$$Y_t(j) = A_t N_t(j) \quad \ldots\ldots (4.28)$$

Following the earlier studies on fiscal and money policy interactions, such as De Resende (2007:1-36), the model assume that a proportion of $1-\theta$ of the firm can set a different price in each period, and a proportion of the θ of the firm keep its price constant. In order to take the inflationary persistence into consideration, the model incorporates backward looking behaviour in the price setting process:

$$P_{H,t}^{b} = P_{H,t-1}^{\bullet} \frac{P_{H,t-1}}{P_{H,t-2}} \quad \ldots\ldots (4.29)$$

Where $P_{H,t-1}^{\bullet} = \left(P_{H,t-1}^{f}\right)^{1-\vartheta} \left(P_{H,t-1}^{b}\right)^{\vartheta}$ defines the total prices chosen in period $t-1$.

Suppose that a fraction of $1-\theta$ of the firm can set a new price optimally in each production period, the remaining part θ set their prices past inflation rate. The rule of thumb price setter take into account the previous period inflation rate $\pi_{H,t-1} = \frac{P_{H,t-1}}{P_{H,t-2}}$ as well as the aggregate prices $P_{H,t-1}^{\bullet}$ occurred in time $t-1$, as prices are reset in period t. The presence of backward looking firms alongside with the forward looking firms make it possible to obtain equations (4.30) and (4.31) in terms of deviation from the steady state.

$$\hat{\pi}_{H,t} = \lambda^{b}\hat{\pi}_{H,t-1} + \lambda^{f} E_t\left[\hat{\pi}_{H,t+1}\right] + k\hat{mc} + \varepsilon_t^{\pi} \quad \ldots\ldots (4.30)$$

$$\hat{mc}_t = \sigma_\alpha + \emptyset(\hat{y}_t - \hat{y}_t^{\,n}) - \sigma_\alpha \hat{g}_t + \hat{\tau}_t \quad \ldots\ldots (4.31)$$

Where $\lambda^{b} = \frac{\vartheta}{\theta + \vartheta(1-\theta(1-\beta))}$

$\lambda^{f} \frac{\beta\theta}{\theta + \vartheta(1-\theta(1-\beta))}$

$k = \frac{(1-\beta\theta)(1-\theta)(1-\vartheta)}{\theta + \vartheta(1-\theta(1-\beta))}$

$\hat{m}$ is defined as the marginal cost and $\tau_t = -\ln\left(\frac{1-\gamma_t}{Y_t}\right)$ is the log-linearised tax rate. ε_t^{π} denotes the cost push.

Equation (4.31) implies that government spending, tax and the output gap directly influence inflation via Equation (4.30).

4.4.3 Government

Government as an economic agent influence the level of economic activity through monetary policy and fiscal policy. Hence, the sub-section specifies both monetary and fiscal policies rules

Monetary Policy Rule:

Following (Grith & Uhlig, 2007:1-70), a simple Taylor type interest rate rule based on inflation and output gap is defined as:

$$\hat{r_t} = \rho_r\left(\hat{r_{t-1}} - \hat{r_{t-1}^n}\right) + (1 - \rho_r)\left[r_\pi \hat{\pi}_{H,t} + r_y\left(\hat{y}_t - \hat{y}_t^{\,n}\right)\right] + \hat{r_t^n} + \varepsilon_t^r \quad \text{.....(4.32)}$$

$\hat{r_t^n}$ stands for interest rate at natural level, ρ_r is the interest rate coefficient which is between nil and one. ε_t^r is the interest rate shock which is usually defined as unsystematic part of monetary policy in modelling of DSGE. r_π and r_y represent the preferences of central bank between inflation and output gap. Since the central bank aim at stability of price, then the parameter r_π must be greater than r_y. By implication, the apex bank follows a monetary policy rules that changes the interest rate when there is deviation of inflation at equilibrium and departure of output from its natural state. More so, the central bank also considers the previous values of interest rate when resetting the interest rate. The greater the degree of interest rate smoothing, the lower would be the contemporaneous responses of nominal interest rate both inflation and output gap.

Under fiscal dominance, apex bank takes the level of borrowing into consideration when determining interest rates policy. According to Çebi (2012:1258-1267), the modified version of Taylor rule could be written as:

$$\hat{r_t} = \rho_r\left(\hat{r_{t-1}} - \hat{r_{t-1}^n}\right) + (1 - \rho_r)\left[r_\pi \hat{\pi}_{H,t} + r_y\left(\hat{y}_t - \hat{y}_t^{\,n}\right) + r_b(b_t - b_{t-1})\right] + \hat{r_t^n} + \varepsilon_t^r \text{(4.33)}$$

The parameter r_π is the defined as proportional weight apportioned to variation in borrowing.

Fiscal Policy Rules

The fiscal policy rules consider a backward looking version of fiscal policy reaction by taking into account previous responses of fiscal policy to economic activity with underlying assumption of smoothing of fiscal instruments (Çebi, 2012:1258-1267):

$$\hat{g_t} = \rho_g \hat{g_{t-1}} + (1 - \rho_g)\left[g_y(\hat{y}_{t-1} - \hat{y}_{t-1}^{\,n}) + g_b \hat{b_t}\right] + \varepsilon_t^g \quad \text{.....(4.34)}$$

$$\tau_t = \rho_\tau \tau_t + (1 - \rho_t)\left[\tau_y(y_{t-1} - y_{t-1}^n) + \tau_b b_t\right] + \varepsilon_t^\tau \quad \text{.....(4.35)}$$

Parameters ρ_g and ρ_τ are defined as degree of fiscal smoothing in Equations (4.34) and (4.35). g_y and τ_y show how government spending and tax respond to previous values of output gap. g_b and τ_b show the responses of unobservable debt stock. ε_t^g and ε_t^τ are government spending shock and tax shocks respectively and they are non-systematic element of discretionary fiscal policy. Conclusively, the government inter-temporal fiscal constraint in the log-linearised form can be expressed as:

$$\hat{b_{t+1}} = \hat{r_t} + \frac{1}{\beta}\left[\hat{b_t} - \hat{\pi_{H,t}} + (1 - \beta)(\hat{\tau_t} - \hat{y}_t) + \frac{\acute{C}}{\bar{B}}(\hat{g_t} - \tau_t)\right] \quad \text{.....(4.36)}$$

$b_t = \ln\left(\frac{B_t}{P_{H,t-1}}\right)$, B_t is the nominal stock debt. $\bar{B}$ is defined as the steady state debt and Ć is steady state of consumption.

4.4.4 Calibration

After solving the structural model, the next stage in DSGE modelling is to obtain the parameter values (Çebi, 2012:1258-1267). Two methods have been used in obtaining the parameter values. Some studies use either some econometric technique while some use the calibration method (Grith & Uhlig, 2007:1-70). The latter procedure is to calculate the parameter values arbitrarily through available data or by using values from other works or some economic intuitions about the economies under consideration (Grith & Uhlig, 2007: 1-70). This method is mostly used in the literature. On the other hand, it is possible to estimate the parameters. This study makes use of the

calibration technique. The model equilibrium is a set of 20 equations that show the behaviour of twenty endogenous variables. The main calibration procedure adopted here is to obtain the values of parameters from other relevant DSGE work in the literature and some economic intuitions about Nigerian and South African economies. The calibrated parameters are presented in Appendix (2)

4.5 BAYESIAN VECTOR AUTOREGRESSIVE (BVAR) MODEL

Bayesian vector autoregressive (BVAR) is a development on the traditional VAR model (Koop & Korobilis, 2010:267-358). BVAR makes use of Bayesian approaches to implement a vector autoregressive (VAR) (Gefang, 2014:1-11). Unlike traditional VAR models, in the BVAR model, parameters are assumed to be random, and prior probability values are assigned to the model (Gefang, 2014:1-11). The major superiority of the BVAR model is that it is not faced with the difficulties of collinearity and over-parameterisation which are peculiar to conventional VAR models because BVAR enforces priors on the parameters of AR.

Given an autoregressive equation as:

$$Y = \alpha_0 + \sum_{i=1}^{k} \alpha_i(X_i) + \varepsilon \quad \text{..... (4.36)}$$

Equation (36) can be written in a general VAR (P) model:

$$Y_t = C + B_1 Y_{t-1} + B_2 Y_{t-2} + \ldots . + B_p Y_{t-p} + \varepsilon_t \quad \text{..... (4.37)}$$

Where $Y_t = \left(Y_{it-1}, Y_{it-2}, Y_{it-3}, \ldots \ldots . . Y_{it-p}\right)$ is a $T\ by\ N$ matrix, which means number of observations multiply by number of endogenous variables (inflation, output, interest rate, government debt, money supply and government spending). In a more specific form, Equation (4.37) can be written as:

$$Y_t = Z_t B + \varepsilon_t \quad \text{..... (4.38)}$$

Where $Y_t = \left(c_i, Y_{it-1}, Y_{it-2}, Y_{it-3}, \ldots \ldots . . Y_{it-p}\right)$ is a T by $(1 + N^* P)$ matrix. ε is a stochastic term with nil and non-negative definite covariance matrix $\sum$. In other word, $\varepsilon \sim iidN(0, \sum)$. The ε_t is assumed to be multivariate normal.

4.5.1 Bayes law

Bayesian probability law is one of the major theoretical and practical frameworks for reasoning and analysis under Bayesian vector autoregressive (George, Sun & Ni, 2008:553-580). The historical foundation of the theory could be traced to the late 18th and early 19th century, with Thomas Bayes and Pierre-Simon de Laplace (Gefang, 2014:1-11). It serves as important framework for the understanding and analysis of BVAR modelling. Mathematically, Bayes law could be expressed as:

$$P(B,\sum \mid Y_t) \propto P(Y_t \mid B,\sum) \,.P(B,\sum) \quad \text{.....(4.39)}$$

Where $P(B,\sum \mid Y_t)$ is the posterior distribution of the parameters, $P(Y_t \mid B,\sum)$ is the likelihood data, and $P(B,\sum)$ is the prior distribution of parameters. It is assumed that the model parameters are stochastic in nature. A prior distribution is stated by using Bayes Theorem to generate some objective information (Giannone, Lenza, & Primiceri, 2015: 436-451). The prior distribution specification serves as 'contraction' preventing the estimated parameters from displaying spurious correlations (Giannone, Lenza, & Primiceri, 2015: 436-451). The likelihood function is derivable from the sampling density, $P(Y_t \mid \alpha,\sum)$. Because it is a function of the parameters, it can be partitioned into two parts, namely: a distribution for $\alpha \mid \sum$ and $\sum^{-1}$ that follows a Wishart distribution. This is better expressed in Equation (4.40).

$$\alpha \mid \sum,\ r\sim N(\,\bar{\alpha},\sum \otimes\ (Z'\,Z)^{-1}) \quad \text{.....(4.40)}$$

And $\otimes$ is a tensor product of two vectors.

4.5.2 Prior distribution in Bayesian VAR

Prior probability distributions in BVAR are derived from the DSGE modelling. According to (Koop, 2013:280-290), the following prior probability distributions are often used in BVAR estimation process:

a. Natural conjugate prior

The natural conjugate priors in BVAR analysis allows development of closed-form solutions for the posteriors for the BVAR models. The natural conjugate prior takes the form:

$\alpha \mid \sum, r \sim N(\bar{\alpha}, \sum \otimes V)$ ……(4.41)

and

$\sum^{-1} \mid r \sim W(z, S^{-1})$ …… (4.42)

The posterior distribution for α is given as :

$\alpha \mid \sum, r \sim N(\bar{\alpha}, \sum \otimes \tilde{V})$ ……(4.43)

Where $\tilde{V} = (V^{-1} + Z'Z)^{-1}$ and

$\bar{\alpha} = vce(\hat{Z} \; and \; \hat{Z} = \tilde{V}(V^{-1}B + Z'Z\dot{B}))$.

The posterior for $\sum$ is given as:

$\sum^{-1} \mid r \sim W(V, \hat{S}^{-1})$ ……(4.44)

Where $\tilde{V} = T + V$.

b) Independent Normal-Wishart prior

According to Koop and Korobilis (2010:267-358), Normal-Wilshart prior is a common prior and it imposes no restrictions. Therefore, the BVAR model can be re-written as:

$y_{mt} = z'_{mt} + \varepsilon_{mt}$ ……(4.45)

Where m are the vector of the variables from 1 to $M(i.e\; m = 1, \ldots \ldots M)$ and t represents the observations for the m variables $(t = 1 \ldots \ldots \ldots T)$. y_{mt} is the t^{th} observations for the m^{th} variable, z_{mt} is a k_m vector that contains the t^{th} observations of the vector of explanatory variables relevant for the m^{th} variable and β_m is the k_m vector of model coefficients. z_m^t can be said to be an unrestricted VAR if $z_{mt} = (1, y'_{t-1} \ldots \ldots \ldots y'_{t-p})$ for $m = 1, \ldots, M$. Meanwhile, when employing the Normal-Wishart Prior, z_{mt} can be allowed to vary across equations and as a result make the coefficient on the lagged dependent variables to be restricted to zero.

Given the above information, Equation (4.45) can be written in both vector and matrices as:

$y_t = (y_{1t}, \ldots . y_{Mt})'$, $\varepsilon_t = (\varepsilon_{1t}, \ldots . \varepsilon_{Mt})'$,

$$\beta = \begin{pmatrix} \beta_1 \\ \vdots \\ \beta_M \end{pmatrix}$$

$$Z_t = \begin{pmatrix} Z_{1t}^{l} & 0 & \cdots & 0 \\ 0 & Z_{2t}^{l} & \ddots & \vdots \\ \vdots & \ddots & \ddots & 0 \\ 0 & \cdots & 0 & Z_{Mt}^{l} \end{pmatrix}$$

Note that ε is taken as identically and independently distributed with zero mean and covariance $\sum$, such that $\varepsilon \sim ii.dN(0, \sum)$. β is $k\ by\ 1$ matrix/vector. Z_t is an $M\ by\ k$ Matrix

and $k = \sum_{j=1}^{M} k\, j$.

Consequently, Equation (4.45) can be written as:

$y = z\beta + \varepsilon$ where $y = \begin{pmatrix} y_1 \\ \vdots \\ y_T \end{pmatrix}$, $\varepsilon = \begin{pmatrix} \varepsilon_1 \\ \vdots \\ \varepsilon_T \end{pmatrix}, Z = \begin{pmatrix} Z_1 \\ \vdots \\ Z_T \end{pmatrix}$ and $\varepsilon \sim N(0,\ I \otimes \sum)$.

The independent Normal-Wishart prior for the above model becomes $P(\beta, \sum^{-1}) = P(\beta)P(\sum^{-1})$.

The variables in BVAR model are represented in logarithmic terms at the estimation stage. Therefore, no differencing of data to ensure stationary. Sims and Zha (1998: 949-968), Korobilis (2013:204-230) and Koop and Korobilis (2010:267-358) did not recommend differencing the data in a BVAR model, because differencing leads to loss of useful information on the responses among the variables and co-movements in BVAR model.

4.6 TECHNIQUE OF ANALYSIS

Both descriptive statistics and econometric techniques of data analysis were employed to attain the highlighted objectives. Objective one of the study is achieved using DOLS technique suggested by Stock and Watson (1993: 783-820) to estimate Equation (4.21). Descriptive analysis is used to compare the degree of fiscal and monetary policies independence with inflationary trend in Nigerian and South African economy. The DSGE model is employed to evaluate the dynamic

responses among fiscal and monetary policies variables in respect to the degree of fiscal and monetary policies interdependence. BVAR served as robustness checks on dynamic responses between fiscal and monetary policies variables.

4.6.1 Unit root test

The implications from economic modelling were greatly damaged by the pervasiveness of sizeable co-movements between time series data. Granger and Newbold (1974:111-120) argued that if there is existence of unit roots between dependent and independent variables, customary estimation technique employing levels observation of the variables would probably produce significant relationship whereas there may not be expressive economic linkage. In order to overcome this challenge, the data should be subjected to necessary unit root test. Augmented Dickey- Fuller (ADF) and Phillip-Perron (PP) tests are used in this study. They are explained below:

4.6.1.1 Augmented Dickey Fuller (ADF) Test

This test is carried out under the supposition that stochastic terms are correlated serially. The test is implemented by augmenting equations 4.46 – 4.48 in order to remove any serial correlation.

$\Delta Y_t = \delta Y_{t-1} + U_t$ ..... (4.46)

$\Delta Y_t = \alpha + \delta Y_{t-1} + U_t$ ..... (4.47)

$\Delta Y_t = \alpha + \delta Y_{t-1} + \beta t + U_t$ ..... (4.48)

Officially, the test is implemented on the basis of Equation (4.49).

$\Delta Y_t = a_0 + \delta Y_{t-1}\, a_1 t + \sum_{i=1}^{m} \beta_i \Delta Y_{t-i} + \varepsilon_t$ ..... (4.49)

where ε_t is white noise, a_0 is an intercept and δ, β_i, a_1 are coefficients.

4.6.1.2 Phillips and Perron Test

Phillips and Perron (1988:335-346) established a broad theory on stationarity. The techniques are not different from ADF tests. The line of difference between the two lies on the approach of

overcoming serial correlation and heteroskedasticity in the stochastic term. However, the technique normally produces the same conclusions as the ADF tests.

The following model:

$Y_t = \theta_t + \emptyset\, Y_{t-1} + a_t$ ..... (4.50)

DF: $a_t \sim$ iid

PP: $a_t \sim$ serially correlated

$PP \text{ test equation} : \Delta Y_t = \theta_0 + \delta Y_{t-1} + a_t$

The hypothesis to be tested from 4.46 using PP test is:

$$H_0 : \delta = 0$$
$$H_1 : \delta < 0$$

The PP techniques adjust for problems of serial correlation and heteroskedasticity in the residuals a_t directly amending the test statistics δ_t =0 .The revised statistics, represented by Z_t and Z_δ are presented as:

$$Z_t = \sqrt{\frac{\hat{\sigma}^2}{\hat{\lambda}^2}} t_{\hat{\delta}} - \frac{1}{2}\left(\frac{\hat{\lambda}^2 - \hat{\sigma}^2}{\hat{\lambda}^2}\right)\left(\frac{n\left(s.e.\left(\hat{\delta}\right)\right)}{\hat{\sigma}^2}\right)$$

$$Z_\delta = n\hat{\delta} - \frac{1}{2}\frac{n^2\left(s.e.\left(\hat{\delta}\right)\right)}{\hat{\sigma}^2}\left(\hat{\lambda}^2 - \hat{\sigma}^2\right)$$

The terms σ^2 and λ^2 are reliable estimates.

$$\sigma^2 = \lim_{n \leftarrow \infty} n^{-1} \sum_{t=1}^{n} E\left(a_t^2\right) \qquad \lambda^2 = \lim_{n \to \infty} \sum_{t=1}^{n} E\left(\frac{1}{n}\sum_{t=1}^{n} a_t^2\right)$$

The superiority of PP techniques over the ADF techniques is that the PP approaches are more robust in overcoming problem of heteroscedasticity. Also, it does not need specification of lag length.

4.6.2 Lag length selection criteria

The selection of accurate lag length is important in modelling of econometrics, particularly in a BVAR model. This becomes necessary to overcome spurious conclusions. The lag length also affects the rejecting power of the hypothesis. For the purpose of any study, the optimal lag length suggested by Akaike information criteria (AIC), Schwarz information criterion (SC), Hannan–Quinn criterion (HIQ), Final prediction error could be picked. These criteria sometimes give differing lag length choices. Nevertheless, choice on the lag length of a BVAR model can be informed by the fact that a given criterion gives a white noise residual and safeguards degree of freedom.

4.7 DESCRIPTION OF VARIABLES

This section describes each variable and explains how it is measured. The following variables are employed in the estimation process.

4.7.1 Consumption expenditures

Consumption expenditures can be defined as expenditures made by the household on finished goods and services (Bhattarai & Whalley, 2000:69-93). Expenditures on consumption significantly affects macroeconomic activity both in the short run and the long run (Jhingan, 2007). This is one of the component of GDP. The other are investment, purchases of government, and net exports. The major purpose of consumption expenditures is to acquire the goods and services that satisfy wants and needs of the household (Bhattarai & Whalley, 2000:69-93).

4.7.2 Money supply

Money supply can be defined as entire total currency stock and other liquid instruments circulating in the economy at a particular time (Friedman, 968:1-17). The money supply includes cash, coins and balances held in checking and savings accounts. Money supply can also be defined as physical cash in circulation plus the money held in checking and savings accounts (Friedman, 968: 1-17). Central bankers across the globe largely measure their money supply with M1 and M2. The most liquid form of money is M1 (Goodhart, 1994: 139-187). Consequently, the presents study

makes use of M1 as a measure of monetary aggregates in estimating the degree of fiscal and monetary policies interdependence.

4.7.3 Inflation rate

Inflation is the increase in the Consumer Price Index (CPI). The CPI is a weighted average of prices for various goods (Akatu, 1993:321-339). The kind of goods that are included in the composition of CPI is determined by representative goods of consumers (Jhingan, 2007). There could be goods which experience fall in prices while other had price increase but eventual value of CPI will be determined by relative weight of each of the goods. Annual inflation which is used in the study as a monetary policy variable is the percent change of the CPI relative to the previous year.

4.7.4 Output level

Output is the final value of all goods and services an economy produces (Jhingan, 2007). It can also be defined as quantity of goods and services produced in a given time period, by country. The concept of national output is essential in the field of macroeconomics. It is an important and regular tool used in the analysis of macroeconomics to determine if an economy is growing or contracting (Easterly & Levine, 2003:3-39). Output can be used to assess the relative output among countries. It is often said that it is the national output of a country that makes her rich, not large amounts of money. The GDP is the predominant measure that is often used in the empirical analysis to measure national economic output.

4.7.5 Government spending

Government spending can be defined as government's purchase of goods and services (Bhattarai & Whalley, 2000:69-93). Government spending is undertaken by the government sector to perform key functions, such as national defence, education, subsidy for start-up industries or industries that cannot drive their operations with funding by the private sector, transfer payments in forms pensions, unemployment benefits, and financial and fiscal incentives to private firms in order to reinforce investment activity among others. These expenditures are financed with a combination of taxes and borrowing. Government spending is also used to inject extra spending into the macro-economy (Adams, 2008:1-8). This is primarily done to help achieve increases in total spending or

aggregate spending in economic activity. This kind of a stimulus is part of discretionary fiscal policy of government.

4.7.6 Government debt

Government debt is generally identified as total debt obligations of a country. It is the total indebtedness of a country either internally or externally (Ayodele & Falokun, 2003:1-560). Government debt can be categorized by duration or maturity period. The maturity period for short term debt is within a year while long-term debt is debt is over ten years. Medium-term debt is of course longer than short-term debt but shorter than long-term. The study makes use of public debt which is the summation of the internal and external outstanding debt of government.

4.7.7 Interest rate

Interest rate is an important monetary policy tool used to regulate the volume and direction of the credit or money in the economy (Jhingan, 2007). An interest rate as an important monetary policy variable is measured in many ways. The rate at which the central bankers rediscount their bill to commercial banks is a form of an interest rate which is called monetary policy rate (MPR). On the other hand, the rate at which money deposit banks, known as commercial banks allocate credit to the public is called lending rate or interest rate (Nwezeaku, & Akujuobi, 2010:140-150). This is a broader monetary policy tool as it encapsulates the monetary policy interest rate. Consequently, the study makes use of banking interest rate in the study.

4.7.8 Tax

Tax is an important fiscal policy variable; it is one of the major dominant sources of revenue to finance government spending, especially in developed countries. The total amount of money that government receives from taxation is termed tax revenue (Daniel, 2001:293-308). The tax revenue is the sum of the revenues of different kind of taxes such as the revenue of physical and juridical persons known as direct tax, wealth and assets, the domestic economic transactions (indirect taxes such as VAT) and international trade transactions (import duties) (Ogunmuyiwa, 2008:558-580). The study uses revenue from all tax levies of government.

4.8 DATA SOURCES

Data on consumption, inflation, outstanding government debt, money supply, government spending, economic growth, tax revenue and interest rate were employed. The data were obtained from World Development Indicator, while simulation and calibration was done within the DSGE model. A sample 36 years was used, that is from 1981 to 2016. The researcher chose 1981 because of notable monetary policy and fiscal policy development in Nigeria and South Africa during this period such as financial liberalisation of financial sector.

4.9 SUMMARY

The chapter presented the research methodology employed in the study. The relevant theoretical framework on fiscal and monetary policies interactions was reviewed. The theoretical framework provides the relevant background that supports the empirical investigation. The chapter also spelt out the various models to be estimated in the study. The dynamic least square model used in estimating the degree of fiscal and monetary policies interactions was derived clearly and methodically. The chapter presented the dynamic stochastic general equilibrium model (DSGE) and Bayesian vector autoregressive (BVAR) used in evaluating the dynamic responses between fiscal and monetary policies variables. The chapter also spelt out various estimation techniques and the variables used in the study were clearly explained. The study used three different statistical packages at different stages of the study as the need arose. The packages used were **Eviews 9, Matlab 2017A/ dynare** and **R** statistical package. The next chapter of the study presents the various empirical results and discussion of the findings.

CHAPTER 5

EMPIRICAL RESULTS AND DISCUSSION

5.1 INTRODUCTION

This chapter of the study presents the results of estimation of models on the degree of fiscal and monetary policy independence and the dynamic responses between fiscal and monetary policy variables in Nigerian and South African economies. The chapter is organised as follows. Section 5.2 deals with statistical properties of all the variables employed in the various stages of the estimation process Section 5.3 is tailored towards attainment of objective one of the study which is to determine the degree of fiscal and monetary policies interdependence in Nigeria and South Africa. More specifically, Section 5.3.1 examines the time-series properties or order of the integration of the variables. Section 5.3.2 on the other hand, focuses on the co-integration test. Section 5.3.3 presents and discusses the results of estimated parameters of the degree of fiscal and monetary policies interdependence using DOLS. Section 5.4 focuses on analysis of trend of inflation in respect to degree interdependence between fiscal and monetary policies. Sections 5.5 to 5.6 deal with the evaluation of the dynamic responses among fiscal and monetary policies variables shocks using DSGE in Nigeria and South Africa respectively. Section 5.7 presents the of the BVAR as robustness checks on the dynamic responses among fiscal and monetary policies variables.

5.2 DESCRIPTIVE STATISTICS

It is customary to carry out descriptive statistics of the variables before the econometrics analysis are done. Variables such as GDP, nominal consumption expenditure (CONS), money supply (MS), interest rate (INT), inflation rate (INF), government debt (DEBT), government spending (GSPD) and tax revenue (TR) are used at various stages of the estimation process. The descriptive analysis presented in Tables 5.1 and 5.2 reveal the basic characteristics of the all the variables used at various stages of estimation in this study.

The summary of statistics gives information about the statistical properties of the variables, such as means, median, minimum value and sample distribution measured by the skewness, kurtosis and Jarque-Bera statistics. The various statistics are indicated in Tables 5.1 and 5.2.

Tables 5.1 and 5.2 indicate that the variables used in estimation process for Nigeria and South Africa respectively display a high level of internal consistency within the maximum and the minimum values of these variables. In addition, the variables have a relatively low standard deviation which indicates that the variances of the variables are not unnecessarily large. The statistics of skewness and kurtosis offer important information on the symmetry of the probability distribution of time series and the thickness of the tails of these distributions, respectively. The skewness and kurtosis also show that the variances of the variables are minimal.

The Jarque-Bera statistics measures the normality properties of the data. At one percent level of significance, the Jarque–Bera statistics of each variable accepts the null hypothesis of the normality. This is further confirmed by the nearness of the mean and median values of each of the two series. The closer the mean and the median of the two variables, the greater the probability that such series will be normally distributed. This is the case in Tables 5.1 and 5.2 on the time series in the study.

Table 5.1: Summary statistics of variables (Nigeria)

Statistics	Variables							
	MS	**DEBT**	**CONS**	**GDP**	**GSPD**	**INF**	**INT**	**TR**
Mean	3.151	6.912	25.54	10.22	4.502	2.685	2.836	4.940
Median	3.085	7.0855	25.282	10.01	4.512	2.529	2.872	5.263
Maximum	3.767	9.301	26.48	11.14	4.670	4.288	3.454	8.094
Minimum	2.582	2.604	24.74	9.530	4.218	1.683	2.187	1.093
Std. Dev.	0.265	0.941	0.566	0.535	0.09	0.720	0.302	2.431
Skewness	0.175	-0.757	0.468	0.443	0.942	0.815	0.671	-0.257
Kurtosis	2.696	2.383	1.724	1.77	4.373	2.641	3.069	1.612
Jarque-Bera	0.314	3.898	3.65	3.431	7.935	4.178	2.711	3.284
Probability	0.854	0.1423	0.16	0.179	0.018	0.123	0.257	0.193
Sum	110.3	241.9	894.1	367.9	157.5	96.67	102.1	177.8
Sum Sq. Dev.	2.398	128.1	10.89	10.03	0.301	18.15	3.209	206.91
Observations	36	36	36	36	36	36	36	36

Source: Author’s computation

Table 5.2: Summary statistics of variables (South Africa)

Statistics	Variables							
	MS	**DEBT**	**CONS**	**GDP**	**GSPD**	**INF**	**INT**	**TR**
Mean	4.079	3.507	26.04	13.49	4.584	2.084	2.670	2.515
Median	3.995	3.453	25.97	13.58	4.594	2.073	2.710	2.595
Maximum	4.391	3.843	26.55	15.28	4.628	2.926	3.106	3.367
Minimum	3.817	3.0982	25.58	11.22	4.504	0.325	2.140	1.029
Std. Dev.	0.174	0.225	0.314	1.238	0.032	0.552	0.296	0.513
Skewness	0.456	0.141	0.275	-0.269	-0.763	-0.725	-0.282	-0.663
Kurtosis	1.718	1.843	1.694	1.886	2.962	3.943	1.875	3.494
Jarque-Bera	3.711	2.125	3.01	2.293	3.499	4.492	2.375	2.927
Probability	0.156	0.345	0.221	0.317	0.173	0.105	0.304	0.231
Sum	146.8	126.2	937.6	485.9	165.0	75.032	96.14	88.05
Sum Sq. Dev.	1.061	1.779	3.46	53.64	0.036	10.70	3.076	8.955
Observations	36	36	36	36	36	36	36	36

Source: Author's computation

5.3 DEGREE OF FISCAL AND MONETARY POLICY INDEPENDENCE

This section of the study deals with estimating the degree of fiscal and monetary policies interdependence in Nigeria and South Africa. As earlier pointed out in Chapter 4 of the study, the degree of fiscal and monetary policies interdependence is achieved by estimating equation (4.20) using dynamic least squares (DOL) proposed by Stocks & Watson (1993:783-820). The DOLS estimation requires the variables under estimation; consumption expenditure, government debt and monetary base to be stationary at first difference and be cointegrated.

5.3.1 Unit root test results

The unit root results considered at both levels and 1st difference are presented in Table 5.3. and Table 5.4 for Nigerian and South African economies respectively. By means of ADF and PP techniques, all the variables were non-stationary at levels, because the t-statistic for each of the variables is less than the critical values at 5% level of significance as suggested by insignificance

of the variables at their levels. The variables were then examined at first difference. This means the null hypothesis that the variables are I (1) was investigated. The results showed that first differencing would make the variables to be stationary at 5% significance level.

Table 5.3: Unit root test for the variables in level and 1st difference (Nigeria)

Series	ADF test		PP test	
	Level	1st diff.	Level	1st diff.
MS	0.1170	0.0003*	0.2205	0.0000*
DEBT	0.0921	0.0021*	0.1261	0.0021*
CONS	0.9855	0.0000*	0.9824	0.0000*

** Represents significance at 5% level of significance*

Source: Author's computation

Table 5.4: Unit root test for the variables in level and 1st difference (South Africa)

Series	ADF test (Prob. Values)		PP test (Prob. Values)	
	Level	1st diff.	Level	1st diff.
MS	0.8944	0.0020*	0.8564	0.0020*
DEBT	0.1892	0.0005*	0.4664	0.0175*
CONS	0.9715	0.0088*	0.9729	0.0191*

** Represents significance at 5% level of significance*

Source: Author's computation

5.3.2 Co-integration test results

The results of Johansen cointegration test for Nigeria and South Africa are presented respectively in Tables 5.5 and 5.6. From Tables 5.5 and 5.6, there exists a co-integration relationship between monetary base, government debt and consumption in Nigeria and South Africa. The presence of co-integration relationship was also established using Philips and Ouliaris co-integration technique which is available in the software R, in package Urca. The results of Philips and Ouliaris are presented for Nigeria and South Africa in Tables 5.7 and 5.8 respectively. Because the test statistic values are greater than critical values as can be seen in Tables 5.7 and 5.8, the null hypothesis of

no co-integration is not accepted. Thus, it is concluded that there is occurrence of co-integration relationship.

The results of cointegration are particularly important and of high significance because it enables the equilibrium money market to be empirically characterised as a cointegrating relation. In other words, if the individual series can be said to be nonstationary processes, the behavioural pattern and model constraints means that the combination of these variables should be stationary. Consequently, dynamic least square (DOLS) produces a super-consistent estimate of the parameter that gives the degree of the interdependence between fiscal and monetary policies interactions.

Table 5.5: Cointegration test results (Nigeria)

Eigen value	**Trace statistic**	**5 Percent critical value**	**Hypothesised NO of CE(s)**
0.531934	35.94904	29.79707	None *
0.457969	28.89720	27.49471	At most 1 *
0.031352	1.051169	3.841466	At most 2
Eigen value	**Max-Eigen statistic**	**5 Percent critical value**	**Hypothesised NO of CE(s)**
0.531934	25.05183	21.13162	None *
0.457969	9.846036	14.26460	At most 1 *
0.031352	1.051169	3.841466	At most 2

*Notes: Both Trace test and maximum Eigen statistics indicate two co-integrating equations at 5-percent significant level; * denotes rejection of null hypothesis at 0.05 significant level; Critical values are from Mckinnon-Haug-Michelis (1999); The results reported are based on the assumption of constant and a liner trend with optimal lag length 1.*

Source: Author's computation

Table 5.6: Cointegration test results (South Africa)

Eigen value	**Trace statistic**	**5 Percent critical value**	**Hypothesised NO of CE(s)**
0.583057	33.69677	24.27596	None *
0.309475	31.953341	20.32090	At most 1 *
0.000330	0.011235	4.129906	At most 2

Eigen value	Max-Eigen statistic	5 Percent critical value	Hypothesised NO of CE(s)
0.583057	29.74343	17.79730	None *
0.309475	23.94210	11.22480	At most 1 *
0.000330	0.011235	4.129906	At most 2

*Notes: Both Trace test and maximum Eigen statistics indicate two co-integrating equations at 5-percent significant level; * denotes rejection of null hypothesis at 0.05 significant level; Critical values are from Mckinnon-Haug-Michelis (1999); The results reported are based on the assumption of constant and a liner trend with optimal lag length 1.*

Source: Author's computation

Table 5.7: Philips and Ouliaris cointegration test results

Deterministic term	Test statistic	Critical values
Absence of Trend	8.61	-3.6
With Trend	7.326	-4.1

Note: Critical values are computed from the MacKinnon's table on co-integration test

Source: Author's computation

Table 5.8: Philips and Ouliaris cointegration test results

Deterministic term	Test statistic	Critical values
Absence of trend	11.327	-3.6
With trend	10.816	-4.1

Note: Critical values are computed from the MacKinnon's table on cointegration test

Source: Author's computation

5.3.3 Estimate of structural parameters using DOLS

The degree of fiscal and monetary policies interdependence which is otherwise a measure of central bank independence is obtained by estimating equation (4.20) using dynamic OLS (DOLS). The DOLS version of equation (4.20) is expressed in equation (4.21). The econometric strategy of the DOLS requires that the variables in the estimated model be $I(1)$ and have a cointegrating relationship. Having used the necessary unit root tests and cointegration tests to establish and confirm both conditions, the results of structural parameters estimates are presented in Table 5.9.

The results show that the degree of fiscal and monetary interdependence in Nigeria is 0.84 while it is found to be 0.67 in South African economy. Recall that when the degree of fiscal and monetary policies interdependence, δ, is 1, all the government debt is backed or financed by the current value of the primary surplus and when it is found to be 0, the whole debt is paid by the monetary authority.

Since the degree of fiscal and monetary policies in both Nigeria and South Africa is greater than 0.5 and closer to one, it implies that in coordination of fiscal and monetary policies in both countries, the central bank is more active and a first mover. It connotes that monetary authorities in both countries fixed their policies ahead and enforce discipline on fiscal authorities. This discipline connotes that fiscal authority would follow a sequence of primary surpluses and debt that is steady or consistent with the sequence of monetary aggregates supplied in both economies by the monetary authority. This submission conforms to the findings by Castro, Resende & Ruge-Murcia (2003: 1-34) and Fischer, Sahay and Vegh (2002:887-880). Also, since the degree of fiscal and monetary policies interdependence in both Nigeria and South Africa is closer to one than zero, this implies that hypothesis of fiscal dominance would be quite low or near complete absence in both economies. This is consistent with empirical findings by Sanusi & Akinlo (2016:125-131).

On the other hand, the results show that, on average, about 84% and 67% of government debt is backed up by fiscal authority in Nigeria and South Africa while the remaining percentage is accommodated by monetary authority. Put differently, the empirical findings show that, on average, greater percentage of government debt is backed up by fiscal authority in the Nigerian and South African economy, while the lower percentage is accommodated by monetary authority. From the analysis, the extent to which monetary authority activities are influenced by fiscal authority is found to be higher in the South African economy than in Nigeria. This implies that fiscal authority responds more to current levels of debt in Nigeria through raising of revenue to increase the future primary surplus than in the case of South African economy.

However, Sargent & Wallace (1981:1-17) and Aiyagari & Gertler (1985:19-44) argued that the degree of fiscal and monetary policies interdependence should be higher in developed economies than developing economies. Consequently, it would be naturally expected that the degree of fiscal and monetary policies interdependence would be higher in South Africa than Nigeria given the

higher level development in South Africa. The empirical findings from this study did not substantiate the position of Sargent & Wallace (1981:1-17) and Aiyagari & Gertler (1985:19-44). Nevertheless, the empirical findings are consistent with Castrol, Resende and Ruge-Murcia (2003: 1-34) who reported higher degrees of fiscal and monetary policies interdependence in Austria than France and Germany.

Table 5.9: Degree of fiscal and monetary policies interdependence in Nigeria & South Africa (DOLS MODEL)

Country	$\boldsymbol{\rho_1}$	$\boldsymbol{\rho_2}$=$-(\mathbf{1}-\boldsymbol{\delta})$	$\boldsymbol{\delta}$ **(degree fiscal & monetary Policies interdependence with p-value in parenthesis**
Nigeria	0.43768	-0.1590	0.841 (0.0111)
South Africa	0.55156	-0.3297	0.6703 (0.0000)

Source: Author's computation

5.4 ANALYSIS OF TREND INFLATION IN RESPECT TO DEGREE OF INTERDEPENDENCE BETWEEN FISCAL AND MONETARY POLICIES

Having determined the degree of fiscal and monetary policies interdependence, the next task is to analyse the trend of inflation in Nigeria and South Africa in the light of the estimated degree of fiscal and monetary policies interdependence. This becomes pertinent following some theoretical and empirical arguments on the degree of fiscal and monetary policies interdependence and inflationary trend. Kydland & Prescott (1977:473-491), Barro & Gordon (1983:101:121) and Rogoff (1985:1169-1190) articulated this theoretical position, while some empirical evidence is provided by Bade & Parkin (1982), Grilli, Masciandaro & Tabellini (1991:49-77) Alesina & Summers (1993:151-162). They argued that a higher degree of fiscal and monetary policies interdependence is associated with lower levels of inflation.

The trends of inflation in both Nigeria and South African economies are contained in Figures 5.1 and 5.2 respectively while the combined graph is shown in Figure 5.3. By looking at the vertical-axis of both Figures 5.1 and 5.2, it is clear that inflation has higher frequency in Nigeria and South

Africa. This simply suggests higher inflation trends in Nigeria compared to South Africa under the study period.

It is clear from the graphs that the inflation rate has been consistently higher in the Nigerian economy than in the South African economy. Nigeria recorded more double-digit inflation rates than South Africa. South Africa recorded double-digit inflation rate from 1981 until 1992. From 1993, South Africa began to record annual single-digit inflation rate and the annual inflation was mostly falling except for a few years such as 1997, 2002, 2007 and 2008 in which the country experienced a sharp rise in annual inflation rate. The rise in annual inflation rate in 2007 and 2008 could be largely attributed to global financial crisis which affected most of the emerging economies.

On the other hand, annual inflation rate in Nigeria under the study period has been largely double-digits. Nigeria recorded several episodes of double-digit inflation and few of these episodes of double-digit inflation were exceptionally high such as 50% between 1993 and 1994. However, this is an outlier as it could be mainly attributed to unstable and unfavourable macroeconomic environment created by political and governance crisis experienced during the military era, which plunged the economy into serious and deep crisis. Taking average of annual inflation rates under the study period, average annual inflation rate in Nigeria is 19.6% while it is 9.1% in South Africa. This means that on average, inflation rate in Nigeria is higher than South Africa.

Turning to theoretical and empirical arguments that higher degrees of fiscal and monetary policies interdependence are associated with lower levels of inflation, this position is consistent with the evidence from the South African economy. It can be seen that the degree of fiscal and monetary policies interdependence is 0.67, which is closer to one than zero. It shows that the South African economy is not injected into a fiscal dominance environment. This suggests that the central bank in South Africa enjoys a measure of independence, which in turns translates to a moderate inflation rate in the country, as the annual inflation rate in South Africa has been largely single digit since the end of the apartheid era. This is consistent with several other empirical findings in the literature such as Alesina & Summers (1993:151-162), Fratianni & Spinelli (2001:252-272), Leeper (1991:129-147) Sargent & Wallace (981:1-17) and Xiong (2012:512-533).

However, empirical findings suggest that though Nigeria has higher degree of fiscal and monetary policies interdependence than South African economy, average inflation rate in Nigeria is high. This empirical finding does not support the position of Alesina & Summers (1993:151-162) among others. This result does not find evidence of low inflation being associated with higher degrees of fiscal and monetary policies interdependence. The empirical results corroborate the findings by Ornellas & Portugal (2011:1-31). Ornellas & Portugal (2011:1-31) found higher degree of fiscal and monetary policies in Brazilian economy than US and Canadian economies but inflation was found to be higher in Brazil during the period under consideration.

One possible deduction from high levels of inflation in Nigeria during the study period, despite lower level fiscal dominance as implied by a higher degree of fiscal and monetary policy interdependence is that inflation in Nigeria is largely non- monetary. In other words, inflation in Nigeria during the study period has been driven by factors other than increased money supply. Factors such as weak productive base, low export, high levels of importation of already inflated commodities from overseas, political instability and structural rigidities among others could be responsible for high level of inflation in Nigeria despite a low level fiscal dominance.

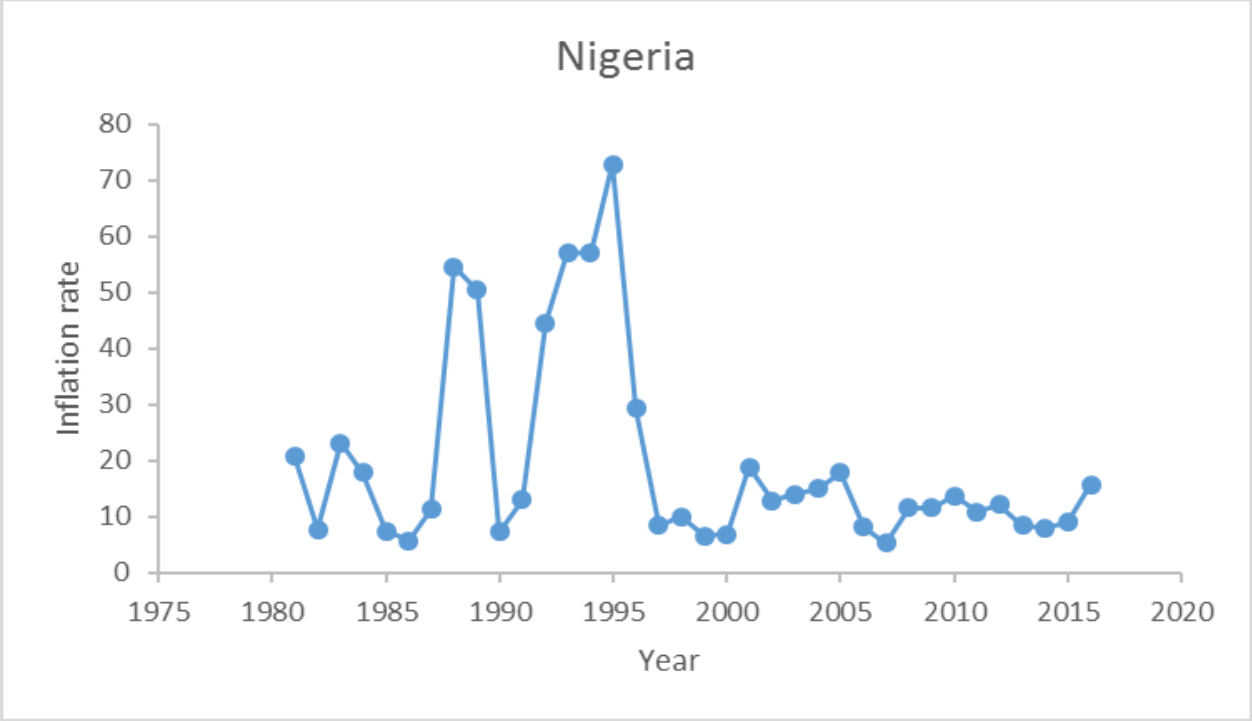

Figure 5.1: Inflationary trend in Nigeria

Source: Author's computation

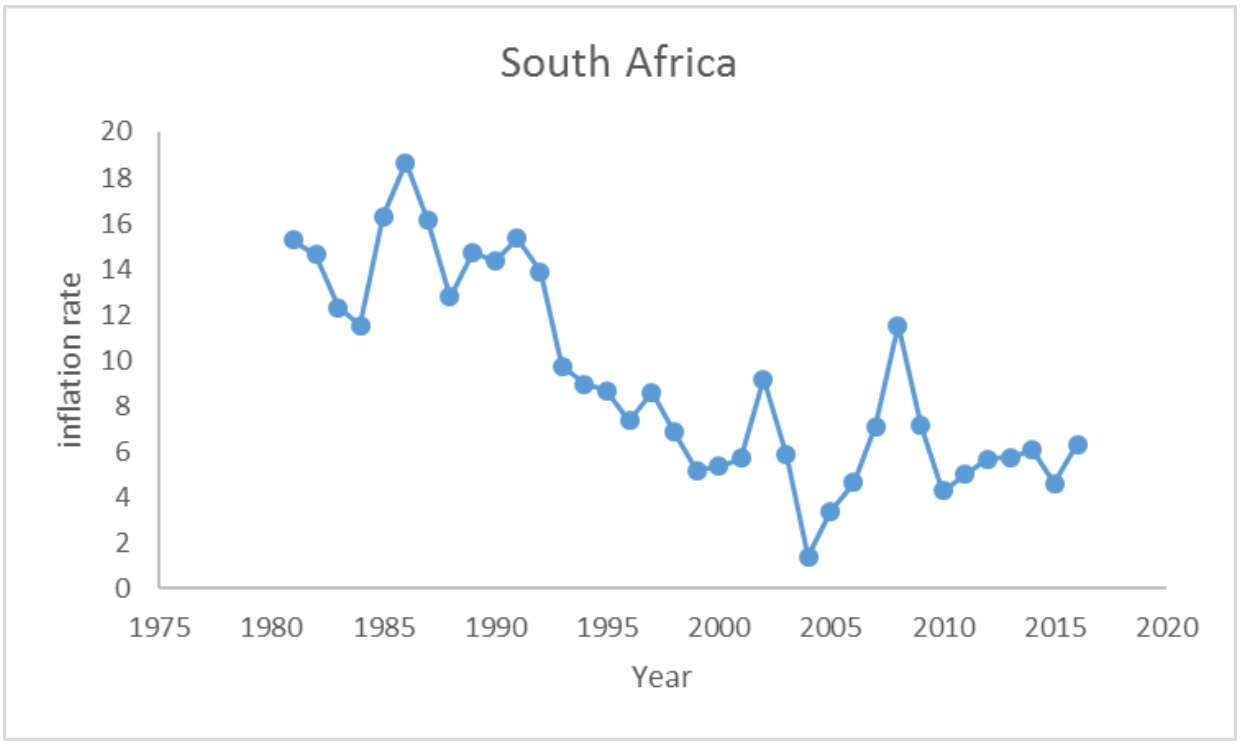

Figure 5.2: Inflationary trend in South Africa

Source: Author's computation

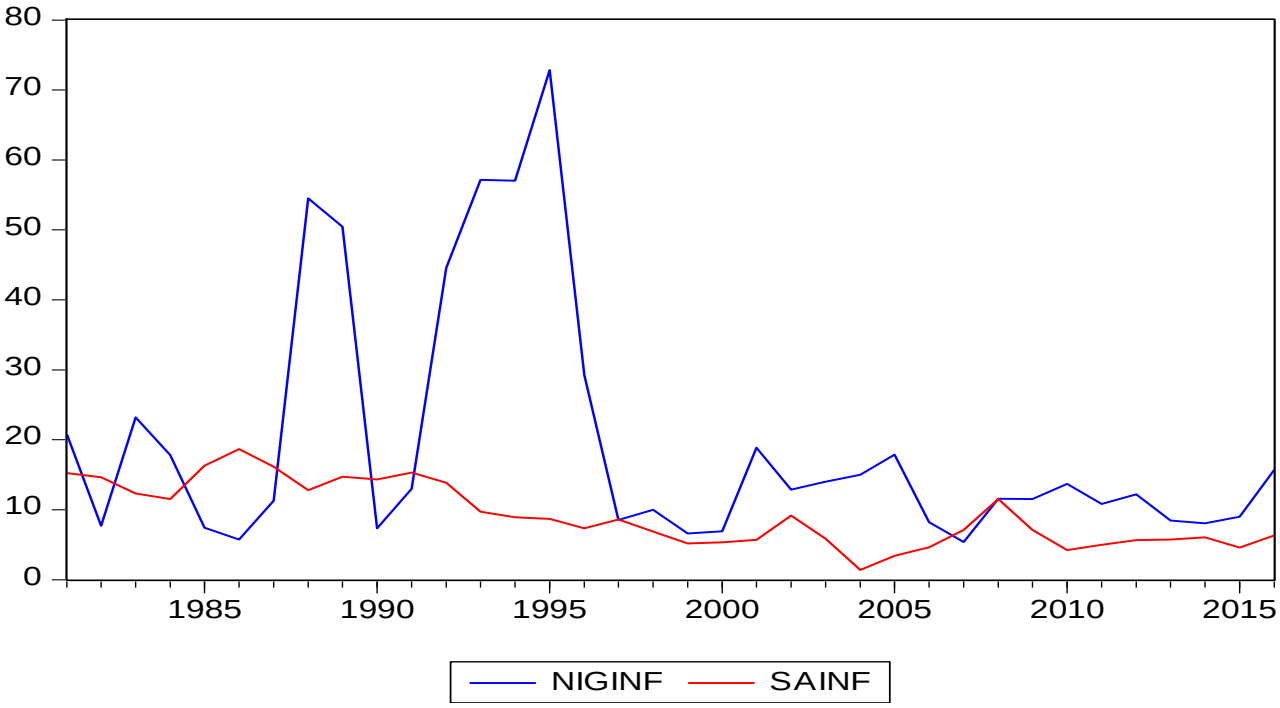

Figure 5.3: Combined inflationary trend

Source: Author's computation

5.5 EVALUATION OF THE DYNAMIC RESPONSES AMONG FISCAL AND MONETARY POLICIES VARIABLE SHOCKS USING DYNAMIC STOCHASTIC GENERAL EQUILIBRIUM MODEL (DSGE) IN NIGERIA

The analysis of dynamic responses within the DSGE model is done by evaluating the impulse responses functions obtained from Dynare software. The fiscal and monetary policy variables examined in this study are interest rate, inflation rate, government debt, tax revenue, government debt and output. This section discusses how each of the variables responds to various modelled shocks in Nigerian. The following subsections deal with discussion on the responses of fiscal and monetary policies variables to various modelled shocks in Nigeria:

5.5.1 Inflation shocks

Figure 5.4 shows how various fiscal and monetary policy variables responds to inflationary shocks in the Nigerian economy. A shock to inflation causes an initial rise in inflation rate, interest rate and government spending before it becomes stable and later begins to decline until the effects of the shock completely fizzle out as inflation rate returns back to the steady state. These behaviour responses of inflation rate, interest rate and government spending are consistent with both theoretical and existing literaure. The initial rise could be theoretically attributed to the fact the economic agents did not have an expectation of the shocks.

However, as the expectations are formed, the effects of the shocks become stable and finally return to the steady state. This is consistent with empirical findings such as Cebi (2012:1258-1267) and Gali (2003:151-197). On the other hand, the shock to inflation causes an initial fall in output, government debt, and tax revenue. The domestic output fell sharply due to shocks in inflation which might be as a result of increased cost of production. It then declined until it eventually returned to the steady state. Government debt also fell abruptly due to shocks to inflation and eventually returned to its steady state, while tax rose after the initial falls due to the inflationary shocks before finally settling at its steady state.

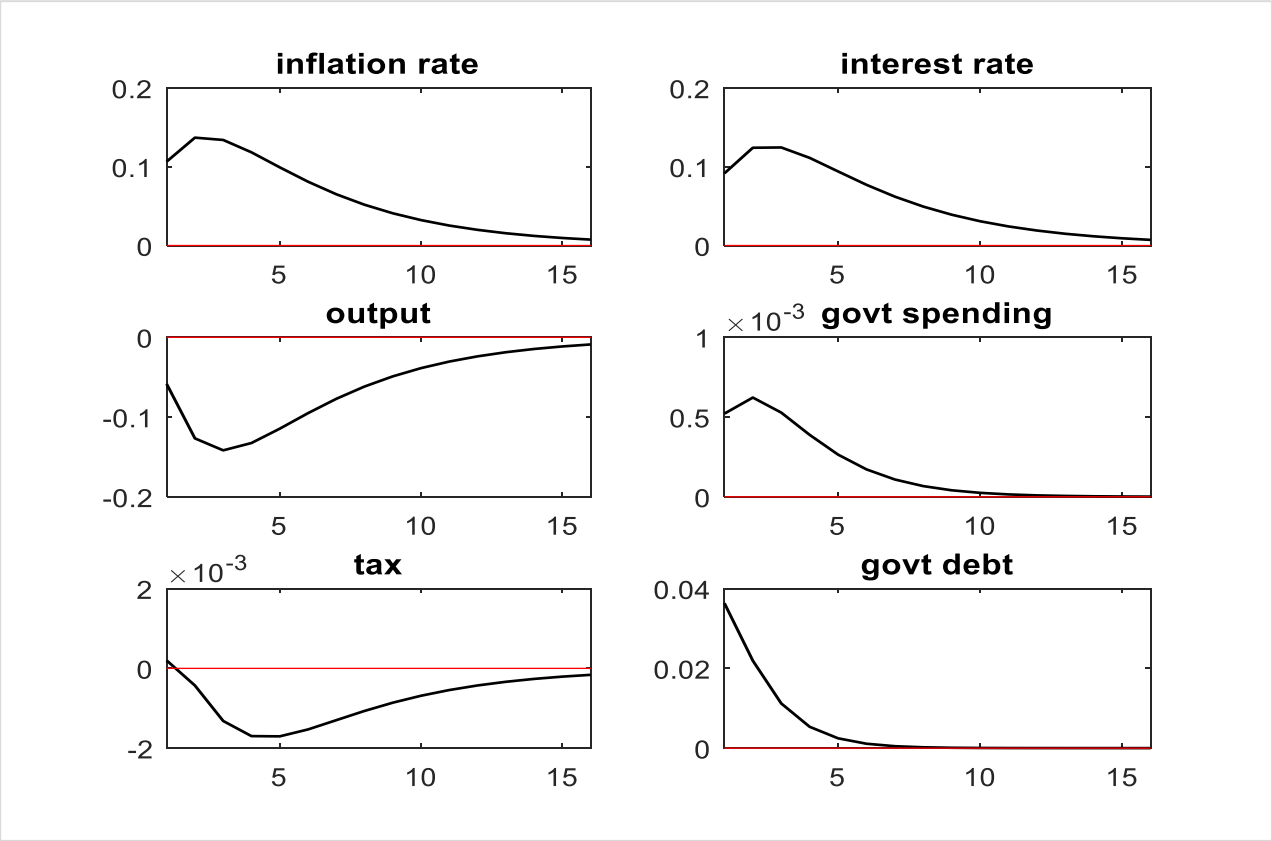

Figure 5.4: Orthogonalised Inflation shocks

Source: Author's computation

5.5.2 Interest rate shocks

Figure 5.5 shows the responses of fiscal and monetary policy variables to interest rate shocks. An interest rate shocks causes initial falls to inflation rate, interest rate and tax revenue. Inflation rate and tax revenue fell shortly and immediately rose and finally converged at the steady state while the interest rate continued to fall until the effects of shocks finally dissipated. On the other, the shock to interest rate causes initial rises in output, government debt, and govermnent spending. The effects of the shocks however fade away with time and they eventually settle at their steady state. The increase in government debt is consistent with the theoretical expectations. This is because a shock to interest rate would motivate government debt to rise to boost the aggregate output in the economy, which in turns increases the government spending and output. The empirical result is consistent with a few existing studies such as Muscatelli, & Tirelli (2005:549-585), Sims (1994:381-399). The result however, differs from Shahid and Waseem (2016:1-41).

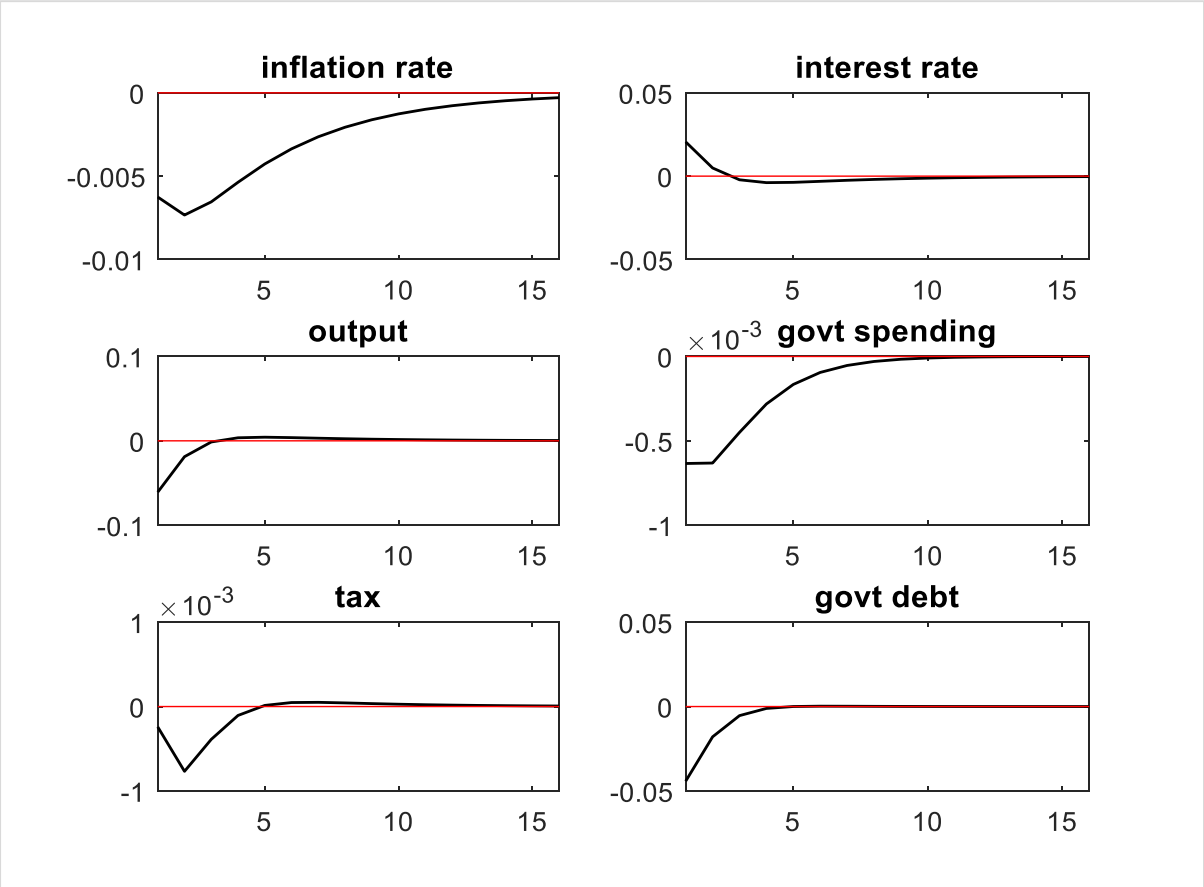

Figure 5.5: Orthogonalised interest rate shocks

Source: Author's computation

5.5.3 Government spending shocks

Shocks to government spending in Nigeria can be seen from Fgure 5.6 to cause immediate fall in inflation rate. As people form expectations about the shocks, it begins to have positive impact on inflation rate in the country. This supports the earlier claim that inflation in Nigeria is not largely a monetary phenomenon. Expectedly, the shocks to government spending have immediate positive impacts on the output level. However, the effect begins to wane as output converges back to the steady state. The initial increase in the output level could be associated with the sudden surge in the aggregate spending which in turns stimulates the economic activities and consequently increases the output level. The findings are consistent with studies such as as Cebi (2012:1258-1267) and Shahid &Waseem (20161:1-41). The effects of shocks to government spending on government debt are positive throughout until economy converges at the steady state. The rise in the government debt could be attributed to the fact that, the change in government spending is a

shock and not planned, government is likely to finance the majority of the shocks in spending by debt. Meanwhile, tax revenue is observed to fall immediately, but the tax revenue in turns, begins to increase as the economy moves towards the steady state. Response of government spending to its own shocks also conforms to virtually all the earlier studies. Government spending initially rose and later stabilised and tends to converge back to its steady state.

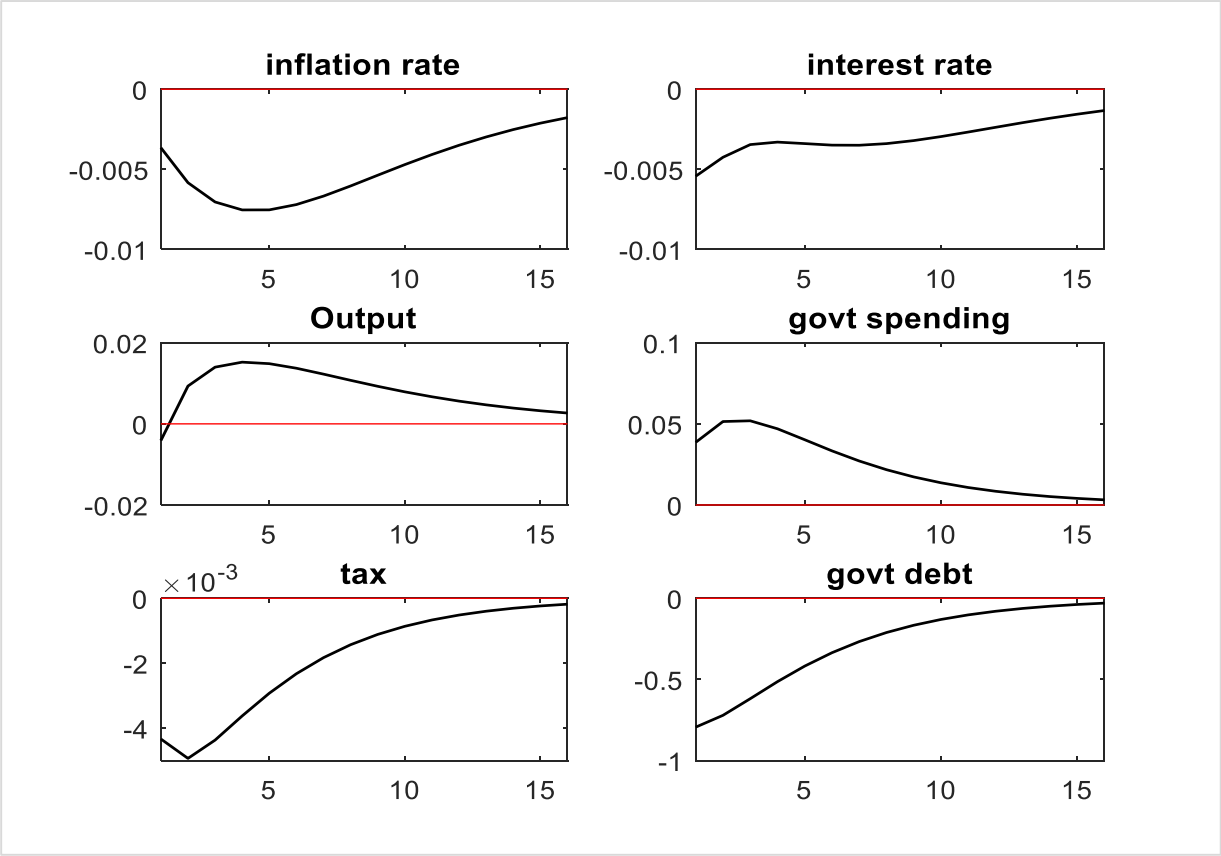

Figure 5.6: Orthogonalised government spending shocks

Source: Author's computation

5.5.4 Tax shocks

Figure 5.7 explains how fiscal and monetary policies variables respond to tax shocks. The shock to tax causes a slight fall in inflation rate, and becomes relatively stable and consequently begins to rise toward the steady state. Tax shocks are seen to have a positive effect on interest rate. Interest rate responds positively and increases continuously until the economy reachs the steady state. The response of interest to tax shocks could be associated to some imperfection in financial system in

Nigeria, which is not connected with paucity of funds for borrowers but rather some factors such as information asymmetry between the borrowers and the lenders, and inadequate organised financial market where buyers and lenders freely interact. Meanwhile, the shocks in tax do not produce expected macroeconomic outcomes on output and government spending in Nigeria. One would expect a positive relationship between tax shocks and output on one hand, and positive relationship between tax shocks and government spending on the other hand; the reverse is observed. The possible explanation for this is the fact that tax is an automatic stabiliser in the economy which reduces the amount by which output responds to changes in any of its autonomous components. However, if tax is well and judiciously used, it would be expected to boost the output level through increased spending by government on production. One must expect a negative impact on the output level since the government spending responds negatively. Government debt falls due to the shocks in tax revenue. The implication here is that due to the increase in government revenue from tax, a proportion of the spending financed by debt significantly fell and the effects also fizzled out as the economy converges back to its steady state.

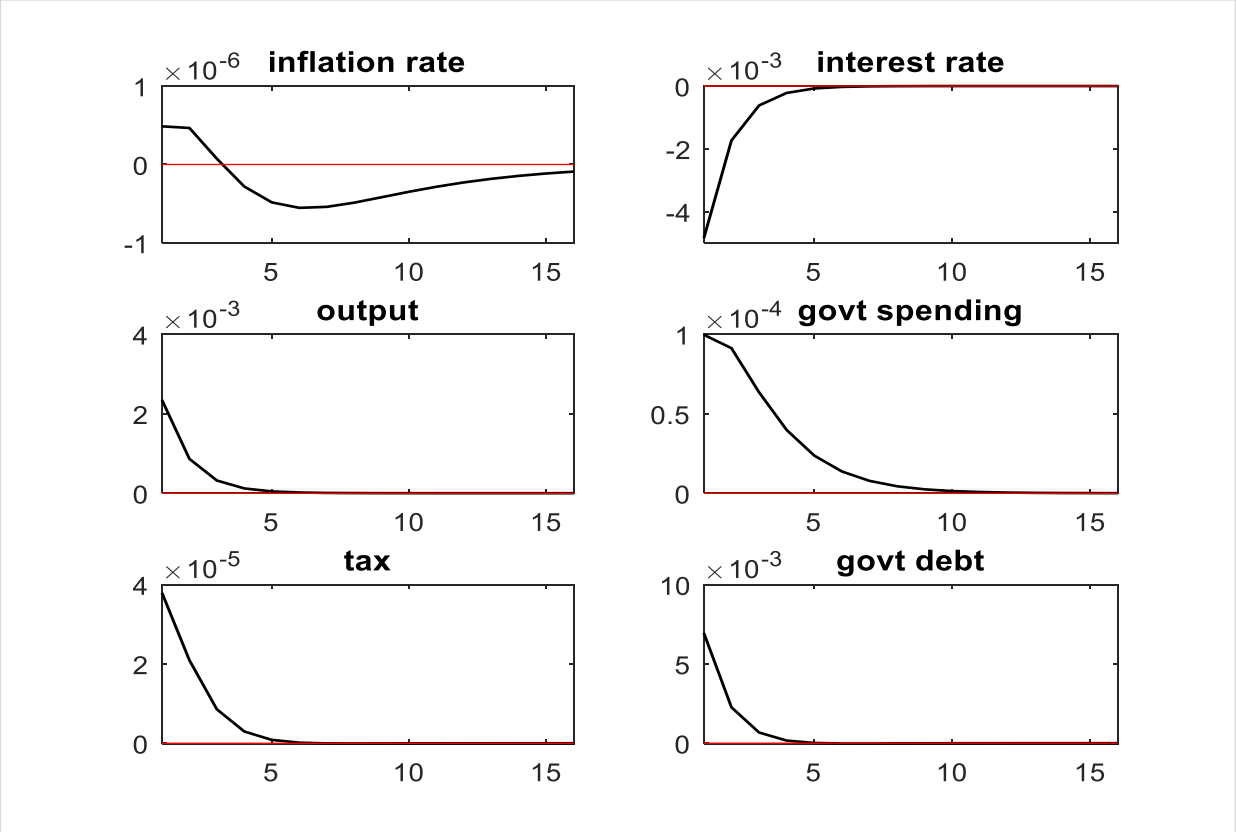

Figure 5.7: Orthogonalised shocks to tax

Source: Author's computation

5.5.5 Technological shocks

In DSGE analysis of fiscal and monetary policies interactions, the role of technological shocks is always considered given the theoretical models underpinning DSGE model. Figure 5.8 shows the roles of technological shocks to fiscal and monetary policy variables. The empirical results show that shocks to technology, known as total factor productivity, have permanent positive effects on the domestic output, as there is a change in the steady state of the economy. While a shock to technology seemed to have a reducing impact on the inflation rate and interest rate. Technological shocks leave a permanent rising effect on government debt, as the steady state appears to shift upward. This means the bulk of the cost used in financing the technology might be through government debt.

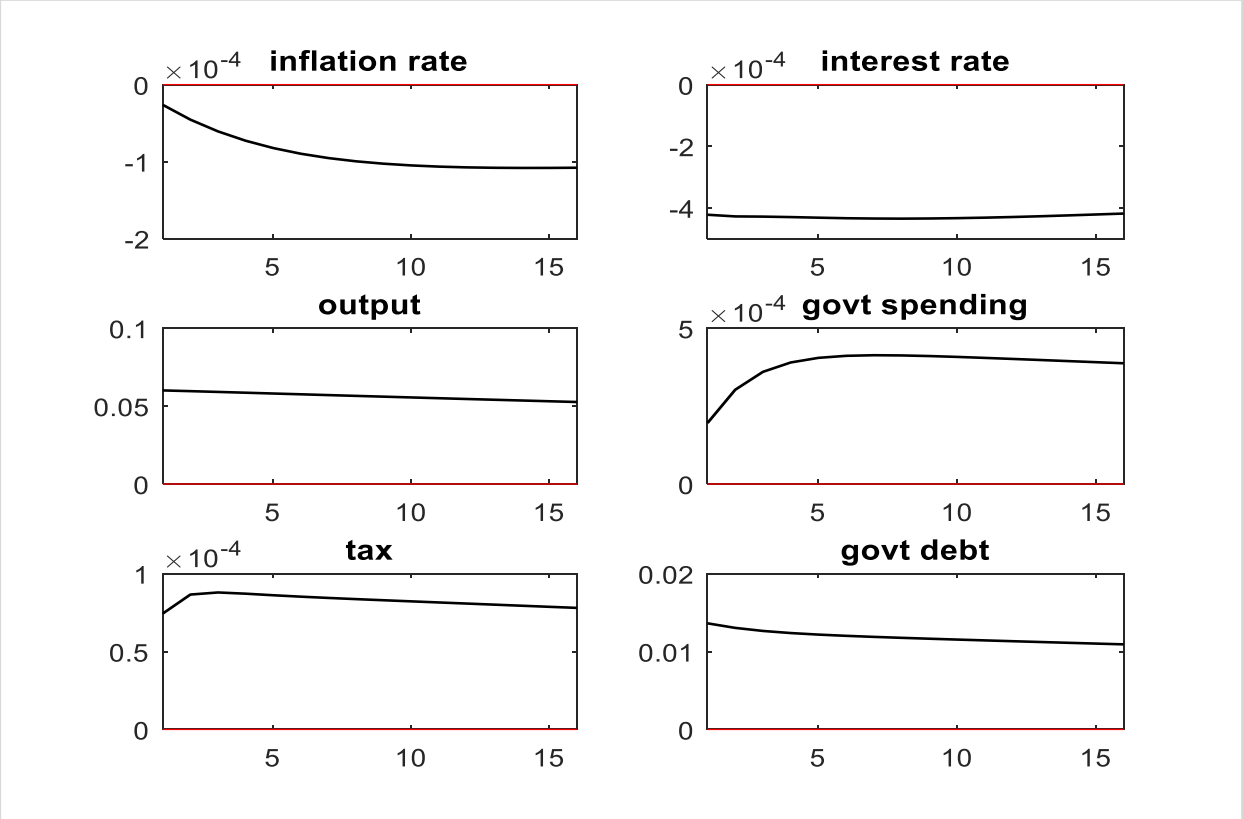

Figure 5.8: Orthogonalised technological shocks

Source: Author's computation

The shocks to technology causes both government spending and tax to rise and the effects seem to be relative stable. Figure 5.8 shows that the increase in government spending could be associated

with the increase in other components of government's expenditure such as education and research which are necessary to provoke technological breakthrough. Meanwhile, as technology becomes more advanced, the means of collecting tax becomes easier and various ways by which people avoid tax become blocked. The resultant effect of this is increased revenue from tax; in all fiscal and monetary policy variables respond appropriately to shocks in technology. This is consistent with standard economic theory that technology plays an important role in fiscal and monetary policies interactions. The findings are also consistent with existing studies such as Shahid & Waseem (20161:1-41) and Grith & Uhlig (2007: 1-70).

5.6 EVALUATION OF THE DYNAMIC RESPONSES AMONG FISCAL AND MONETARY POLICIES VARIABLE SHOCKS USING DYNAMIC STOCHASTIC GENERAL EQUILIBRIUM MODEL (DSGE) IN SOUTH AFRICA

As stated earlier that the discussion on the analysis of dynamic responses within the DSGE model is largely carried out in the literature by evaluating the impulse response functions obtained from Dynare. This section focuses on how the fiscal and monetary policy variables such as interest rate, inflation rate, government debt, tax revenue, government debt and output respond to modelled shocks in the South African economy. Subsequently, this section is divided into the following subsections which highlight the response of each of the variable to modelled shocks:

5.6.1 Inflation shocks

Responses of fiscal and monetary policy variables to shocks in inflation in South Africa exhibited some similarities and sharp differences when compared with that of Nigerian economy as shown in Figure 5.9. A shock to inflation like Nigerian economy brought about sharp rise in inflation rate and interest rate. The inflation later began to fall and the effects of the shocks fade away as the economy converges back to the steady state. Similarly, output also fell due to shock to inflation. The effect of the fall in the output did not however last as output began to rise again and economy converges back to the steady state.

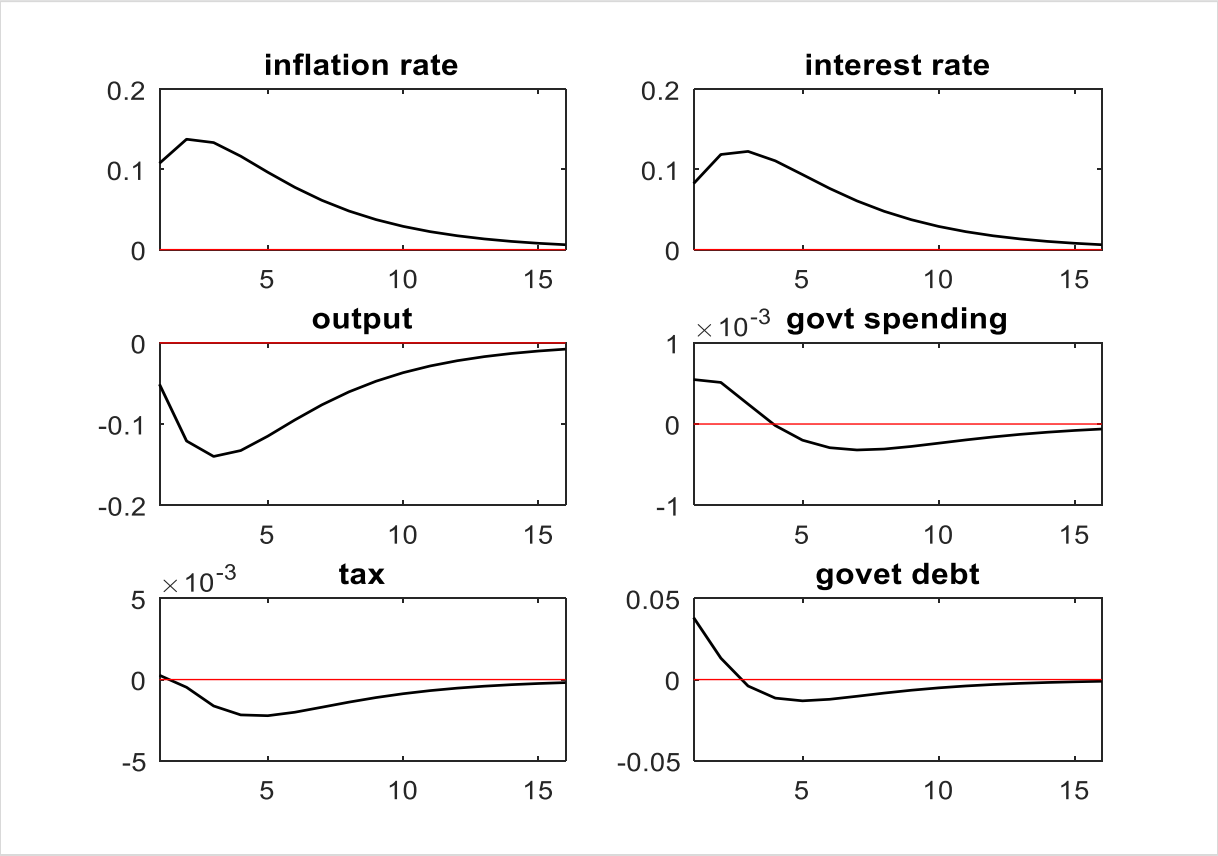

Figure 5.9: Orthogonalised shocks to inflation

Source: Author's computation

Looking at the response of government spending, government spending fell due to shocks in inflation in South Africa, unlike Nigeria where a short increase in government spending is observed as shown in figure 5.9. The eventual fall in government spending is longer in Nigeria than South Africa as economy quickly converged back to the steady state in South Africa. However, tax revenue also fell in South Africa due shocks in inflation, the weight of the fall in tax revue is higher in Nigeria than South Africa. Tax quickly returned to its steady state after a short fall. Shocks to inflation rate are also found not to have significant effect on the government debt in South African economy. Government debt slightly fell around its steady state but immediately returned to its steady state.

5.6.2 Interest rate shocks

Figure 5.10 depicts the responses of fiscal and monetary policy variables to interest rate shocks within the South African economy. An interest rate shocks stimulate a short fall in inflation rate

and the fall is immediately accompanied with a rise as it converges back to its steady state. The responses of interest rate to its own shocks and response of tax revenue to interest shocks are similar to that of Nigerian economy as well. They originally deviated from the steady state with initial rise and shortly began to increase again and finally settle at the steady state. On the other, the shock to interest rate, just like the case of Nigeria, causes output, government debt, and government spending deviated initially from the steady state and immediately rose back to their steady state.

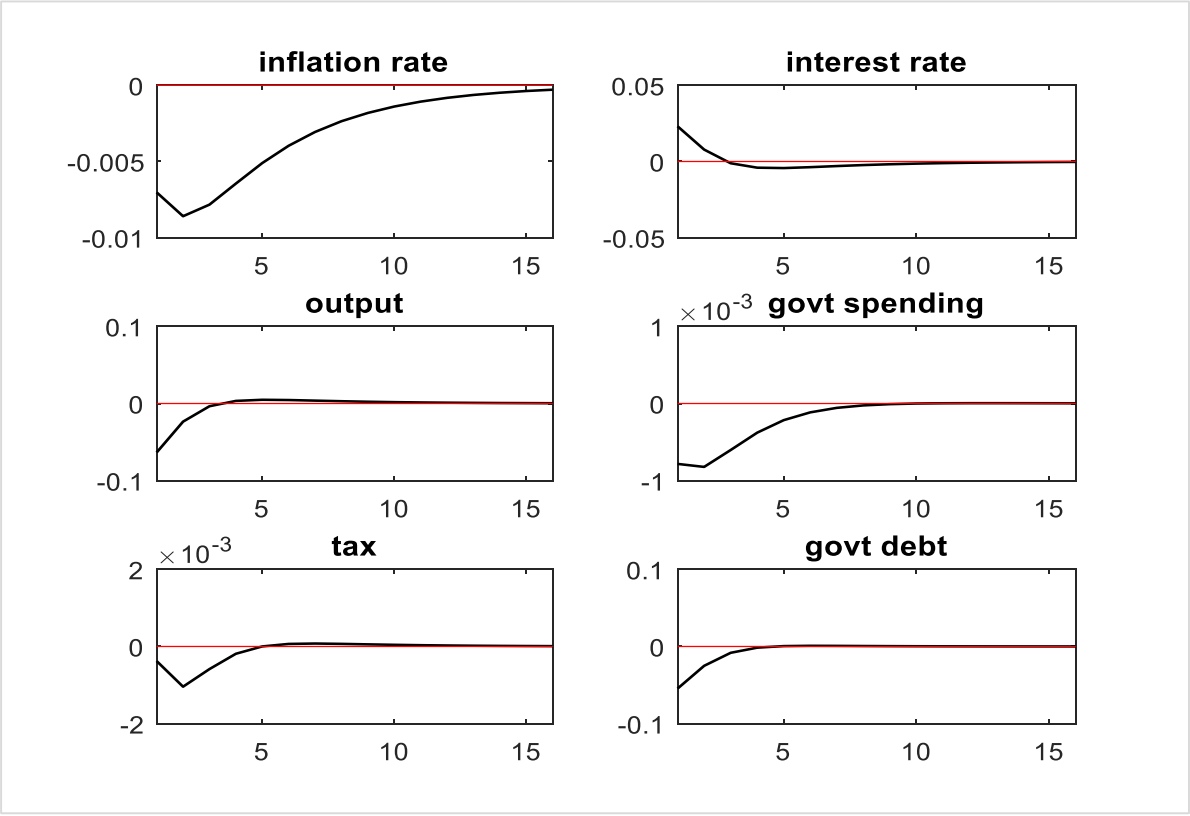

Figure 5.10: Orthogonalised shocks to interest rate

Source: Author's computation

Figure 5.10 shows that a rise in government debt after the deviation from the steady state as a result of shock to interest rate could be attributed to increase in the aggregate output in the economy which would also lead to a rise in the government spending and output. The overriding picture here is that fiscal and monetary policies variables in South Africa and Nigeria respond the same way to interest rate shocks. Earlier empirical efforts which show that fiscal and monetary policies

variables behave similarly are Muscatelli, Tirelli & Trecroci (2005:549-585) and, Sims (1994:381-399) among others.

5.6.3 Government spending shocks

Figure 5.11 displays the behaviour of fiscal and monetary policies variables to shocks ingovernment spending in South African economy. It is clear from the graph that domestic output behaved better and its response to shocks in government spending is much higher than Nigeria. In addition, permanent effect of shocks to government spending on domestic output outweigh that of Nigeria. One possible explanation for output to respond better and higher to government spending shocks than Nigeria is higher levels of corruption and leakages in Nigerian economy, better infrastructural facilities in South African economy could also be a possible factor. Also, the effects of government spending to its own shocks is higher in South African economy than Nigerian economy.

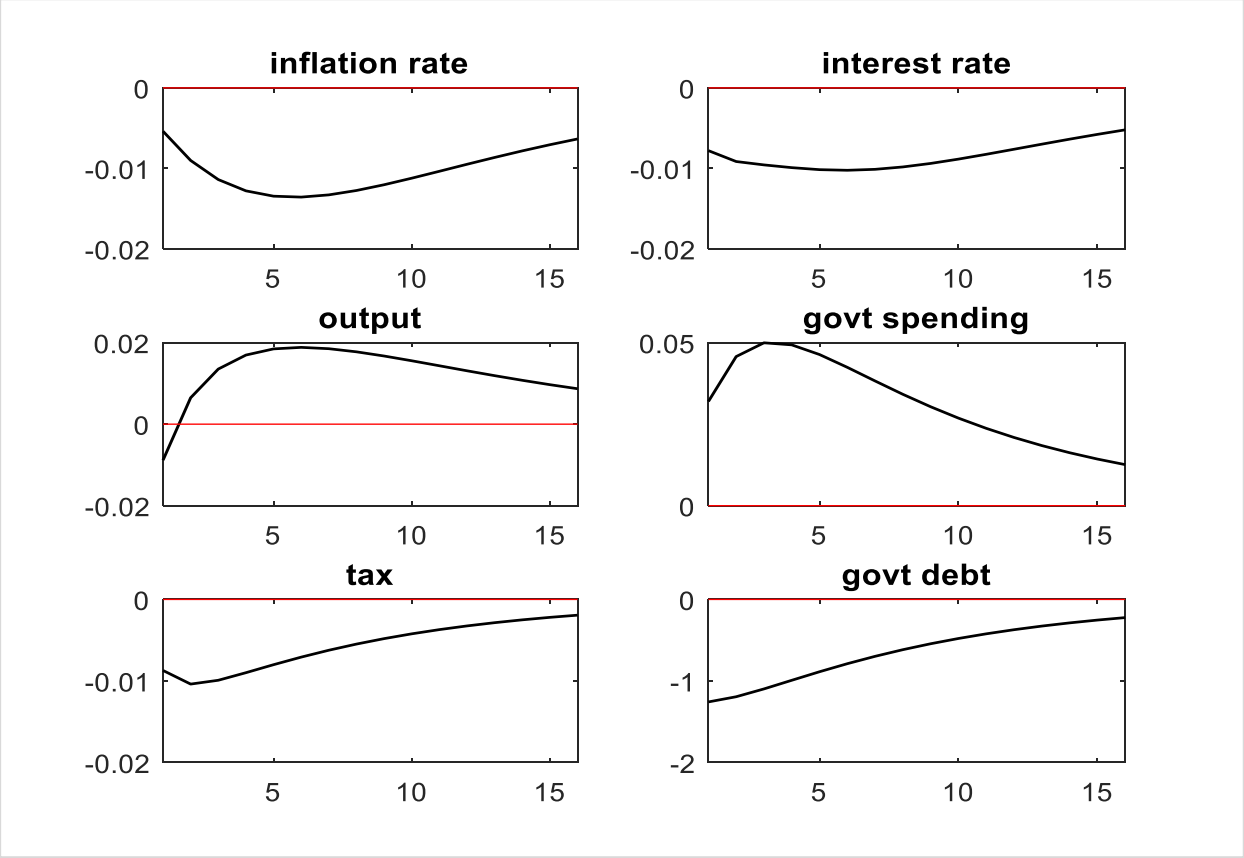

Figure 5.11: Orthogonalized shocks to government spending

Source: Author's computation

However, figure 5.11 shows that inflation falls slower in South African economy than Nigeria before tending towards it steady state. As people form expectations about the inflationary shocks, the shocks begin to rise and tend toward the steady state. More so, the impacts of shocks to government spending on government debt can be seen to cause a sudden deviation from the steady state and begin to rise. The effect remains positive throughout as it moves toward the steady state. It can also be argued that the increase in government debt might be associated with the fact that debt is largely used to finance the shock in spending. The response of tax revenue to shocks in government spending is similar to that of Nigeria. In other words, tax behaviour to sudden shocks in government spending in South Africa is similar to Nigeria's case.

5.6.4 Tax shocks

Figure 5.12 shows the macroeconomic responses of other fiscal variables and monetary variables to tax shocks. The shock to tax is observed to have a similar effect on both interest rate and inflation rate. Both inflation rate and interest rates rose sharply in response the shocks but the rise did not last. Both interest and inflation rates later began to fall and the effects of the shocks finally fizzled out as they both try to converge back to their steady state. The subsequent fall in interest rate due to shocks in tax revenue is contrary to that of Nigeria where interest rate continuously rose until it settled at its steady state. Unlike Nigeria, South Africa is believed to have a more organised financial market.

Interestingly, government debt behaves as expected. Government debt fell sharply as there were shocks to tax revenue. This means as government has a sudden surge in revenue from tax, proportion of the spending financed by debt significantly fell and the effects also fizzled out as economy converged back to its staedy state. In addition, government spending is seen not to rise proportionately with the shocks to tax revenue. Government spending is observed to be relatively stable due to the shocks in tax revenue, and the effects of the shocks begin to fade away as government spending falls and returns to its steady state.

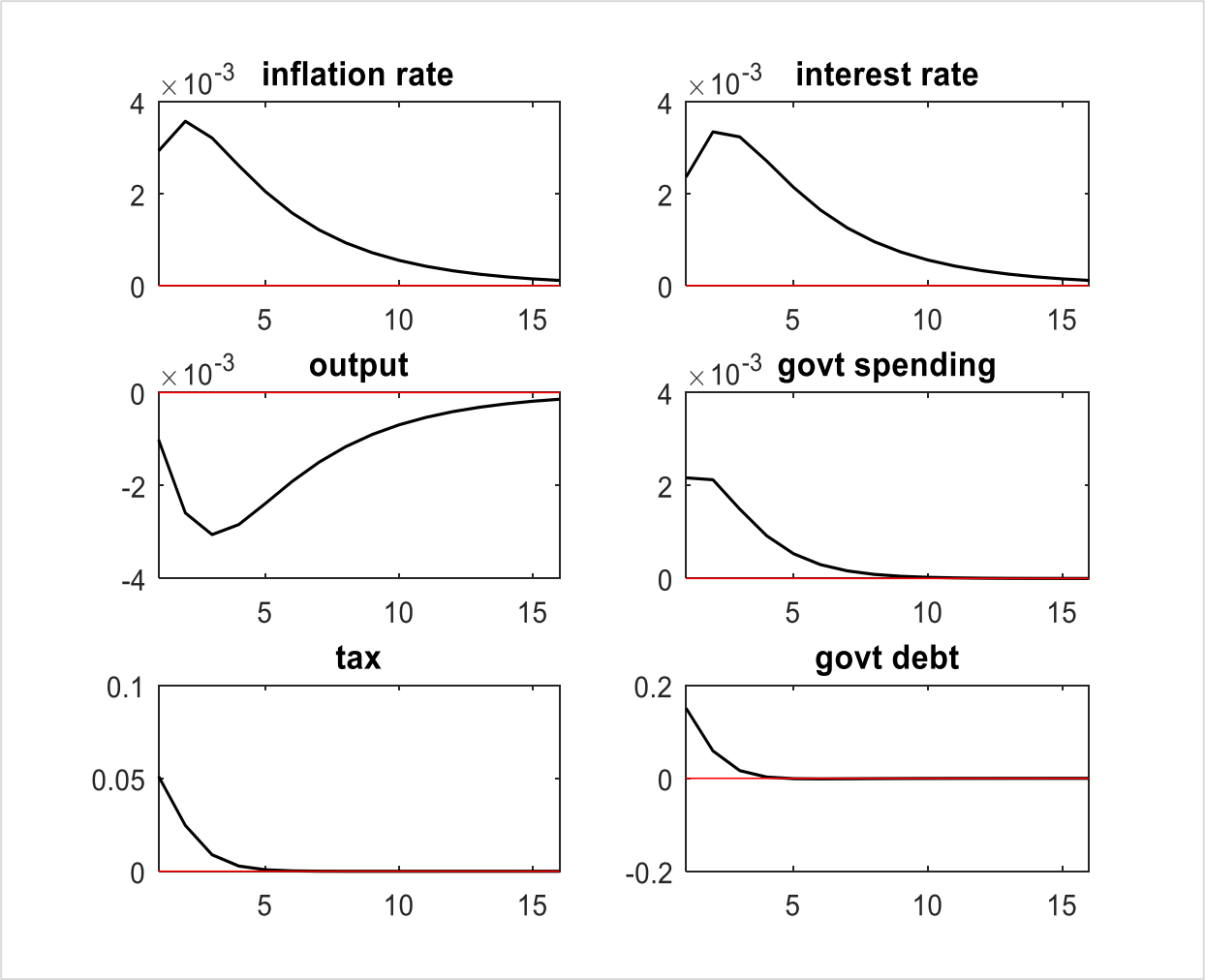

Figure 5.12: Orthogonalised tax shocks

Source: Source: Author's computation

5.6.5 Technology shocks

This sub-section looks at the roles of technological shocks in fiscal and monetary policies variables interactions. Figures 5.13 shows how the fiscal and monetary policies variables respond to technological shocks. The empirical evidence suggests that shocks to technology known as total faactor productivity have permanent positive effects on the domestic output, as there is a change in the steady state of the economy. The permanent positive impact is similar to that of Nigeria and consistent with a number of other studies such as Grith & Uhlig (2007: 1-70), Smets & Wouters (2003a: 1123-1175). Shocks to technology like Nigeria are found to have a reducing impact on the inflation rate and in interest rate. However, the reducing impacts on interest are more than that of

Nigeria. The higher reducing impact of technological shocks on interest rate in South African economy could also be attributed to a more functioning and organised financial system in South Africa. Technological shocks can also be seen to have a permanent increase on government debt.

Advancement in technology is not cheap and is mostly as a result of adequate funding of education and research. South Africa, like other emerging economies have continued to incur higher debt in a quest for technological advancement. The shocks to technology cause both government spending and tax to rise. The increased government spending is theoretically expected as both the cost of technology and cost of maintenance of technology throughout the globe is huge. Technology makes data collection and capturing easy, which are needed for tax burden assessment and this in turns increases the tax revenue.

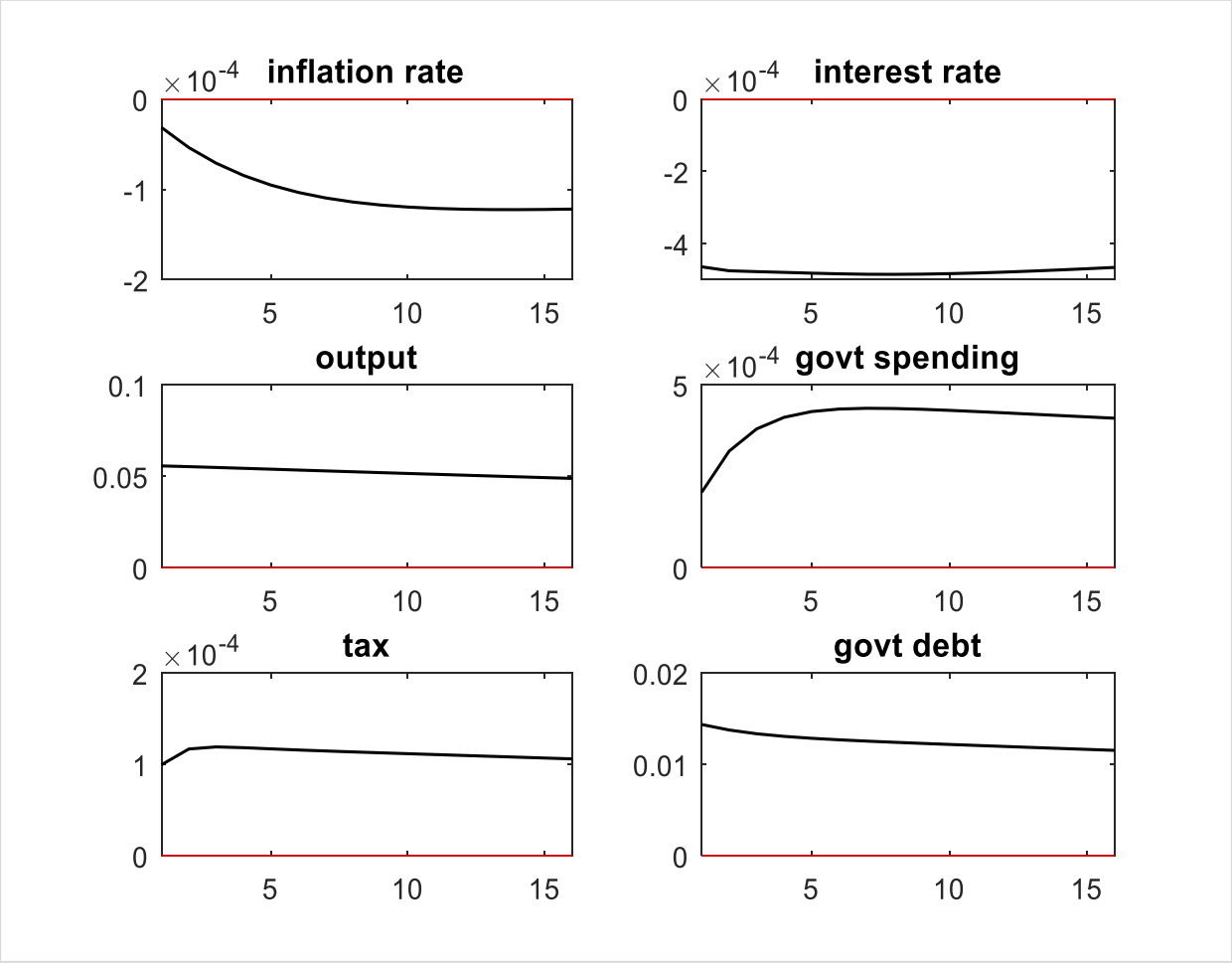

Figure 5.13: Orthogonalised technological shocks

Source: Source: Author's computation

5.7 BAYESIAN VECTOR AUTOREGRESSIVE (BVAR) ANALYSIS OF THE DYNAMIC RESPONSES AMONGST FISCAL AND MONETARY POLICIES VARIABLES

This section deals with Bayesian VAR estimation results also used in evaluating the dynamic responses among fiscal and monetary policies variables. As earlier stated, the variables in BVAR model are expressed in logarithmic forms. Sims & Zha (1998: 949-968), Korobilis (2013:204-230) and Koop & Korobilis (2010:267-358) argued that once variables are linearised in a BVAR model that is in their logarithmic forms, the variables should not be differenced because useful information on the nature of relationship among the variables and co-movements might be lost in BVAR model. Consequently, data was not differenced. In addition, BVAR is a model which follows a stochastic process employed to determine the linear interdependencies among variables. BVAR model makes use of the impulse response functions (IRF) and forecast error variance decomposition (FEVD) to explain and deduce the interactions among variables. IRFs are employed to determine the responses of a variable to shocks to another variable, while FEVD describes the variations among the variables under consideration. Therefore, the BVAR results would be explained using impulse response functions and forecast error variance decomposition.

5.7.1 BVAR lag length selection criteria

Tables 5.10 and 5.11 show the result of lag selection results for BVAR model for both Nigeria and South African economies respectively. From Tables 5.10 and 5.11 appropriate lag order is one, based on the minimum value of Schwarz information criterion (SC). As such, we cannot take lags of more than one. Importantly, SC (also known as Bayesian information criterion) has been chosen over the other information criteria due to its strengths. It is highly reliable and often employed to compare non-nested models. Comparison among different models can be made using SC. Moreover, the SC is significantly conservative in respect of lag selection when compared with other criteria (Korobilis, 2013:204-230).

Table 5.10: BVAR lag selection order criteria (Nigeria)

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-75.42938	NA	2.878718	6.732990	6.831728	6.757822
1	-63.64882	20.48793*	1.467638	6.056419*	6.352635*	6.130917
2	-58.86790	7.483186	1.386606*	5.988513	6.482206	6.112675*
3	-55.98099	4.016564	1.567333	6.085303	6.776474	6.259131
4	-53.41743	3.120853	1.863762	6.210211	7.098859	6.433704
5	-48.90784	4.705662	1.934810	6.165899	7.252024	6.439056

Source: Author's computation

Table 5.11: BVAR lag selection Order criteria (South Africa)

Lag	LogL	LR	FPE	AIC	SC	HQ
0	48.57069	NA	2.06e-05	-2.278534	-2.151869	-2.232736
1	165.9369	211.2592	9.14e-08*	-7.696844*	-7.190180*	-7.513651*
2	169.0154	5.079479	1.24e-07	-7.400768	-6.514106	-7.080179
3	174.6362	8.431325	1.50e-07	-7.231812	-5.965152	-6.773828
4	190.3505	21.21421*	1.12e-07	-7.567524	-5.920866	-6.972144
5	194.1900	4.607406	1.55e-07	-7.309499	-5.282844	-6.576724

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

Source: Author's computation

5.7.2 Impulse response analysis for Nigeria

The impulse response graph from Bayesian vector autoregressive estimation is presented in Figure 5.14 and is as discussed as follow:

5.7.2.1 Response of output level to various shocks

The impulse response graph shows that output level responds positively to its own unexpected shocks. The output level's response to its own shocks ranges between 2% to 4%. The response

was around 4% at the initial period but subsequently reduced to about 2% at the later period. Also shocks to government debt, government spending and tax revenue produce positive response in output level, though the impact of government spending shocks and tax shocks was marginal on the output level as the response was less than 1% throughout the time horizon. However, shocks to inflation produces negative response in output level. The output level fell throughout the time horizon in response to inflation shocks though the impact was also found to very marginal. Output level could be said to respond positively to interest rate shocks. The response was initially negative but yielded a marginal and negligible positive impacts after the initial marginal negative impacts.

5.7.2.2 Response of government debt to various shocks

A positive shock to output level produces a positive response from government debt. Government debt responds positively to shock in output level. The positive response however decreases with time but impacts remain positive throughout the time horizon. The impact was initially less than 1% but rose to about 5% and later decreased to 3%. The response of government debt to its own shocks was very significant and positive. It ranges from 12% to 23%. Shocks to government spending and inflation produce negative response from government debt. In other words, government debt fell in response to inflation and government spending shocks. Meanwhile, an interest rate shocks was also seen to produce positive response from government debt. Government debt responds positively to shocks to tax revenue. One would expect an increased tax revenue, to lead to reduction in debt outstanding of government. The reversed is observed due to the problem of misappropriation of fund and corruption among others.

5.7.2.3 Response of government spending to various shocks

Impulse response results show that government spending respond positively to shocks in output level. In other words, a positive shock to output level generates positive response from government spending. Interesting, negative response is observed from government spending due to shocks in government debt. This could mean that government tries to moderate its spending in order to prevent future surge in government debt or the income from the debts are diverted or misappropriated. Government spending responds positively to its own shocks while interest rate shocks are also observed to generate positive response from government spending. Shocks to inflation rate generate negative response from government spending. The rationale here is that

government attempts to moderate its spending or curtail its spending in order to curb or prevent future shocks to inflation. In addition, tax shocks generate negative response from government spending. This might still be attributed to corruption, mismanagement of funds and diversion of generated revenue.

5.7.2.4 Response of inflation rate to various shocks

Shocks to the output level initially produce expected negative response from inflation. In other words, inflation initially fell due to shocks in output level but subsequently became positive. Also, the response of inflation due to shocks in government spending and government debt oscillate between negative and positive though the response of inflation due to shocks in both government spending and government debt is less than 1% throughout the time horizon. Interestingly, inflation responds negatively to its own shocks. The impact was initially positive in the first two periods and subsequently became positive. The initial positive response might be associated to the fact the shocks was unexpected. However, as people and government form expectation, the response would be expected to be negative as government would expected to put in appropriate policies to prevent subsequent rise. Inflation rate is also observed to rise in response to interest rate shocks while it falls in response to tax shocks.

5.7.2.5 Response of interest rate to various shocks

Shocks to output level are seen to generate positive response from interest rate though the impacts are negligible as it is less than 1% for most of the periods. One might argue that a positive shock to output level would motivate foreign investors and thereby possibly increasing the demand for loanable funds which consequently lead to a rise in interest rate. However, this could be largely associated to lack of adequate and well-organised financial market. In addition, shocks to government debt and shocks to interest rate's own shocks produce positive response from interest rate. Interest rate responds positively to shocks in government debt. The rise in interest rate in response to shocks in government debt could be precipitated on the premise that government might want discourage possible future shocks in government debt and hence encourage interest rate to rise. Response of interest rate to government spending is seen to oscillate between negative and positive. It was initially negative and subsequently became positive. Shocks to tax are also seen to generate negative response from interest rate.

5.7.2.6 Response of tax to various shocks

The impulse response analysis results show that a positive shock to output level generates a positive response from tax shocks. This means that tax responds positively to shocks in output level. However, the response effect is very marginal at the initial stages as the positive response is less than 1% but gradually increased to more than 2%. Tax revenue response to shocks in government debt and tax itself is also found to be positive. However, the response of tax to its own shocks was higher at the early stage and subsequently began to reduce, as the effects of the shocks tend to fade away but remain positive all through the period. In addition, shocks to interest rate and inflation rate generate oscillating response from the tax revenue. The responses oscillate between negative and positive. For inflation rate, the response was initially positive and later became negative, while for interest rate, the tax revenue initial response was negative and later became positive at the mid stage.

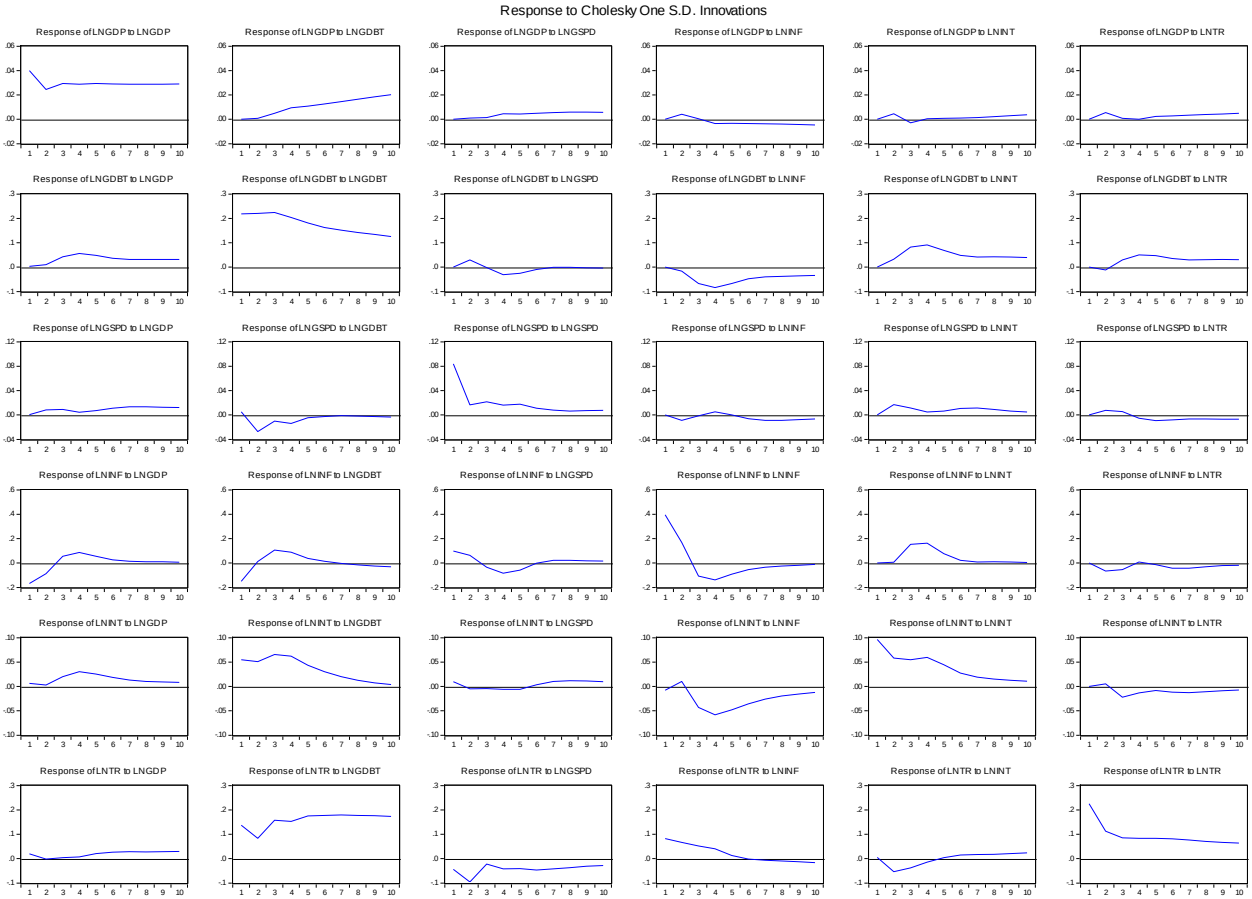

Figure 5.14: BVAR impulse response for Nigeria

Source: Author's computation

5.7.3 Forecast error variance decomposition

Forecast error variance decomposition (FEVD) splits the variation in an endogenous variable into the component shocks of the BVAR model. In other words, variance decomposition gives information about the relative importance of each random innovation affecting the variables in the VAR model. More specifically, FEVD gives information about the predominant sources of variation in all the variables in the system. Earlier empirical results on FEVD show that the dominant sources variation in all the variables in the system are the "own" shocks and our results follow suit with exception of tax shocks. The result of FEVD is presented in figure 5.15. The empirical results show that the dominant sources of variation in output level are shocks to government debt. Its shocks account for close to 14% variation in output level while the shocks to other variables account each for about 1% variation in output level. On the other hand, interest rate and inflation rate are significant sources of variations in government debt. They account for about 7% and 5% variations in government bond respectively. While tax revenue and output level account for about 2% and 3% variations respectively. Government spending accounts for less than 1% forecast error. In addition, output level, government debt and interest rate are important sources of variation in government spending. Both output level and government debt accounts each for about 8% variations while interest rate accounts for less than 7%.

On average, all the variables are significant sources of variation in inflation. Tax shocks account for least shock in forecast error variance in inflation and are about 3% while interest rate is found to be the highest sources of variation, which is about 13%. Government debt and inflation shocks are significant of sources variation in interest rate; they about account for about 31% and 18% variations in interest rate respectively. Output level, tax and government spending shocks account each for about 5%, 3% and 1% variations in interest rate respectively. Lastly, government debt shocks are found to be very significant sources of variation in tax revenue. In fact, it accounts for more than 60% variation in tax revenue at the later stage. While government spending and inflation shocks also appear to be significant sources of variation in tax revenue with about 5% and 3% variations respectively.

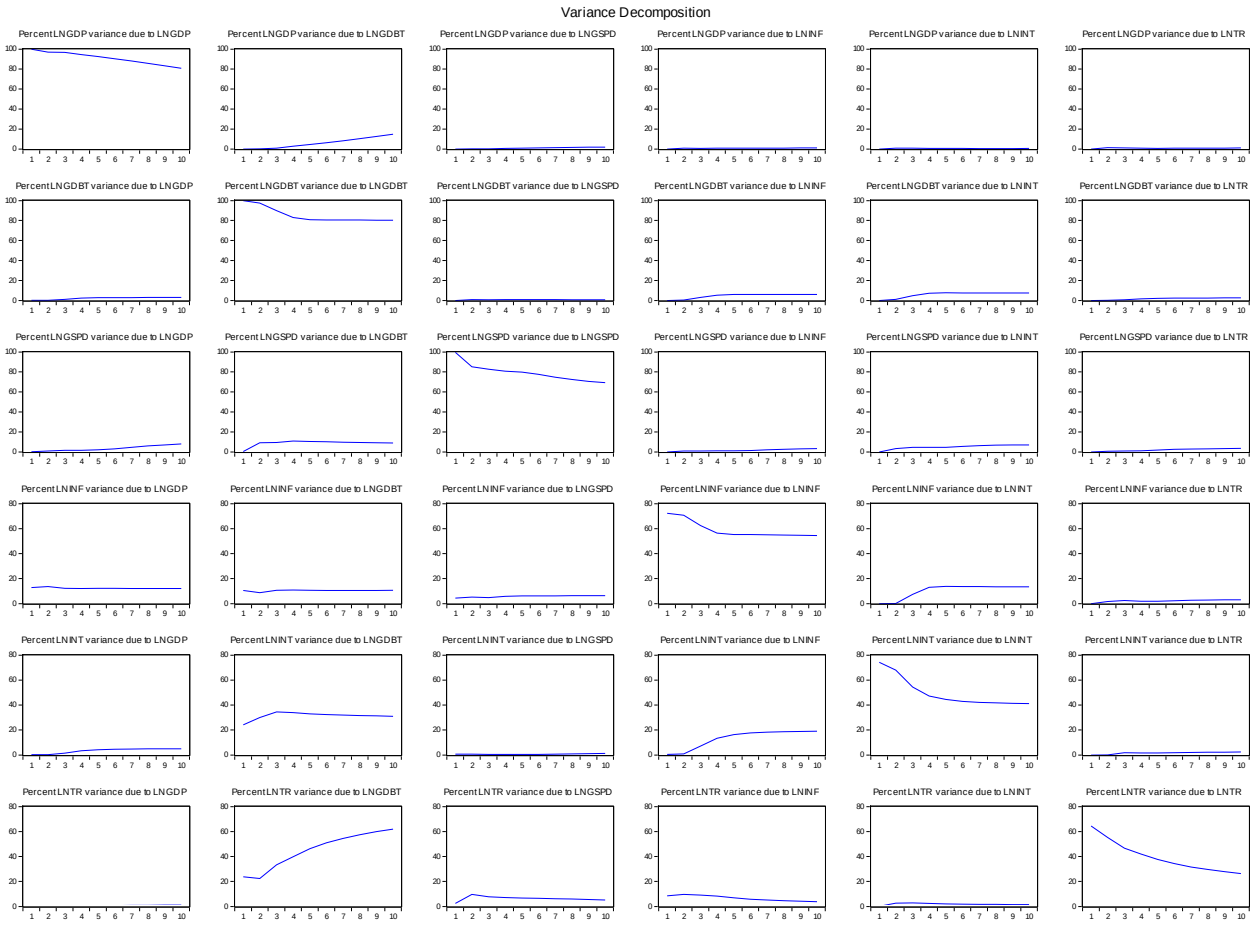

Figure 5.15: Forecast error variance decomposition for Nigeria

Source: Author's computation

5.7.4 Impulse response analysis for South Africa

The results of impulse response analysis from Bayesian vector autoregressive is presented in Figure 5.16 and is discussed as follows:

5.7.4.1 Response of GDP to various shocks

The impulse response analysis shows that a shock to output level yields a positive response on the output level in the economy. The response was less than 1% at the initial period but subsequently increased to about 2% at the later period. Response of output level to its own shocks at the initial stage is lower when compared with that of Nigeria. However, at the later period, the response of the output to its own shock is roughly the same. In addition, shocks to government debt, inflation

rate and interest rate generate negative response from the output level though the resultant responses were marginal as output level's response in each case was less than 1% throughout the time horizon. Meanwhile, shocks to government spending and tax revenue produce positive response in output level. The output level responds positively to shocks in tax revenue throughout the time horizon while it initially fell in response to government spending shocks but immediately became positive all through the time horizon.

5.7.4.2 Response of government debt to various shocks

A positive shock to output level initially produces a negative response from government debt. The initial negative response is less than 1% and later government debt responds positively to shocks in output level. Government debt responds positively to its own shocks The positive response as observed in Nigeria case decreases with time but impacts remain positive throughout the time horizon. The impact was initially less than 5% and later decreased to less than 1%. Shocks to government spending and interest rate produce negative response from government debt. In other word, government debt fell in response to inflation and government spending shocks. Unlike Nigeria, inflation shocks produce positive response from government debt. Government debt initially responds negatively to shocks in tax revenue but subsequent responds positively.

5.7.4.3 Response of government spending to various shocks

As expected, impulse response analysis shows that government spending responds positively to shocks in output level. Put differently, a shock to output level a generates positive response from government spending. Government spending initially responds positively to shocks in government debt and inflation rate but subsequently becomes negative from the mid-period. The subsequent fall in government spending due to government debt and inflation shocks is expected, as fiscal and monetary policies ought to have put measures in place that can prevent future surge in government spending. Government spending responds positively to its own shocks though the response is continuously decreasing. Interest rate shocks are also observed to generate positive response from government spending. Unlike Nigeria, tax shocks generate positive response from government spending. In other words, a positive shock to tax revenue motivates increased spending.

5.7.4.4 Response of inflation rate to various shocks

Shocks to the output level produce positive response from inflation. Inflation is observed to rise in response to shocks in output level. In addition, the response of inflation due to shocks in government debt is negative, though inflation responds positively to shocks in government debt initially but remains negative subsequently. The response of inflation due to shocks in government spending is positive. The response largely ranges from 1% to 3%. An increased government spending, if financed by debt, may lead to increased cost of capital and consequently lead to rise in inflation rate. Looking at behaviour of inflation in response to interest rate shocks, shocks to interest rate initially generate negative response inflation rate but the response subsequently becomes positive. On the average, inflation rate responds negatively to its own shocks though the response was also initially positive. The initial positive response might not be unconnected with the fact that the shocks were unexpected. However, as people and government form expectations, the response to the shocks would be expected to wane. Inflation rate is also observed to oscillate in response to tax shocks.

5.7.4.5 Response of interest rate to various shocks

Shocks to output level generates both negative and positive response from interest rate. The response is initially positive, becomes negative and subsequently positive. The positive response portion might not be associate with the financial market frictions as financial system in South Africa is more developed and organised when compared with Nigeria. The positive response portion might be associated with influx of foreign investors following an output shocks. This possibly increases the demand for loanable funds which consequently lead to a rise in interest rate. Like Nigeria, shocks to government debt generates positive response from the interest rate though response effect is very marginal. A shock to government debt increases the demand for loanable funds and consequently interest rate. Response of interest rate to government spending, inflation rate and tax shocks is positive throughout the time horizon. While the response of interest rate to its own shocks oscillates between positive and negative.

5.7.4.6 Response of tax to various shocks

The results show that a positive shock to output level creates a positive response from tax shocks. However, the response was negative at the initial stage but subsequently became positive as observed in Nigeria's situation. Tax revenue response to shocks in government debt is found to be oscillating between positive and negative. The response of tax to its own shocks was higher at the early stage like Nigeria, and subsequently became negative and later turned positive and the effects of the shocks began to fade towards the end of the time horizon. In addition, shocks to government spending and interest rate produce positive response from tax revenue. Tax responds positively as there are unexpected shocks to government spending and interest rate. The responses of tax revenue to inflation shocks also oscillate between positive and negative.

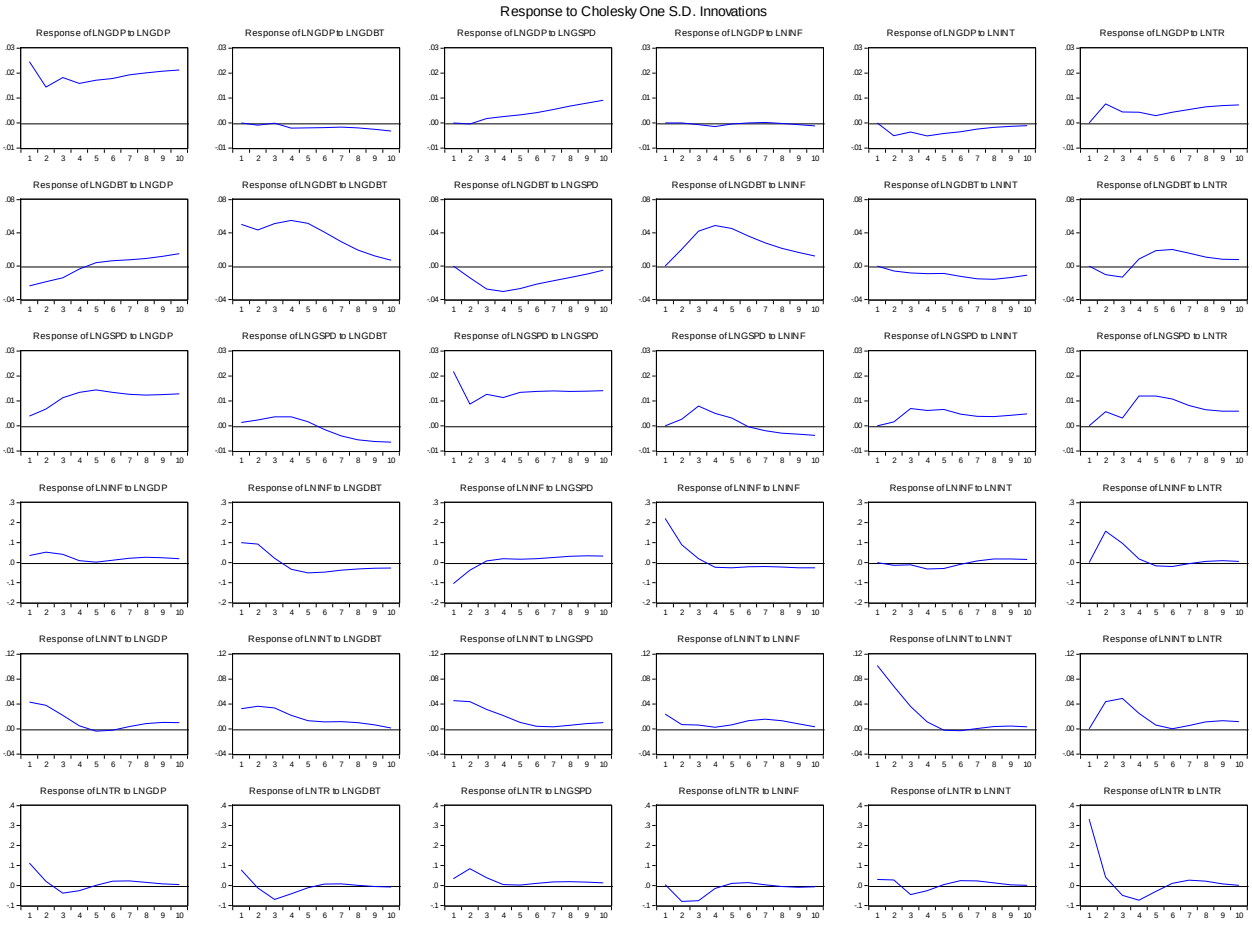

Figure 5.16: BVAR impulse response for South Africa

Source: Author's computation

5.7.5 Forecast error variance decomposition

It has been earlier stated that empirical results on forecast error variance decomposition (FEVD) show that the dominant sources variation in all the variables in the system are the "own" shocks. The FEVD result is presented in Figure 5.17. The empirical results show that the dominant sources of variation in output level is shocks to tax, interest rate and government spending. Tax shocks accounts for closed to 7% variation in output level while the shocks to interest rate account for about 4% variation in output level while government spending accounts for closed to 6%.

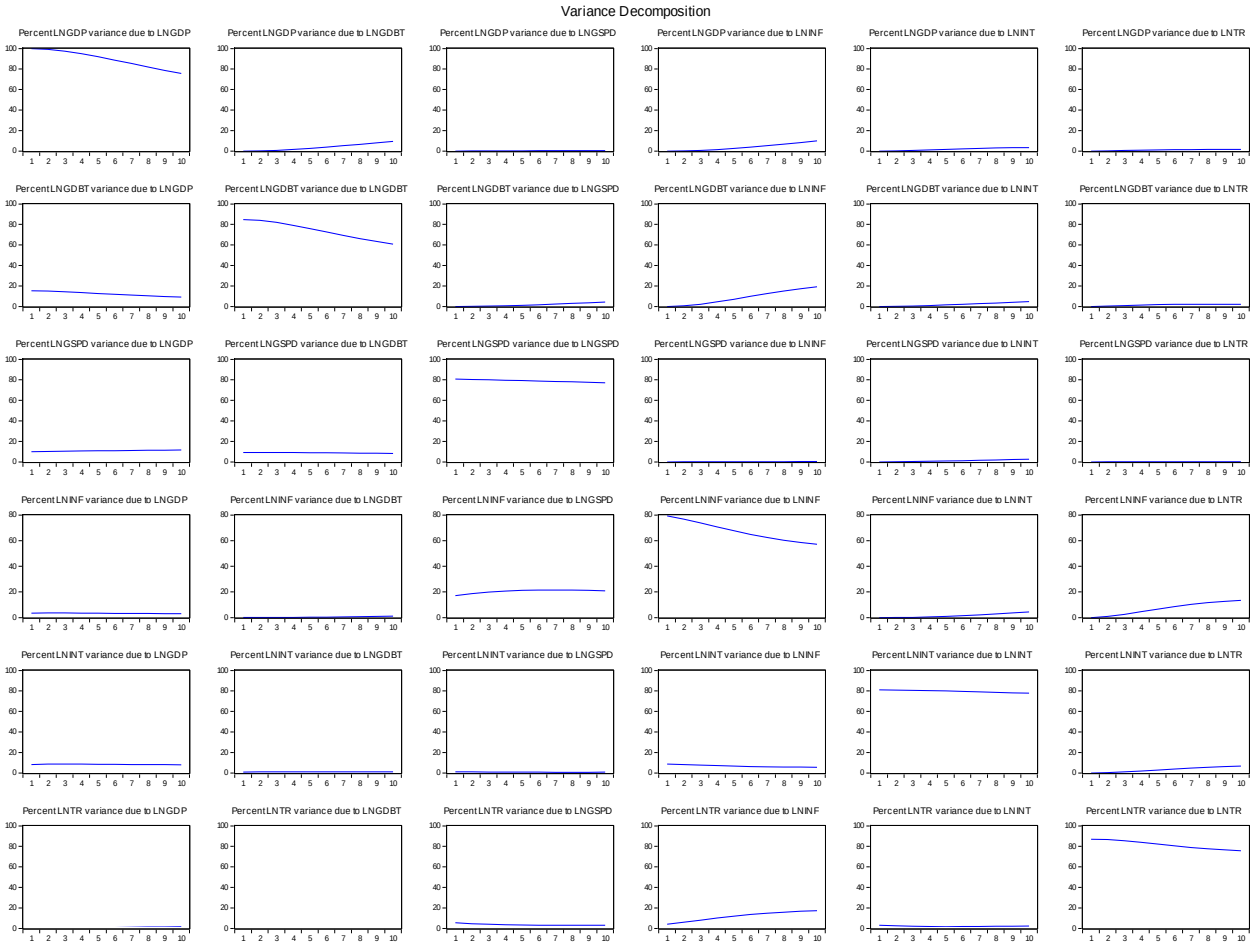

Figure 5.17: Forecast error variance decomposition for South Africa

Source: Author's computation

Further results in Figure 5.17 shows that the inflation rate, government spending and output level shocks are significant sources of variations in government debt. They account for about 28%, 11% and 5% variations in government debt respectively; while tax revenue and interest rate shocks

account for about 4% and 3% variations respectively. In addition, output level, tax revenue and interest rate shocks are important sources of variation in government spending. Output level, tax revenue and interest rate shocks account each for about 29%, 15% and 5% variations in government spending. While inflation and government debt shocks account each for about 3% and 2% respectively.

Tax revenue, government debt and government spending shocks are significant sources of variation in inflation with shocks to each of this variable accounts for 22%, 18% and 11% variation in inflation rate. Output level and interest rate accounts for about 5% and 2% forecast error variance in inflation. Meanwhile, shocks to all the variables are significant sources of variation in interest rate. Shocks to other variables account each for more than 10% forecast error variance in interest rate except interest rate shocks that accounts only for 3% variation. Lastly, unlike Nigerian case, output level shocks are found to be very significant sources of variation in tax revenue. It accounts for more than 9% forecast error variance in tax revenue; while government debt, inflation and government spending shocks account each for about 7%, 7% and 6% variations respectively and interest rate shocks account for about 3% variations.

5.8 SUMMARY

This chapter of the study bridged significant research gap in the literature and significantly contributed to literature on fiscal and monetary policies interactions by estimating the degree of fiscal and monetary policies interdependence for Nigeria and South Africa which prior to this study has not received research Attention. DOLS was used to estimate the relevant equation. The results show that the degree of fiscal and monetary interdependence in Nigeria is 0.84 while it is found to be 0.67 in South African economy. This means that about 84% of government debt is backed up by fiscal authority in Nigeria, while the remaining percentage is accommodated by monetary authority. On the other hand, about 67% of government debt is backed up by fiscal authority in South Africa, while the remaining percentage is accommodated by monetary authority.

The chapter also contributed significantly by analysing the trend of inflation *vis-a-vis* the degree of fiscal and monetary policies interdependence in Nigeria and South Africa. More specifically, the hypothesis of higher degree of fiscal and monetary policies interdependence being associated with lower inflation rate was examined using a trend analysis and empirical results from the study

could not find the support the hypothesis of lower inflation rate being associated with high degree of fiscal and monetary policies interdependence.

From the methodological point of view, the chapter also contributed to the literature by making use of dynamic stochastic general equilibrium model (DSGE) to analyse the dynamic responses between fiscal and monetary policies interactions. In addition, the use of Bayesian vector autoregressive (BVAR) has not received considerable attention from Nigeria and South Africa. The study also contributed by making use of Bayesian vector autoregressive to analyze the dynamic responses between fiscal and monetary policies interactions. Findings from DSGE and BVAR reveal that fiscal and monetary policies interact with each other in the Nigerian and South African economies.

CHAPTER 6

SUMMARY, RECOMMENDATION AND CONCLUSION

6.1 INTRODUCTION

This study examined the fiscal and monetary policy interactions in Nigeria and South Africa using modern econometric methods. The study explored modern econometrics techniques such as dynamic stochatic general equillibrium model (DSGE) and Bayesian Autoregressive methods (BVAR) to examine the dynamic responses amongst fiscal and monetary policies in the Nigerian and South African economies. Dynamic ordinary least square (DOLS) method was employed to estimate the degree of fiscal and monetary interdependence. The subsequent results emanating from the findings are that the degree of fiscal and monetary policy independence is higher in Nigeria than in the South African economy, the average inflation level is lower in South Africa than in Nigeria and the hypothesis of low inflation being associated with higher degree of fiscal and monetary policy interdependence could not be substantiated. Consequently, this chapter presents a summary of the study, the major conclusions drawn from the study and their policy implications. Following this introductory section, the study and its major empirical findings are summarised and their policy implications are discussed. The last section outlines the major conclusions of this study and major limitations.

6.2 SUMMARY OF THE STUDY

This study utilises econometric methods to analyse fiscal policy and monetary policies interdependence, comparing Nigeria and South Africa, using simulation analysis and annual data from 1981 to 2016 within the framework of DSGE and BVAR. Specifically, the study examines the degree of fiscal and monetary policies interdependence in Nigeria and South Africa. The study analysed the trend of inflation in respect to degree of interdependence between fiscal and monetary policies. The study also attempts to evaluate the dynamic responses among fiscal and monetary policies variables shocks. The subsequent section presents, in an abstract manner, the theoretical background of the study, research methodology and empirical findings.

6.2.1 Theoretical background

The customary duty of central bank throughout is to regulate price levels. Beginning from Fisher's work (1911), quantity theory of money formed the basis of studies on determination of price. However, against the position of monetarist, there is another line of thinking known as the fiscal theory of the price level (FTPL). The fiscal theory of price level (FTPL) argued that determination of price is a fiscal phenomenon rather than a monetary one. The quantity theory of money and the fiscal theory of price level (FTPL) perhaps apparently at variance, they are not mutually exclusive theories (i.e. they are not theories that cannot occur simultaneously) but they are rather different component of the same theory. Various economic models on fiscal and monetary policies disagree about the way economic policy is coordinated.

The first sets of economic models specify a money demand function while the second sets specify the government's intertemporal budget constraint function. However, in the two specified functions, a variable, which is the price level is unknown. Consequently, monetary and fiscal policies have to be coordinated in order to determine the single price level given that fiscal authority controls government spending and debt while monetary authority controls money supply.

Sargent and Wallace (1981) terms this situation a "game of chicken" between the central bank and the fiscal authority. Nevertheless, this description could be misleading. What is however important is to know if fiscal authority generates a sequence of spending, surpluses and debt that leads to a single equation ensure the equilibrium between the money demand function and government intertemporal budget constraints.

Hence, it is necessary to stipulate special conditions that portray the coordination. The traditional monetarist assessment offers a modest solution to the query about the realization of price stability. Accordingly, they state that all that is needed is that the central bank be dedicated to the realization of price stability objective. This principle identifies that both fiscal and monetary policies should be meticulously decided and coordinated so as to achieve the price stability objective. As a result, if the apex bank is devoted to its objective, this would spontaneously make fiscal authorities implement apt fiscal policy rule that would aid the attainment of price stability objective. Consequently, based on the standard monetarist notion, the apex bank determines money supply and accordingly outlines the level of price with the aids of money demand equation. As a result,

the fiscal authority adjusts its spending, choosing the sequence of fiscal rule such that government inter temporal budget constraints function is described irrespective of the price level determined by money demand function and regardless of money supply decision made by the apex bank.

Some monetarists analyse the money demand function without introducing government intertemporal budget constraints. Such omission makes the quantity theory of money, that is money demand function, an incomplete one. The level of price has been decided and the government spending to them is just one amongst many other useful endogenous variables. On the contrary, a robust quantity theory must include a fiscal value in government inter-temporal budget constraints function and the description of fiscal policy must be consistent with the monetary policy.

This fiscal regime assumes that the fiscal authority reimburses for any seigniorage, controlling all surplus or spending irrespective of policy of apex bank. Under Sargent and Wallace's fiscal description, the fiscal authority sets the government spending and surpluses, but fails to regulate and reimburse for the seigniorage component of the surplus. Consequently, the central bank exercises authority price behaviour The central bank or monetary authority can choose between "inflation now" and "inflation later", which is defined by its choice of money supply through interest rate manipulation.

If a low level of money supply is chosen today defined by high interest rates, the price level would be lowered and the government debt would be increased. However, the central bank must have a coordinated policy such that money supply must increase in the future so as to upsurge seigniorage at a future date so that government intertemporal budget constraints is balanced with reduced price level. This approach consequently leads to increased inflation in future.

The linkages between monetary and fiscal policies do not require detail definition. Several authorities inherently assume the fiscal authority to be inactive by sequentially fine-tuning surpluses by negligible amount to offsets variation in the government's debt induced by changes in monetary policy. However, fiscal authority may not re-adjust the government intertemporal budget constraints possibly due to unavoidable spending or unguarded spending. Consequently, the fiscal regime becomes dominant and consequently lead to inflation. From the fiscal viewpoint, the fiscal authority triumphs the "game of chicken" if the fiscal authority sets government spending

and its surpluses while the price level is being determined by inter temporal budget constraints function. The apex bank consequently passively determines the money supply level. The money demand function just fixes the money supply level rather than specifying the level of price. Consequently, the level of price attainment is a function of fiscal decisions.

If the central bank of Nigeria and South African Reserve Bank (SARB) are inactive as argued by the tradition of the monetarist, (i.e. if the degree of fiscal and monetary policy interdependence is closer to zero than one), level of price would not be specified by their policy approach and consequently level of price is indeterminate at any date. Nonetheless, if they are active, the previous level of price could be acknowledged by the government's intertemporal budget constraints, and price level determination would be consequently restored.

6.2.2 Research methodology

A detailed investigation into the literature shows that there are many studies on fiscal and policy interactions. However, few studies have been carried out quantitatively to estimate the degree of fiscal and monetary policy interdependence. Most of the studies are largely from developed countries. The empirical review indicates a lack of studies specifically on estimating the degree of fiscal and monetary interdependence. Consequently, the study used econometric techniques to estimate the degree of fiscal and monetary policy interdependence in Nigeria and South Africa. Econometric techniques are deemed fit as they give reliable statistical conclusions and large samples sizes. A sample of 36 years was used, from 1981 to 2016. The researcher chose 1981 because of notable monetary policy and fiscal policy development in Nigeria and South Africa during this period.

More specifically, the study used dynamic ordinary least squares (DOLS) to estimate the parameter of the degree of fiscal and monetary policy interdependent in the equilibrium equation (20) using annual data on three variables in the equation (20), namely data on money supply, government debt and consumption expenditure. DSGE was employed to assess the dynamic responses among fiscal and monetary policy variables. Model simulations were carried out to obtain the impulse response analysis of fiscal and monetary policy variables to shock to the economic systems. The calibration of parameters was done for Nigeria and South African economy using economic intuitions and inferences from past studies on DSGE modelling. Also, BVAR was

further employed to further analyse the dynamic response among fiscal and monetary policies variables. The BVAR model makes use of annual times series data on output level, government debt, government spending, inflation rate, interest rate and tax shocks.

Before the estimation of the DOLS model, statistical tests were performed. Descriptive statistics analysed the mean, median, maximum and minimum of both dependent and independent variables in the model. Meanwhile, graphical analysis was done to examine the trend of inflation in respect of the degree of fiscal and monetary policies interdependence. In addition, before the simulation within the DSGE modelling, calibration of relevant parameters was done. Amongst the relevant parameters calibrated, were subjective discount factor, degree of price stickiness, inverse of labour supply elasticity, inverse of substitution elasticity in consumption supply, degree of interest rate, inflation coefficient using Taylor rule, output gap coefficient using Taylor rule, degree of tax smoothing, spending coefficients on debts, tax coefficients on debt, AR coefficient of technology, standard deviation (SD) of technology innovation , SD of inflation innovation, SD of interest rate innovation, SD of government spending innovation, and SD of tax innovations. In addition, in BVAR analysis, selection of appropriate lag order was done. All the variables were linearised. Hence, variables were not differenced as argued by the theoretical studies on BVAR modelling and previous empirical studies. The study employed Normal-Wishart prior within the BVAR modelling. Normal-Wishart prior allows for more general specifications and produce a tractable prior posterior distribution.

Dynamic Ordinary Least Squares Estimator (DOLS) was introduced by Stock and Watson (1993:783-820). DOLS is one of the cointegrated regressions which is superior to ordinary least square in that the convergence of OLS can be low in finite samples. DOLS estimates do not suffer from serial correlation and heteroscedasticity, which is often associated with conventional OLS. DOLS takes care of endogeneity problems and small sample bias by adding the leads & lags (DOLS). DOLS is simpler and reduces bias better than fully modified least square (FMOLS). The t statistic from DOLS is better than the statistic from traditional OLS or FMOLS.

Dynamic stochastic general equilibrium modeling popularly known as DSGE modelling is a subdivision of theory of equilibrium that is of great influence in modern and present-day modelling of macroeconomics variables. The approach of DSGE attempts to clarify total economic

occurrences and monetary and fiscal policy effects using macroeconomics models that are derived from the principles of microeconomics. DSGE models purpose to define the economic behaviour as a whole by evaluating microeconomic decisions. As the name connotes, DSGE models are dynamic, investigating how economy changes. Meanwhile, DSGE models are stochastic in nature considering the fact that economy is influenced by random shocks like changes in technology. This is in sharp contrast with static model. The model currently is being used by the apex banks across the globe for forecasting. The major superiority of DSGE modelling over most of the other econometric methods is that the model incorporates dynamics, in other words, a time dimension and uses stochastic uncertainty to study general equilibrium effects. The advent of the Bayesian approach to VAR analysis led to a re-evaluation of the ordinary VAR procedure using Bayesian principles. The conventional VAR procedure was faced with some inadequacies, such as over-fitting problem, in other words, the problem of over parameterization and misspecification of degrees of freedom. The Bayesian school offers resolution to this difficulty because it does not consider too model parameters.

6.2.3 The empirical findings of the study

Chapter 5 of the study bridged the research gap on the estimation of the degree of fiscal and monetary policies interaction in Nigeria and South Africa. The study also contributed to available studies employing dynamic stochastic general equilibrium model in analysing fiscal and monetary policies interactions as well Bayesian vector approach to fiscal and monetary policies interactions in Nigeria and South Africa.

The results show that the degree of fiscal and monetary interdependence in Nigeria is 0.84 and 0.67 in South African economy. This empirical finding suggests that the degree of fiscal and monetary policies in both Nigeria and South Africa is greater than 0.5 and closer to one, it implies that in coordination of fiscal and monetary policies interactions in both economies, central bank is more active and a first mover. In other words, about 84% of government debt is backed up by fiscal authority in Nigeria, while the remaining percentage is accommodated by monetary authority. On the other hand, about 67% of government debt is backed up by fiscal authority in South Africa, while the remaining percentage is accommodated by monetary authority. The

implication is that monetary authorities in both countries fixed their policies ahead and enforce discipline on fiscal authorities.

Though empirical findings suggest that Nigeria has higher degree of fiscal and monetary policies interdependence than South African economy, average inflation rate in Nigeria is higher than that of South Africa. This result does not find evidence of low inflation being associated with higher degree of fiscal and monetary policies interdependence. Hence, the study could not establish the position that the degree of fiscal and monetary policies interdependence is correlated with inflation rate.

6.2.3.1 Major findings from DSGE estimation for Nigeria

The results show that a shock to inflation causes initial rise in inflation rate, interest rate and government spending before it becomes stable and later begins to decline until the effects of the shock are completely fizzled out as inflation rate returns back to the steady state. On the other hand, the shock to inflation causes an initial fall in output, government debt, and tax revenue. The domestic output fell sharply due to shocks in inflation which might be as a result of increased cost of production. It then declines until it eventually returns to the steady state. Government debt also fell abruptly due to shocks to inflation and eventually returnned to its steady state, while tax rose after the initial falls due to the inflationary shocks before finally settling at its steady state.

An interest rate shocks causes initial falls to inflation rate, interest rate and tax revenue. Inflation rate and tax revenue fell and immediately rose and finally converged at the steady state while the interest rate continued to fall until the effects of shocks finally dissipated. The shocks to interest rate causes initial rises in output, government debt and government spending before the effects of the shocks fade away.

Shocks to government spending causes immediate fall in inflation rate and output level in Nigeria while effects of shocks to government spending on government debt is positive throughout until economy converges at the steady state. Tax revenue is observed to immediately fall but the tax revenue in turn begins to increase as the economy moves towards the steady state.

The shock to tax causes a slight fall in inflation rate and becomes relatively stable and consequently begins to rise toward the steady state while tax shocks are seen to have a positive effect on interest

rate. More so, the shocks to tax do not produce expected macroeconomic outcomes on output and government spending in Nigeria. Government debt falls due to the shocks in tax revenue.

The empirical results shows that shocks to technology, known as total factor productivity have a permanent positive effects on the domestic output as there is a change in the steady state of the economy. Shocks to tecnonology have a dropping effect on the inflation rate and interest rate. Technological shocks leave a permanent rising effect on government debt, as the steady state is seems to shift upward. The shocks to technology cause both government spending and tax to rise and the effects seem to be relatively stable.

6.2.3.2 Major findings from DSGE estimation for South Africa

A shock to inflation, like in the Nigerian economy, brought about a sharp rise in inflation rate and interest rate. The inflation later began to fall and the effects of the shocks faded away as the economy converged back to the steady state. However, tax revenue also fell in South Africa due to shocks in inflation; the weight of the fall in tax revenue is higher in Nigeria than that of South Africa. Government debt slightly fell around its steady state but immediately returned to its steady state.

An interest rate shock stimulated a short fall in inflation rate as inflation fall is immediately accompanied with a rise and economy converged back to its steady state. The shock to interest rate just like the case of Nigeria makes output, government debt, and govermnent spending deviate initially from the steady state and immediately rose back to their steady state

In addition, the response of domestic output to shocks in government spending is much higher and better than Nigeria. The effects of government spending to its own shocks are higher in the South African economy than Nigerian economy. Shocks to government spending causes government debt to suddenly deviate from the steady state and begin to rise before converging back to the steady state. The response of tax revenue to shocks in government spending is similar to that of Nigeria.

The shock to tax is observed to have a similar effect on both interest rate and inflation rate. Both inflation rate and interest rates rose sharply in response to the shocks but the rise did not last. Both interest and inflation rates later began to fall and the effects of the shocks finally fizzled out as

they both try to converge back to their steady state. Government debt fell sharply as there were shocks to tax revenue. Government spending is observed to be relatively stable due to the shocks in tax revenue; and the effects of the shocks begin to fade away as government spending falls and returns to its steady state.

The empirical evidence suggests that shocks to technology, known as total factor productivity, have permanent positive effects on the domestic output, as there is a change in the steady state of the economy. Shocks to tecnology are found to have a reducing impact on the inflation rate and interest rate. However, the reducing impacts on interest rate are more than that of Nigeria. Technological shocks can also be seen to have a permanent increase on government debt. The shocks to technology cause both government spending and tax to rise.

6.2.3.3 Major findings from BVAR estimation for Nigeria

Shocks to government debt, government spending and tax revenue produce positive response in output level, though the impact of government spending shocks and tax shocks was marginal on the output level as the response was less than 1% throughout the time horizon. In addition, shocks to inflation produce negative response in output level. The response of output to interest rate shocks oscillate between negative and positive.

A positive shock to output level produces positive response from government debt. Shocks to government spending and inflation produce negative response from government debt. Government debt responds positively to shocks to tax revenue and interest rate shocks.

Government spending is found to respond positively to shocks in output level while it responds negatively to government debt shocks and interest rate shocks. Tax shocks generate negative response from government spending.

Response of inflation to output level shocks was initially positive but subsequently became positive. In addition, the response of inflation due to shocks in government spending and government debt oscillate between negative and positive. The inflation rate is also observed to rise in response to interest rate shocks while it falls in response to tax shocks.

Shocks to output level have positive negligible impacts on interest rate. In addition, shocks to government debt and shocks to interest rate's own shocks produce positive response from interest rate. Interest rate responds positively to shocks in government debt. The response of interest rate to government spending is seen to oscillate between negative and positive.

Positive shock to output level is found to generate a positive response from tax shocks while shocks to interest rate and inflation rate generate oscillating response from the tax revenue. The response of tax revenue to shocks in government debt and tax own shocks is found to be positive.

The empirical results show that the dominant source of variation in output level is shocks to government debt. In addition, output level, government debt and interest rate are important sources of variation in government spending. Government debt and inflation shocks are significant and dominant sources of variation in interest rate while government debt shocks are found to be a very significant source of variation in tax revenue.

6.2.3.4 Major findings from BVAR estimation for South Africa

The impulse response analysis shows that a shock to output level yields a positive response on the output level in the economy. In addition, shocks to government debt, inflation rate and interest rate generate negative response from the output level though the resultant responses were marginal. Meanwhile, shocks to government spending and tax revenue produce positive response in output level.

A positive shock to output level initially produces negative response from government debt but subsequently becomes positive. Shocks to government spending and interest rate produce negative response from government debt. Unlike Nigeria, inflation shocks produce positive response from government debt. Government debt initially responds negatively to shocks in tax revenue but, subsequently, responds positively.

A shock to output level and interest rate generates positive response from government spending. Government spending initially responds positively to shocks in government debt and inflation rate but subsequently becomes negative from the mid-period. Unlike Nigeria, tax shocks generate positive response from government spending.

Inflation is observed to rise in response to shocks in output level and government spending. The response of inflation rate to shocks in government spending and interest rate oscillate between negative and positive. Inflation rate responds negatively to its own shocks though the response was also initially positive.

The interest rate's response to output level shocks is initially positive, becomes negative and subsequently positive. Like Nigeria, shocks to government debt generate a positive response from the interest rate, though the response effect is very marginal. The response of interest rate to government spending, inflation rate and tax shocks is positive throughout the time horizon.

Tax revenue response to shocks in government debt and output level shocks is found to be oscillating between positive and negative. In addition, shocks to government spending and interest rate produce positive response from tax revenue.

The empirical results show that the dominant sources of variation in output level are shocks to tax, interest rate and government spending. Inflation rate, government spending and output level shocks are noteworthy causes of variations in government debt. In addition, output level, tax revenue and interest rate shocks are important sources of variation in government spending. Meanwhile, tax revenue, government debt and government spending shocks are weighty springs of variation in inflation. Unlike the Nigerian case, output level shocks are found to be a very significant sources of variation in tax revenue.

6.3 REALISATION OF STUDY OBJECTIVES

This section gives a synopsis of how the study's objectives were achieved.

6.3.1 Primary objective

The primary objective of this study was to analyse fiscal and monetary policy interdependence in Nigerian and South African economies. This was achieved by breaking down the primary objective into theoretical objectives and empirical objectives.

6.3.2 Theoretical objectives

The study listed four theoretical objectives as outlined in Chapter 1. All the theoretical objectives are stated below and how they were achieved.

- **To critically examine theories on fiscal and monetary policy**

The study provided various theories on fiscal and monetary policies in Chapter 3 of the study. Specifically, fiscal theories were critically examined in Section 3.3. The study began with the identification of Keynesians' theory of fiscal policy in Section 3.3.1. The arguments and the position of Keynesians on fiscal policy were clearly articulated. In addition, monetarist's theory of fiscal policy was also considered in Section 3.3.2. Section 3.4 of the study dealt with identification of various theories on monetary policy. The background was laid for the oldest theory of monetary policy known as quantity theory of money in Section 3.4.1. The quantity of money was critically examined in Section 3.4.2. while the Keynesians' challenge of quantity theory of money was carefully articulated in Section 3.4.3. Keynesians 'theory of monetary policy was subsequently considered in Section 3.4.4. The monetarists' revival of quantity theory of money was examined in Section 3.4.5.

- **To review various fiscal policies regimes adopted and its performance in Nigeria and South Africa**

The study carried out a review of various fiscal policy regimes adopted in Nigeria and South Africa with critical insights into their performance in Chapter 2 of the study under Section 2.3. Prior to this, political and economic development in Nigeria and South Africa that influenced and motivated the choice and adoption of various fiscal policy were outlined in Section 2.2. Various Fiscal policy regimes in Nigeria were extensively discussed with review of the performance in Section 2.3.1 while fiscal policy regimes adopted in South Africa and the performance were carefully discussed in Section 2.3.2.

- **To assess the various monetary policy regimes and their performances in Nigeria and South Africa**

The assessment of monetary policy regimes in Nigeria and South Africa was carried out in Section 2.4 under Chapter 2 of the study. Section 2.4.1 examined the various monetary policy regimes in Nigeria and monetary policy performance under various regimes under various monetary policy frameworks. Section 2.4.2 analysed the various monetary policy era and performance in South Africa by classifying the monetary policy framework under five broad frameworks.

- **To evaluate existing empirical studies on fiscal and monetary policies interdependence**

This study on fiscal and monetary policies interdependence was not separated from previous research efforts. This theoretical objective was achieved in Chapter 3 of the study under Section 3.5. The overall pictures that emerged show that research efforts on estimation of the degree of fiscal and monetary policy interdependence has received significant attention in developed economies. It has not received adequate attention from Africa, hence, this study.

6.3.3 Empirical objectives

On the basis of primary objective, the succeeding empirical objectives were articulated: to examine the degree of fiscal and monetary policies interdependence in Nigeria and South Africa; to analyse the trend of inflation in respect to degree of interdependence between fiscal and monetary policies variables; and to evaluate the dynamic responses among fiscal and monetary variables shocks. Below are the discussions of empirical objectives and all these empirical objectives are built and expounded in Chapters 4 and 5 using dynamic ordinary least squares (DOLS), dynamic stochastic general equilibrium model (DSGE) and Bayesian vector autoregressive model (BVAR).

- **To examine the degree of fiscal and monetary policies interdependence in Nigeria and South Africa**

The degree of fiscal and monetary policy interdependence for Nigeria and South Africa was estimated in section 5.3 in Chapter 5. The degree of fiscal and monetary policy interdependence which ranges between zero and one, is a measure of the proportion of debt that is supported up by fiscal authority. It is a measure of fiscal and monetary dominance in an economy. The study found the measure to be 0.84 and 0.67 in Nigeria and South Africa respectively.

- **To analyse the trend of inflation in respect to degree of interdependence between fiscal and monetary policies**

The analysis of trend of inflation in respect of degree of fiscal and monetary policies interdependence was achieved in Section 5.4 under Chapter 5 of the study. This empirical objective was achieved by analysing the trend of inflation in Nigeria and South Africa with respect to the degree of fiscal and monetary policy interdependence. The study could not substantiate the hypothesis of higher degree of fiscal and monetary policies being associated with lower inflation rate. The study found that though the degree of fiscal and monetary policies interdependence is higher in Nigeria than South Africa, inflationary trend and average inflation is lower in South Africa.

- **To evaluate the dynamic responses among fiscal and monetary policies variables shocks**

The dynamic responses among fiscal and monetary policy variables were evaluated by means of both dynamic stochastic general equilibrium model (DSGE) and Bayesian vector autoregressive model (BVAR). The DSGE estimation was carried out in Section 5.5 and Section 5.6 for Nigeria and South Africa respectively. The BVAR estimation process was achieved in Section 5.7 of the same Chapter five of the study. The empirical findings showed that response of inflation to shocks in fiscal policy via spending of government, borrowing and revenue shocks. The study found that fiscal and monetary policies variables interactions were largely better in South Africa than Nigeria

6.4 POLICY RECOMMENDATIONS

In view of the above findings, the following policy recommendations are made:

- Monetary policy authorities in Nigeria and South Africa should strive more to maintain the current level of their autonomy given their higher degree of fiscal and monetary policies interdependence. Current levels of autonomy can be maintained by ensuring that the fiscal authority plans its intertemporal budget constraints in such away that current levels of government outstanding debt and its interest would always be offset by future primary surpluses rather than seigniorage.

- Given the higher level of inflation in Nigeria despite the higher degree of fiscal and monetary policies interdependence, the supply side of the economy needs to be strengthened. The productive base of Nigeria needs to be awakened as is almost moribound in terms of perfomance. This can be done through elimination of various structural rigidities in the

Nigerian economy, provision of adequate and modern infrastructure such as quality infrastructure, good roads, power suppy which aid productive activities, discouraging importation of already inflated products into the country and tax concessions to producers of essential commodities. Meanwhile, though the average level of inflation in South Africa is lower than that of Nigeria, South African inflation rate can still be brought lower given the degree of fiscal and monetary policies interdependence by also further strengthening the productive base of the economy.

- Institutional settings in Nigeria need to be overhauled and reformed to allow proper working of the economics systems. For instance, the tax system could not provide a desired impacts on the output level and government spending. Various government agents that are responsible for fighting corruption need to be more autonomous and reformed to carry out their duties as expected to curb corruption and this would alleviate or reduce the problem of misappropriation of funds and corruption among others. These in turn ensure that tax revenue are judiciously used to bring about the desired impacts on output level and government spending. Also, financial markets in Nigeria needs to be critically reformed as the market is still largely unorganised given the macroeconomic responses of monetary policy variables to tax shocks. Meanwhile, though the interest rate behaved better in South Africa, more can still be done by ensuring that interest rate reduction leads to rise investment levels and output.

- Fiscal policy authorities of both countries should avoid continuous accumulation of deficits in the economy and try to guard against shocks to government debt. The fact that both countries operate in low fiscal dominance environment as suggested by high degree of fiscal and monetary policies interdependence should not be used as a reason for continuous accumulation of deficits in order to prevent the unfavourable response of government debt to its own shocks.

- One of the most important preconditions for sound and coherent monetary policy framework is lack of fiscal dominance. The current system appears to be a coherent framework as seen by high level of degree of fiscal and monetary policies interdependence. Hence, central bank of Nigeria and South African Reserve Bank should continue to advance rapidly in terms of technical capability, transparency of communication with the public and other attributes that will improve the operations of monetary policy framework. Monetary policy authorities should

not relent in pursuit of tight monetary policy. The loose and unguided monetary policy should be avoided to prevent indiscriminate growth of monetary base that could worsen the current inflationary trend in the economies.

- The governments of both countries, especially Nigeria, have a duty to toughen its fiscal consolidation, and more insttutional fiscal frameworks should be created. The monetary authorities should strengthen its capacity to analyze economic models to expand its forecasting capacity of monetary variables.

- From a policy viewpoint, maintaining low fiscal dominance is strategic to attaining and sustaining enduring price stability in both countries. This entails a sound and persistent fiscal fine-tuning reinforced by an apposite monetary policy. An all-inclusive tax reform such as growing the tax base, scheming and sustaining an inflation-proof tax system, refining tax administration and collection, spending rationalization, and privatization of inefficient state enterprises are vital in creating fiscal policy reliability. Fiscal reliability or credibility can also be reinforced by means of improved central bank independence which has a clear obligation to preserve price stability as the superseding goal of monetary policy.

- In order to accomplish more active monetary-fiscal policy coordination, the two economies are encouraged to brace contacts between the monetary and fiscal authorities to cooperatively resolve on aspects relating to design of policy and implementation. Both fiscal and monetary authorities have a duty to establish guidelines and processes, which must be obligatory on both the fiscal and monetary authorities.

- Government should reinforce observing and appraisal units in all relevant policy institutions to monitor and assess the execution and implementation as well as to track deliverables decided on at policy coordination meetings. In addition, both countries are cheered to toughen their medium-term forecast and estimate framework and budget alignment to sectoral policies.

6.5 CONTRIBUTIONS OF THE STUDY

The study has contributed to the current literature on fiscal and monetary policies interaction by quantitatively estimating the degree of fiscal and monetary policy interdependence in Nigeria and

South Africa. Existing studies from Nigeria and South Africa have been largely preoccupied with analysis of interactions between fiscal and monetary policies variables with little or no empirical research efforts on estimating the degree of their interdependence. The results show that the degree of fiscal and monetary interdependence in Nigeria is 0.84 while it is found to be 0.67 in South African economy. In addition, the study largely contributed to scarce empirical efforts on the analysis of the trend of the inflation with respect to degree of interdependence between fiscal and monetary policies variables. More specifically, the hypothesis of higher degree of fiscal and monetary policies interdependence being associated with lower inflation rate was examined using a trend analysis and empirical results from the study could not find the support the hypothesis of lower inflation rate being associated with high degree of fiscal and monetary policies interdependence.

Lastly, from the methodological point of view, the study also contributed to the literature by making use of dynamic stochastic general equilibrium model (DSGE) to analyse the dynamic responses between fiscal and monetary policies interactions. Majority of studies on fiscal and monetary policies interactions in Nigeria and South Africa have largely used ordinary vector autoregressive (VAR) with little efforts on dynamic stochastic general equilibrium model. Hence, this study has contributed immensely by using both dynamic stochastic general equilibrium model (DSGE) and Bayesian vector autoregressive (BVAR) to analyse the dynamic responses between fiscal and monetary policies variables for Nigeria and South Africa.

6.6 LIMITATIONS OF THE STUDY AND FUTURE RESEARCH

Even though all the objectives of the study were achieved, the study, like any other study, has its limitations. The study only considered two biggest and largest economies in Africa. Each of the country is from West Africa and Southern Africa. The study could have added more countries from West Africa and Souther African countries. Also, the study could have added more countries from other regions of the continent. In other word more countries from other regions of Africa such as East Africa and North Africa could have been added. The limitations of the study can be addressed by the following areas of research:

- Future studies can add more countries from both West Africa and Southern Africa.
- Future studies can add more countries from East Africa and North Africa.

6.7 CONCLUSION

This study attempted to analyse econometrically the fiscal and monetary policies interdependence in Nigeria and South Africa in order to define the extent at which fiscal authority actions confines the monetary authority and analyse the dynamic responses between fiscal and monetary policies variables. The empirical confirmation offered in the study on the basis empirical findings showed that the degree of fiscal and monetary policy is high for both Nigeria and South Africa. The evidence shows that both economies are under low fiscal dominance though Nigerian economy is seen to be under a lower fiscal dominance hypothesis when compared with South African economy as degree of fiscal and monetary policy interdependence is higher in Nigeria than South Africa. Therefore, the Nigerian monetary authority has greater freedom to fight inflation. However, the Nigerian economy still has a higher inflation than South Africa. The study finds that the hypothesis of higher degree fiscal and monetary policies interdependence being associated with lower inflation could not be substantiated. In addition, the fiscal and monetary policies variables responses and interactions were largely better in South Africa than Nigerian economy.

The study concludes based on the empirical findings, that monetary policy authorities in Nigeria and South Africa should strive more to maintain the current level of their autonomy given their higher degree of fiscal and monetary policies interdependence. Current level of autonomy can be maintained by ensuring that the fiscal authority plans its intertemporal budget constraints such that current level of government outstanding debt and its interest would always be offset by future primary surpluses rather than seigniorage. The productive base of Nigeria needs to be awakened as is almost moribound in terms of perfomance. This can be done through elimination of various structural rigidities in Nigerian economy, provision of adequate and modern infrastructure such as good roads, power suppy which aid productive activities, discouragement of importation of already inflated products into the country and tax concessions to producers of essential commodities. Meanwhile, though the average level of inflation in South Africa is lower than that of Nigeria, South African inflation rate can still be brought lower given the degree of fiscal and monetary policies interdependence by also further strengthening the productive base of the economy.

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ANNEXURE A1: DSGE DYNARE CODE

```
Description of Endogenous variables

var y yn e_a g pih r rn mc tau b e_pi e_r e_g e_tau cf;

// 2. Description of Exogenous variables

varexo mu_pi mu_r mu_g mu_tau mu_a mu_cf;

// 3. Description of parameters

parameters alpha omega rhoc sigma_alpha sigma gamma eta lambdab lambdaf zeta
theta beta kappa

phi Cbar Bbar rhor r_pi r_y rhog g_y g_b rho_tau tau_y tau_b rho_e_pi rho_e_r
rho_e_g rho_e_tau rho_a rho_cf;

omega=sigma*gamma+(1-alpha)*(sigma*eta-1);

sigma_alpha=sigma/((1-alpha)+alpha*omega);

lambdab = zeta/(theta+zeta*(1-theta*(1-beta)));

lambdaf = (beta*theta)/(theta+zeta*(1-theta*(1-beta)));

kappa=((1-beta*theta)*(1-theta)*(1-zeta))/(theta+zeta*(1-theta*(1-beta)));

model(linear);

y = y(+1)-(g(+1)-g)+alpha*(omega-1)*(rhoc-1)*cf-(1/sigma_alpha)*(r-pih(+1));

yn=((1+phi)/(sigma_alpha+phi))*e_a-((sigma-
sigma_alpha)/(sigma_alpha+phi))*cf;

pih=lambdab*pih(-1)+lambdaf*pih(+1)+kappa*mc+e_pi;

mc=(sigma_alpha+phi)*(y-yn)-sigma_alpha*g+tau;

b(+1)=r+(1/beta)*(b-pih+(1-beta)*(tau-y)+(Cbar/Bbar)*(g-tau));

r=rhor*(r(-1)-rn(-1))+(1-rhor)*(r_pi*pih+r_y*(y-yn))+rn+e_r;

rn=sigma_alpha*(yn(+1)-yn)+sigma_alpha*alpha*(omega-1)*(rhoc-1)*cf;

g=rhog*g(-1)+(1-rhog)*(g_y*(y(-1)-yn(-1))+g_b*b)+e_g;

tau=rho_tau*tau(-1)+(1-rho_tau)*(tau_y*(y(-1)-yn(-1))+tau_b*b)+e_tau;

e_pi=rho_e_pi*e_pi(-1)+mu_pi;

e_r=rho_e_r*e_r(-1)+mu_r;

e_g=rho_e_g*e_g(-1)+mu_g;
```

```
e_tau=rho_e_tau*e_tau(-1)+mu_tau;

e_a=rho_a*e_a(-1)+mu_a;

cf=rho_cf*cf(-1)+mu_cf;

end;

shocks;

var mu_pi = 0.05^2;

var mu_r = 0.05^2;

var mu_g = 0.05^2;

var mu_tau = 0.05^2;

var mu_cf = 0.05^2;

var mu_a = 0.05^2;

end;

stoch_simul(irf=16) pih r y g tau b;
```

ANNEXURE A2: CALIBRATED PARAMETERS FOR NIGERIA

PARAMETER DESCRIPTION	VALUE
Degree of openness	0.23
Subjective discount factor	0.80
Degree of price stickiness	0.24
Inverse elasticity of labour supply	1.00
Inverse elasticity of substitution in consumption supply	0.59
Degree of Interest rate Smoothing	0.28
Taylor rule coefficient on inflation	1.48
Taylor rule coefficient on output gap	0.52
Degree of government spending smoothing	0.78
Spending coefficient on past output gap	0.01
Degree of tax smoothing	0.22
Tax coefficient on past output gap	0.01
Spending coefficient on debt	0.03
Tax coefficient on debt	0.01
Degree of backwardness	0.76
AR coefficient on technology	0.91
AR coefficient on World output	0.36
SD of technology innovation	0.02
SD of inflation innovation	0.05
SD of world consumption innovation	0.02
SD of interest rate innovation	0.02
SD of government spending innovation	0.14
SD of world tax innovation	0.06

ANNEXURE A3: CALIBRATED PARAMETERS FOR SOUTH AFRICA

PARAMETER DESCRIPTION	VALUE
Degree of openness	0.26
Subjective discount factor	0.99
Degree of price stickiness	0.28
Inverse elasticity of labour supply	1.00
Inverse elasticity of substitution in consumption supply	0.61
Degree of Interest rate Smoothing	0.31
Taylor rule coefficient on inflation	1.48
Taylor rule coefficient on output gap	0.52
Degree of government spending smoothing	0.82
Spending coefficient on past output gap	0.03
Degree of tax smoothing	0.31
Tax coefficient on past output gap	0.11
Spending coefficient on debt	0.31
Tax coefficient on debt	0.17
Degree of backwardness	0.66
AR coefficient on technology	0.93
AR coefficient on World output	0.15
SD of technology innovation	0.08
SD of inflation innovation	0.03
SD of world consumption innovation	0.04
SD of interest rate innovation	0.03
SD of government spending innovation	0.18
SD of world tax innovation	0.12

ANNEXURE B1: ORIGINAL DATA (NIGERIA)

YEAR	CONSUMPTION	M1	INFLATION	TOTAL GOVERNMENT DEBT	GDP	GOVERNMENT SPENDING	INTEREST RATE	TAX REVENUE
1981	1.00631E+11	50.1	20.81282291	13.5238	15258	103.918287	8.916666666	4.7261
1982	95549377115	76.0	7.697747247	23.827	14985.08	102.0808271	9.537499999	3.6188
1983	84033205130	118.8	23.21233155	32.7991	13849.73	97.96485052	9.976666666	3.2557
1984	77972605876	169.4	17.82053329	40.4808	13779.26	92.19801717	10.24166667	2.9841
1985	84194012501	201.4	7.435344828	45.2497	14953.91	91.12965622	9.433333333	4.1267
1986	69510040881	227.5	5.717151454	69.8911	15237.99	97.08469912	9.959166667	4.4885
1987	55951739776	268.6	11.29032258	137.5782	15263.93	87.76295107	13.96166667	6.3536
1988	61823541634	318.6	54.51122478	180.9859	16215.37	89.60272914	16.61666667	7.765
1989	59876367457	393.1	50.46668812	287.4433	17294.68	72.42912783	20.44166667	14.7399
1990	72354053775	637.7	7.364400306	382.7075	19305.63	82.34172178	25.3	26.2153
1991	74512649705	50.1	13.0069731	444.6525	19199.06	81.47443673	20.04166667	18.3252
1992	82448622306	76.0	44.58884272	722.2258	19620.19	86.01221927	24.75833333	26.3751
1993	81110296462	118.8	57.16525283	906.9808	19927.99	90.45012424	31.65	30.667
1994	77705245695	169.4	57.03170891	1056.395713	19979.12	93.68841342	20.48333333	41.7184
1995	82161033022	201.4	72.8355023	1194.599534	20353.2	88.24484812	20.23333333	135.4397
1996	97710727775	227.5	29.26829268	1037.295563	21177.92	93.21385818	19.83666667	114.814
1997	94631605476	268.6	8.529874214	1097.683049	21789.1	93.31079764	17.795	166
1998	95356769261	318.6	9.996378124	1193.847208	22332.87	106.7902053	18.18416667	139.2976
1999	90091568058	393.1	6.618373395	3372.181	22449.41	88.10732626	20.29	224.7654
2000	91734575378	637.7	6.933292156	3995.6339	23688.28	67.9198098	21.27416667	314.4839
2001	1.26369E+11	816.7	18.87364621	4193.271	25267.54	90.9167071	23.43833333	903.4623
2002	1.27432E+11	946.3	12.8765792	5098.8855	28957.71	91.45225604	24.77083333	500.9863
2003	1.44704E+11	1,225.6	14.03178361	5808.0093	31709.45	95.64310334	20.71416667	500.8153
2004	1.80875E+11	1,330.7	14.99803382	6260.5947	35020.55	88.12662637	19.18083333	565.7
2005	1.97903E+11	1,725.4	17.86349337	4220.97875	37474.95	87.4344171	17.94833333	785.1
2006	1.78693E+11	2,280.6	8.239526517	2204.72078	39995.5	78.38665479	16.9	677.535
2007	2.54501E+11	3,116.3	5.382223652	2608.519109	42922.41	97.00586668	16.93916667	1264.6
2008	2.35515E+11	4,857.3	11.57798352	2843.564088	46012.52	85.20671551	15.47983333	1336
2009	2.83359E+11	5,017.1	11.53767275	3818.467134	49856.1	100.2656219	18.36166667	1652.654366
2010	2.76178E+11	5,571.3	13.72020184	5241.657488	54612.26	92.12315364	17.585	1907.580501
2011	2.70191E+11	6,771.6	10.84079259	6519.689617	57511.04	90.13449446	16.01666667	2237.88
2012	2.69538E+11	7,420.9	12.21700718	7564.431068	59929.89	81.50264154	16.7925	2628.78
2013	3.15994E+11	7,032.8	8.475827285	8506.310844	63218.72	94.94904677	16.7225	2950.56
2014	3.15677E+11	6,904.8	8.057382626	9535.54192	67152.79	94.01494159	16.54833333	3275.03
2015	3.16427E+11	7,311.7	9.017683791	10948.53071	69023.93	99.86048103	16.84883268	3082.41
2016		9,864.4	15.69685447	14537.1197	67931.24	98.724	16.86702035	2985.13

ANNEXURE B2: ORIGINAL DATA (SOUTH AFRICA)

YEAR	CONSUMPTION	INFLATION	M1	GDP	TOTAL DEBT	GOVERNMENT SPENDING	INTERST RATE	TAX
1981	1.28708E+11	15.25423729	52.61317723	74993	20329	101.9468484	14	14
1982	1.32801E+11	14.63903743	52.59521097	85153	22362	100.40163	19.33333333	13.4
1983	1.36374E+11	12.303207	52.34541534	97390	26540	96.39079988	16.66666667	18.6
1984	1.4343E+11	11.52647975	53.52616911	114104	33349	98.23932553	22.33333333	13.5
1985	1.411E+11	16.29422719	53.16485161	131676	38507	91.42744312	21.5	29
1986	1.42165E+11	18.65492394	49.3631756	154289	44133	91.47573709	14.33333333	15.4
1987	1.476E+11	16.16059379	50.47785005	180339	53323	90.39642008	12.5	11
1988	1.53911E+11	12.77955272	53.43537556	216381	62272	93.71432797	15.33333333	18.1
1989	1.58671E+11	14.73087819	53.6747765	259726	71683	94.85650262	19.83333333	24.4
1990	1.6296E+11	14.32098765	52.15654696	298971	84724	94.69279629	21	27.2
1991	1.63374E+11	15.33477322	53.35797455	342245	102586	95.85472396	20.3125	7.7
1992	1.6257E+11	13.87470208	48.95197838	383723	132474	96.07998478	18.90583333	6.8
1993	1.65305E+11	9.717446554	45.50001823	438884	166704	95.4730635	16.15833333	9.2
1994	1.70404E+11	8.938547486	47.61231115	496233	228188	97.82058025	15.58333333	15.8
1995	1.74766E+11	8.680425266	48.61847589	563870	260800	99.33974143	17.89583333	13.7
1996	1.8228E+11	7.354125906	49.36725017	634611	296330	98.5068018	19.52083333	20.8
1997	1.87692E+11	8.597770154	52.49439283	703117	328048	98.87060048	20	13.4
1998	1.89064E+11	6.880552813	55.07585163	761658	353929	98.88650812	21.79166667	16.4
1999	1.9174E+11	5.181490718	55.73438131	834753	371099	97.47146761	18	8.7
2000	1.99105E+11	5.338953284	52.71049556	946324	392914	97.12001386	14.5	5.7
2001	2.05881E+11	5.701900634	57.30775209	1046144	427655	96.05197755	13.77083333	22.3
2002	2.13111E+11	9.164037855	58.25775612	1217265	414885	96.2029632	15.75	9.4
2003	2.20619E+11	5.858979916	60.63115489	1325766	432020	97.63170876	14.95833333	4.6
2004	2.33833E+11	1.385381833	61.59694221	1476623	461419	100.1438417	11.29166667	9.7
2005	2.47602E+11	3.399299946	66.97005022	1639254	474499	100.2557871	10.625	19.2
2006	2.66954E+11	4.641624894	73.18509933	1839400	476911	101.729477	11.16666667	19.6
2007	2.82762E+11	7.098419808	79.08595146	2109502	467450	101.3353863	13.16666667	21
2008	2.8924E+11	11.53645077	80.79988802	2369063	525896	101.6205141	15.125	16.8
2009	2.86846E+11	7.13	77.6779052	2507677	655794	99.59448525	11.70833333	-3.4
2010	2.97417E+11	4.257415985	75.79962253	2748008	806893	98.7585189	9.833333333	2.8
2011	3.10906E+11	5.000472634	74.63563034	3023659	966873	99.19074869	9	11.8
2012	3.22258E+11	5.653583003	72.94245448	3253851	1146250	101.4519411	8.75	8.6
2013	3.29561E+11	5.751533742	71.01736102	3539790	1353342	102.3920911	8.5	9.6
2014	3.32222E+11	6.067198453	70.8269815	3807676	1553128	101.7401953	9.125	10.2
2015	3.36757E+11	4.588271042	73.46798781	4049759	1786299	101.086435	9.416666667	9
2016	3.40582E+11	6.3262638	72.62535098	4338858	1968426	99.8542963	10.45833333	8.5

ANNEXURE C1: DOLS ESTIMATION FOR NIGERIA

Dependent Variable: LNMS

Method: Dynamic Least Squares (DOLS)

Sample (adjusted): 1981 2016

Included observations: 35 after adjustments

Cointegrating equation deterministics: C

Fixed leads and lags specification (lead=1, lag=1)

Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNDEBT	-0.159037	0.057568	-2.762587	0.0111
LNCONS	0.437684	0.148288	2.951584	0.0072
C	-7.074996	3.530666	-2.003871	0.0570

R-squared	0.480107	Mean dependent var	3.141224
Adjusted R-squared	0.299275	S.D. dependent var	0.268229
S.E. of regression	0.224532	Sum squared resid	1.159540
Long-run variance	0.068356		

ANNEXURE C2: COINTEGRATION RESULTS FOR NIGERIA

Sample (adjusted): 1981 2016

Included observations: 33 after adjustments

Trend assumption: Linear deterministic trend

Series: LNMS LNDEBT LNCONS

Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.531934	35.94904	29.79707	0.0086
At most 1	0.457969	28.89720	27.49471	0.02179
At most 2	0.031352	1.051169	3.841466	0.3052

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

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

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.531934	25.05183	21.13162	0.0133
At most 1	0.257969	9.846036	14.26460	0.2222
At most 2	0.031352	1.051169	3.841466	0.3052

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

* denotes rejection of the hypothesis at the 0.05 level

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

ANNEXURE C3: UNIT ROOT RESULTS FOR NIGERIA

Null Hypothesis: LNMS has a unit root

Exogenous: Constant

Lag Length: 1 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.422609	0.1170
Test critical values:	1% level	-3.639407	
	5% level	-2.951125	
	10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNMS) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.970067	0.0003
Test critical values:	1% level	-3.639407	
	5% level	-2.951125	
	10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNMS has a unit root

Exogenous: Constant

Bandwidth: 7 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.169444	0.2205
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNMS) has a unit root

Exogenous: Constant

Bandwidth: 23 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-7.117501	0.0000
Test critical values:	1% level	-3.639407	
	5% level	-2.951125	
	10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNDEBT has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.654535	0.0921
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNDEBT) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.240558	0.0021
Test critical values:	1% level	-3.639407	
	5% level	-2.951125	
	10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNDEBT has a unit root

Exogenous: Constant

Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.491262	0.1261
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNDEBT) has a unit root

Exogenous: Constant

Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.244776	0.0021
Test critical values:	1% level	-3.639407	
	5% level	-2.951125	
	10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNCONS has a unit root

Exogenous: Constant

Lag Length: 1 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.536783	0.9855
Test critical values:	1% level	-3.646342	
	5% level	-2.954021	
	10% level	-2.615817	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNCONS) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.261061	0.0000
Test critical values:	1% level	-3.646342	
	5% level	-2.954021	
	10% level	-2.615817	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNCONS has a unit root

Exogenous: Constant

Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		0.454511	0.9824
Test critical values:	1% level	-3.639407	
	5% level	-2.951125	
	10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNCONS) has a unit root

Exogenous: Constant

Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-6.234909	0.0000
Test critical values:	1% level	-3.646342	
	5% level	-2.954021	
	10% level	-2.615817	

*MacKinnon (1996) one-sided p-values.

ANNEXURE D1: DOLS ESTIMATION FOR SOUTH AFRICA

Dependent Variable: LNMS

Method: Dynamic Least Squares (DOLS)

Date: 07/27/18 Time: 11:32

Sample (adjusted): 19812016

Included observations: 35 after adjustments

Cointegrating equation deterministics: C

Fixed leads and lags specification (lead=1, lag=1)

Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNDEBT	-0.329744	0.049501	-6.661319	0.0000
LNCONS	0.551565	0.031412	17.55888	0.0000
C	-9.101878	0.790635	-11.51211	0.0000

R-squared	0.971476	Mean dependent var	4.079881
Adjusted R-squared	0.961968	S.D. dependent var	0.176061
S.E. of regression	0.034335	Sum squared resid	0.028294
Long-run variance	0.002146		

ANNEXURE D2: COINTEGRATION RESULTS FOR SOUTH AFRICA

Date: 06/01/18 Time: 14:25

Sample (adjusted): 1983 2016

Included observations: 34 after adjustments

Trend assumption: No deterministic trend

Series: LNMS LNDEBT LNCONS

Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.583057	33.69677	24.27596	0.0024
At most 1	0.109475	3.953341	12.32090	0.7176
At most 2	0.000330	0.011235	4.129906	0.9310

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

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

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.583057	29.74343	17.79730	0.0005
At most 1	0.109475	3.942105	11.22480	0.6377
At most 2	0.000330	0.011235	4.129906	0.9310

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

* denotes rejection of the hypothesis at the 0.05 level

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

ANNEXURE D3: UNIT ROOT RESULTS FOR SOUTH AFRICA

Null Hypothesis: LNMS has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.422079	0.8944
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNMS) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.266752	0.0020
Test critical values:	1% level	-3.639407	
	5% level	-2.951125	
	10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNMS has a unit root

Exogenous: Constant

Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-0.606818	0.8564
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNMS) has a unit root

Exogenous: Constant

Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-4.266752	0.0020
Test critical values:	1% level	-3.639407	
	5% level	-2.951125	
	10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNDEBT has a unit root

Exogenous: Constant

Lag Length: 1 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.263058	0.1892
Test critical values:	1% level	-3.639407	
	5% level	-2.951125	
	10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNDEBT) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.895420	0.0005
Test critical values:	1% level	-3.639407	
	5% level	-2.951125	
	10% level	-2.614300	

Null Hypothesis: LNDEBT has a unit root

Exogenous: Constant

Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.611189	0.4664
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNDEBT) has a unit root

Exogenous: Constant

Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.886252	0.0175
Test critical values:	1% level	-3.639407	
	5% level	-2.951125	
	10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNCONS has a unit root

Exogenous: Constant

Lag Length: 2 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.246139	0.9715
Test critical values:	1% level	-3.646342	
	5% level	-2.954021	
	10% level	-2.615817	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNCONS) has a unit root

Exogenous: Constant

Lag Length: 1 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.696536	0.0088
Test critical values:	1% level	-3.646342	
	5% level	-2.954021	
	10% level	-2.615817	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNCONS has a unit root

Exogenous: Constant

Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		0.264908	0.9729
Test critical values:	1% level	-3.632900	
	5% level	-2.948404	
	10% level	-2.612874	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNCONS) has a unit root

Exogenous: Constant

Bandwidth: 7 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.374811	0.0191
Test critical values:	1% level	-3.639407	
	5% level	-2.951125	
	10% level	-2.614300	

*MacKinnon (1996) one-sided p-values.

ANNEXURE E1: BVAR IMPULSE RESPONSE TABLES FOR NIGERIA

Response of LNGDP:

Period	LNGDP	LNGDBT	LNGSPD	LNINF	LNINT	LNTR
1	0.040015	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.024457	0.000791	0.000977	0.004203	0.004604	0.005557
3	0.029315	0.004885	0.001339	0.000535	-0.002857	0.000912
4	0.028843	0.009471	0.004613	-0.003519	0.000460	8.61E-05
5	0.029356	0.010855	0.004377	-0.003255	0.000924	0.002366
6	0.028929	0.012651	0.004981	-0.003523	0.001042	0.002869
7	0.028839	0.014577	0.005590	-0.003625	0.001432	0.003328
8	0.028748	0.016459	0.005855	-0.003796	0.002125	0.003890
9	0.028857	0.018384	0.005865	-0.004205	0.002900	0.004412
10	0.029033	0.020257	0.005763	-0.004730	0.003699	0.004871

Response of LNGDBT:

Period	LNGDP	LNGDBT	LNGSPD	LNINF	LNINT	LNTR
1	0.003034	0.217917	0.000000	0.000000	0.000000	0.000000
2	0.009950	0.220435	0.029960	-0.016791	0.032063	-0.011834
3	0.042069	0.223815	-0.001299	-0.067716	0.082404	0.029123
4	0.056448	0.203183	-0.030740	-0.083862	0.090720	0.050212
5	0.048150	0.181258	-0.025109	-0.067039	0.068829	0.046733
6	0.036355	0.162794	-0.010005	-0.047854	0.048044	0.035165
7	0.031448	0.151481	-0.000894	-0.039651	0.041370	0.029892
8	0.031351	0.142210	-0.000802	-0.037700	0.041868	0.030592
9	0.031785	0.133762	-0.002916	-0.036222	0.041622	0.031653
10	0.031197	0.125872	-0.003627	-0.033620	0.039156	0.030704

Response of LNGSPD:

Period	LNGDP	LNGDBT	LNGSPD	LNINF	LNINT	LNTR
1	0.000371	0.005183	0.083932	0.000000	0.000000	0.000000
2	0.008331	-0.027472	0.016385	-0.008779	0.016966	0.007394
3	0.008961	-0.010238	0.021487	-0.001351	0.011470	0.005390
4	0.004318	-0.013839	0.016224	0.005134	0.004740	-0.005494
5	0.007250	-0.004559	0.017696	-5.25E-05	0.006508	-0.009295
6	0.011010	-0.002586	0.011194	-0.006140	0.010726	-0.008207

7	0.013311	-0.001128	0.007791	-0.009077	0.011250	-0.006582
8	0.013345	-0.001995	0.006484	-0.008859	0.009013	-0.006661
9	0.012689	-0.002622	0.007082	-0.007579	0.006516	-0.007021
10	0.012119	-0.003300	0.007385	-0.006408	0.004918	-0.006888

Response of LNINF

Period	LNGDP	LNGDBT	LNGSPD	LNINF	LNINT	LNTR
1	-0.167033	-0.150547	0.098657	0.395966	0.000000	0.000000
2	-0.087986	0.011587	0.064034	0.169135	0.006303	-0.066748
3	0.056030	0.105248	-0.034378	-0.106643	0.152290	-0.054383
4	0.086961	0.088094	-0.083087	-0.139226	0.163238	0.007814
5	0.055145	0.038586	-0.057433	-0.091609	0.076609	-0.012754
6	0.025886	0.014530	-0.001589	-0.053903	0.021473	-0.042631
7	0.013291	-0.003792	0.021593	-0.033881	0.008739	-0.042632
8	0.010962	-0.015822	0.022144	-0.025730	0.009697	-0.030424
9	0.009527	-0.024723	0.017707	-0.018762	0.008827	-0.021608
10	0.006644	-0.030245	0.016239	-0.010721	0.004688	-0.018445

Response of LNINT:

Period	LNGDP	LNGDBT	LNGSPD	LNINF	LNINT	LNTR
1	0.006302	0.054818	0.009628	-0.007972	0.096236	0.000000
2	0.002764	0.050740	-0.005126	0.010031	0.057970	0.005600
3	0.019962	0.065585	-0.004235	-0.043131	0.054603	-0.021897
4	0.030537	0.062020	-0.005994	-0.058391	0.059681	-0.013250
5	0.025517	0.043315	-0.005846	-0.047830	0.044408	-0.008372
6	0.018362	0.030101	0.003508	-0.035838	0.027558	-0.011930
7	0.013077	0.019973	0.010117	-0.026137	0.018885	-0.012855
8	0.010424	0.012709	0.011830	-0.019690	0.015063	-0.010842
9	0.009147	0.007520	0.011011	-0.015562	0.012895	-0.008742
10	0.008245	0.003890	0.009895	-0.012328	0.010936	-0.007426

Response of LNTR:

Period	LNGDP	LNGDBT	LNGSPD	LNINF	LNINT	LNTR
1	0.020112	0.136939	-0.044254	0.082302	0.005017	0.225396
2	-0.001228	0.083622	-0.095883	0.066382	-0.053994	0.112888

3	0.004159	0.157927	-0.022021	0.051731	-0.037576	0.085363
4	0.007183	0.152463	-0.041819	0.040274	-0.014758	0.083778
5	0.021012	0.175031	-0.041271	0.012964	0.003943	0.083839
6	0.027101	0.176774	-0.047152	-0.001409	0.014962	0.081385
7	0.028430	0.179024	-0.041950	-0.006519	0.017084	0.076894
8	0.027997	0.177259	-0.036574	-0.009546	0.018034	0.070657
9	0.028461	0.176012	-0.031369	-0.012941	0.020664	0.066435
10	0.029196	0.173229	-0.028474	-0.015995	0.023716	0.063576

Cholesky Ordering: LNGDP LNGDBT LNGSPD LNINF LNINT LNTR

ANNEXURE E2: VARIANCE DECOMPOSITION RESULTS FOR NIGERIA

Variance Decomposition of LNGDP:

Period	S.E.	LNGDP	LNGDBT	LNGSPD	LNINF	LNINT	LNTR
1	0.040015	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.047651	96.85850	0.027541	0.042070	0.778129	0.933665	1.360092
3	0.056258	96.64226	0.773875	0.086794	0.567298	0.927730	1.002039
4	0.064191	94.42157	2.771511	0.583003	0.736342	0.717720	0.769851
5	0.071668	92.52587	4.517528	0.840631	0.796977	0.592390	0.726599
6	0.078611	90.44509	6.344552	1.100087	0.863191	0.509936	0.737140
7	0.085331	88.18276	8.302741	1.362811	0.913038	0.460960	0.777690
8	0.091908	85.79732	10.36413	1.580567	0.957610	0.450819	0.849548
9	0.098477	83.31948	12.51252	1.731445	1.016460	0.479403	0.940691
10	0.105091	80.79527	14.70271	1.821084	1.095175	0.544875	1.040889

Variance Decomposition of LNGDBT:

Period	S.E.	LNGDP	LNGDBT	LNGSPD	LNINF	LNINT	LNTR
1	0.217938	0.019386	99.98061	0.000000	0.000000	0.000000	0.000000
2	0.313903	0.109810	97.50769	0.910948	0.286136	1.043296	0.142119
3	0.403266	1.154827	89.88382	0.552987	2.993066	4.807646	0.607655
4	0.475208	2.242660	83.01014	0.816668	5.269777	7.106672	1.554079
5	0.522534	2.703937	80.68739	0.906331	6.004433	7.612716	2.085191
6	0.553896	2.837211	80.44720	0.839230	6.090155	7.527404	2.258799
7	0.578717	2.894348	80.54572	0.769021	6.048366	7.406557	2.335991
8	0.600193	2.963774	80.49901	0.715152	6.017831	7.372619	2.431611
9	0.619022	3.049865	80.34552	0.674526	5.999685	7.383017	2.547392
10	0.635315	3.136570	80.20282	0.643631	5.975946	7.389056	2.651976

Variance Decomposition of LNGSPD:

Period	S.E.	LNGDP	LNGDBT	LNGSPD	LNINF	LNINT	LNTR
1	0.084093	0.001944	0.379807	99.61825	0.000000	0.000000	0.000000
2	0.092649	0.810219	9.105315	85.19616	0.897878	3.353535	0.636894
3	0.096918	1.595353	9.436775	82.77133	0.839963	4.465289	0.891295
4	0.099727	1.694225	10.83834	80.82062	1.058310	4.443177	1.145331
5	0.102278	2.113194	10.50322	79.83333	1.006209	4.629220	1.914830
6	0.104566	3.130388	10.10972	77.52357	1.307408	5.480931	2.447975

7	0.106890	4.546525	9.686018	74.72039	1.972229	6.352959	2.721874
8	0.108874	5.884686	9.369713	72.37587	2.563055	6.808821	2.997859
9	0.110548	7.025286	9.144400	70.61149	2.956041	6.951678	3.311104
10	0.112008	8.013917	8.994335	69.21705	3.206818	6.964426	3.603458

Variance Decomposition of LNINF:

Period	S.E.	LNGDP	LNGDBT	LNGSPD	LNINF	LNINT	LNTR
1	0.465926	12.85201	10.44030	4.483551	72.22413	0.000000	0.000000
2	0.512020	13.59513	8.696358	5.276653	70.71727	0.015154	1.699434
3	0.561325	12.30808	10.75131	4.765489	62.44924	7.373238	2.352637
4	0.619196	12.08731	10.85970	5.716909	56.37729	13.00943	1.949352
5	0.636911	12.17390	10.63102	6.216457	55.35351	13.74259	1.882521
6	0.641657	12.15724	10.52562	6.125456	55.24345	13.65205	2.296188
7	0.644532	12.09151	10.43536	6.183147	55.02787	13.54887	2.713245
8	0.646502	12.04670	10.43177	6.262852	54.85152	13.48895	2.918202
9	0.647979	12.01346	10.52983	6.309002	54.68553	13.44607	3.016107
10	0.649289	11.97549	10.70436	6.346117	54.49231	13.39707	3.084651

Variance Decomposition of LNINT:

Period	S.E.	LNGDP	LNGDBT	LNGSPD	LNINF	LNINT	LNTR
1	0.111635	0.318687	24.11281	0.743834	0.509930	74.31474	0.000000
2	0.136247	0.255116	30.05701	0.640898	0.884381	67.99367	0.168923
3	0.169122	1.558792	34.54596	0.478648	7.077934	54.55267	1.785991
4	0.201405	3.397968	33.84125	0.426060	13.39603	47.24659	1.692106
5	0.217843	4.276618	32.88053	0.436210	16.27141	44.54115	1.594083
6	0.225604	4.649885	32.43729	0.430886	17.69461	43.02141	1.765913
7	0.229727	4.808511	32.03926	0.609510	18.35965	42.16682	2.016241
8	0.232200	4.908159	31.66006	0.856179	18.68975	41.69430	2.191549
9	0.233801	4.994207	31.33125	1.066295	18.87758	41.42923	2.301442
10	0.234885	5.071464	31.07033	1.233947	18.97932	41.26471	2.380229

Variance Decomposition of LNTR:

Period	S.E.	LNGDP	LNGDBT	LNGSPD	LNINF	LNINT	LNTR
1	0.280566	0.513861	23.82227	2.487897	8.604979	0.031970	64.53902
2	0.339073	0.353138	22.39263	9.699853	9.724347	2.557590	55.27245

3	0.389601	0.278875	33.39236	7.666510	9.128673	2.867437	46.66614
4	0.430921	0.255739	39.81359	7.208519	8.335443	2.461186	41.92552
5	0.475064	0.406047	46.33285	6.685846	6.932802	2.031933	37.61053
6	0.516471	0.618890	50.91649	6.490275	5.866471	1.803108	34.30476
7	0.554623	0.799435	54.57141	6.200143	5.100941	1.658457	31.66961
8	0.588692	0.935754	57.50447	5.889272	4.553917	1.565898	29.55069
9	0.619952	1.054523	59.91216	5.566347	4.149817	1.523066	27.79409
10	0.648746	1.165523	61.84181	5.275829	3.850407	1.524503	26.34193

Cholesky Ordering: LNGDP LNGDBT LNGSPD LNINF LNINT LNTR

ANNEXURE F1: BVAR IMPULSE RESPONSE RESULTS FOR SOUTH AFRICA

Response of LNGDP:

Period	LNGDP	LNGDBT	LNGSPD	LNINF	LNINT	LNTR
1	0.024550	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.014435	-0.000885	-0.000349	6.69E-05	-0.005048	0.007672
3	0.018173	-0.000109	0.001775	-0.000644	-0.003604	0.004419
4	0.015850	-0.002037	0.002568	-0.001414	-0.005144	0.004360
5	0.017166	-0.001883	0.003205	-0.000395	-0.004189	0.003000
6	0.017872	-0.001851	0.004166	-7.67E-06	-0.003498	0.004287
7	0.019247	-0.001676	0.005405	0.000184	-0.002387	0.005410
8	0.020083	-0.001977	0.006743	-0.000187	-0.001776	0.006498
9	0.020774	-0.002506	0.007974	-0.000662	-0.001353	0.007017
10	0.021292	-0.003156	0.009092	-0.001137	-0.001035	0.007264

Response of LNGDBT:

Period	LNGDP	LNGDBT	LNGSPD	LNINF	LNINT	LNTR
1	-0.023713	0.050327	0.000000	0.000000	0.000000	0.000000
2	-0.018853	0.043398	-0.013941	0.020151	-0.005733	-0.010220
3	-0.014048	0.051025	-0.027524	0.042076	-0.008126	-0.013087
4	-0.003460	0.055041	-0.030597	0.048642	-0.009187	0.008467
5	0.004221	0.051300	-0.026822	0.045266	-0.008890	0.018663
6	0.006606	0.040819	-0.021722	0.036134	-0.012326	0.019912
7	0.007549	0.029287	-0.017551	0.027855	-0.015228	0.015515
8	0.009070	0.019538	-0.013628	0.021404	-0.015686	0.010779
9	0.011826	0.012332	-0.009498	0.016379	-0.013739	0.008288
10	0.015029	0.007091	-0.005054	0.011935	-0.010666	0.007869

Response of LNGSPD:

Period	LNGDP	LNGDBT	LNGSPD	LNINF	LNINT	LNTR
1	0.003972	0.001426	0.021807	0.000000	0.000000	0.000000
2	0.006754	0.002327	0.008703	0.002684	0.001601	0.005691
3	0.011231	0.003602	0.012594	0.007938	0.006997	0.003112
4	0.013428	0.003626	0.011342	0.005025	0.006169	0.011913
5	0.014419	0.001664	0.013416	0.003137	0.006563	0.011951
6	0.013397	-0.001455	0.013805	-0.000339	0.004735	0.010775

7	0.012624	-0.004020	0.013972	-0.001915	0.003857	0.008098
8	0.012323	-0.005528	0.013841	-0.002870	0.003707	0.006448
9	0.012531	-0.006219	0.013906	-0.003329	0.004221	0.005847
10	0.012791	-0.006498	0.014061	-0.003810	0.004792	0.005871

Response of LNINF:

Period	LNGDP	LNGDBT	LNGSPD	LNINF	LNINT	LNTR
1	0.035631	0.100327	-0.105182	0.220914	0.000000	0.000000
2	0.052673	0.093041	-0.037735	0.089524	-0.013950	0.157174
3	0.041120	0.022021	0.008395	0.019533	-0.010585	0.096747
4	0.009547	-0.033125	0.019531	-0.023564	-0.031433	0.018252
5	0.002850	-0.051694	0.016729	-0.026350	-0.029297	-0.016289
6	0.011818	-0.047407	0.019322	-0.020568	-0.009208	-0.019841
7	0.022322	-0.038298	0.025758	-0.019209	0.008824	-0.005404
8	0.026824	-0.031617	0.031707	-0.021923	0.018057	0.006300
9	0.024470	-0.028810	0.034240	-0.025480	0.018672	0.009355
10	0.019231	-0.027238	0.032969	-0.026180	0.015658	0.005922

Response of LNINT:

Period	LNGDP	LNGDBT	LNGSPD	LNINF	LNINT	LNTR
1	0.043073	0.032515	0.045367	0.024088	0.101992	0.000000
2	0.037957	0.036398	0.043733	0.007067	0.068503	0.043840
3	0.021943	0.033622	0.031277	0.006253	0.036121	0.048892
4	0.005075	0.022192	0.021634	0.002703	0.011546	0.024955
5	-0.003509	0.013302	0.010841	0.006774	-0.001729	0.006444
6	-0.001827	0.011529	0.004545	0.013388	-0.002625	0.000503
7	0.003868	0.011728	0.003571	0.015793	0.001036	0.005395
8	0.008731	0.010371	0.005780	0.013488	0.004159	0.011267
9	0.010511	0.006583	0.008526	0.008457	0.004611	0.013470
10	0.010188	0.001832	0.010391	0.003534	0.003582	0.011760

Response of LNTR:

Period	LNGDP	LNGDBT	LNGSPD	LNINF	LNINT	LNTR
1	0.111980	0.077811	0.034305	0.004282	0.030220	0.332129
2	0.019971	-0.012097	0.083755	-0.079540	0.027336	0.041249

3	-0.038476	-0.070055	0.039133	-0.075807	-0.045220	-0.049391
4	-0.025984	-0.042438	0.004043	-0.014820	-0.026095	-0.073147
5	0.001173	-0.010835	0.002374	0.010470	0.004670	-0.029290
6	0.021694	0.007411	0.010454	0.013933	0.024028	0.010914
7	0.023381	0.008419	0.018092	0.003682	0.022950	0.026942
8	0.015739	0.001218	0.019340	-0.005731	0.012661	0.021615
9	0.007694	-0.005484	0.016366	-0.008684	0.003847	0.008775
10	0.004327	-0.007766	0.012531	-0.006591	0.000742	0.000292

Cholesky Ordering: LNGDP LNGDBT LNGSPD LNINF LNINT LNTR

ANNEXURE F2: VARIANCE DECOMPOSITION RESULTS FOR SOUTH AFRICA

Variance Decomposition of LNGDP:

Period	S.E.	LNGDP	LNGDBT	LNGSPD	LNINF	LNINT	LNTR
1	0.024550	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.029939	90.48859	0.087456	0.013606	0.000499	2.842470	6.567374
3	0.035534	90.38999	0.063020	0.259211	0.033191	3.046339	6.208246
4	0.039650	88.57897	0.314611	0.627528	0.153760	4.129615	6.195515
5	0.043673	88.46136	0.445264	1.055935	0.134938	4.324035	5.578464
6	0.047730	88.08334	0.523208	1.646061	0.112977	4.157245	5.477168
7	0.052111	87.53528	0.542367	2.456495	0.096020	3.697359	5.672480
8	0.056690	86.51799	0.579888	3.490412	0.082229	3.222464	6.107016
9	0.061373	85.27489	0.661431	4.666260	0.081789	2.797987	6.517642
10	0.066089	83.91853	0.798507	5.916581	0.100128	2.437469	6.828785

Variance Decomposition of LNGDBT:

Period	S.E.	LNGDP	LNGDBT	LNGSPD	LNINF	LNINT	LNTR
1	0.055633	18.16709	81.83291	0.000000	0.000000	0.000000	0.000000
2	0.077920	15.11486	72.73483	3.200800	6.688016	0.541352	1.720144
3	0.107878	9.581302	60.31813	8.179647	18.70208	0.849853	2.368993
4	0.134676	6.213734	55.40549	10.40996	25.04495	1.010624	1.915253
5	0.154864	4.773569	52.87479	10.87244	27.48456	1.093860	2.900781
6	0.167387	4.241732	51.20556	10.99041	28.18567	1.478531	3.898098
7	0.174613	4.084816	49.86845	11.10989	28.44595	2.119218	4.371670
8	0.178773	4.154330	48.76901	11.17995	28.57095	2.791615	4.534138
9	0.181294	4.465090	47.88464	11.14561	28.59797	3.288790	4.617905
10	0.182996	5.056939	47.14846	11.01558	28.49403	3.567668	4.717329

Variance Decomposition of LNGSPD:

Period	S.E.	LNGDP	LNGDBT	LNGSPD	LNINF	LNINT	LNTR
1	0.022211	3.198473	0.412116	96.38941	0.000000	0.000000	0.000000
2	0.025735	9.269719	1.124373	83.24004	1.087625	0.387145	4.891094
3	0.032889	17.33740	1.887733	65.62984	6.491836	4.763012	3.890180
4	0.040113	22.86118	2.086373	52.11569	5.933771	5.566816	11.43617
5	0.046856	26.22486	1.655157	46.39353	4.797132	6.041914	14.88740
6	0.052022	27.90672	1.421003	44.67899	3.895943	5.729882	16.36746

7	0.056224	28.93237	1.727764	44.42571	3.451353	5.375982	16.08682
8	0.059989	29.63432	2.366885	44.34779	3.260674	5.104240	15.28609
9	0.063646	30.20293	3.057457	44.17121	3.170283	4.974281	14.42384
10	0.067278	30.64474	3.669048	43.89902	3.157953	4.959065	13.67017

Variance Decomposition of LNINF:

Period	S.E.	LNGDP	LNGDBT	LNGSPD	LNINF	LNINT	LNTR
1	0.266836	1.783075	14.13653	15.53798	68.54241	0.000000	0.000000
2	0.342008	3.457303	16.00586	10.67563	48.57497	0.166376	21.11986
3	0.359262	4.443248	14.88107	9.729435	44.31681	0.237586	26.39185
4	0.364027	4.396477	15.32207	9.764277	43.58328	0.977022	25.95687
5	0.370532	4.249382	16.73522	9.628290	42.57216	1.568189	25.24676
6	0.375441	4.238072	17.89489	9.643020	41.76629	1.587597	24.87013
7	0.379553	4.492614	18.52739	9.895782	41.12234	1.607433	24.35444
8	0.384228	4.871318	18.75636	10.33741	40.45325	1.789418	23.79225
9	0.388996	5.148334	18.84792	10.86034	39.89674	1.976232	23.27043
10	0.393042	5.282282	18.94210	11.34149	39.52320	2.094459	22.81648

Variance Decomposition of LNINT:

Period	S.E.	LNGDP	LNGDBT	LNGSPD	LNINF	LNINT	LNTR
1	0.126306	11.62959	6.626812	12.90145	3.637060	65.20509	0.000000
2	0.165215	12.07526	8.726553	14.54724	2.308670	55.30127	7.041000
3	0.183359	11.23591	10.44728	14.72043	1.990670	48.77926	12.82645
4	0.188069	10.75293	11.32285	15.31549	1.912858	46.74325	13.95261
5	0.189122	10.66795	11.69180	15.47401	2.019912	46.23255	13.91378
6	0.190027	10.57577	11.94874	15.38410	2.497103	45.81209	13.78220
7	0.191194	10.48800	12.17960	15.23177	3.149038	45.25750	13.69410
8	0.192610	10.53988	12.29112	15.09874	3.593322	44.64124	13.83570
9	0.193906	10.69337	12.24268	15.09099	3.735679	44.10327	14.13400
10	0.194880	10.86002	12.12944	15.22480	3.731303	43.69726	14.35718

Variance Decomposition of LNTR:

Period	S.E.	LNGDP	LNGDBT	LNGSPD	LNINF	LNINT	LNTR
1	0.361956	9.571260	4.621372	0.898267	0.013996	0.697095	84.19801
2	0.383859	8.780844	4.208338	5.559524	4.306083	1.126957	76.01825

3	0.406815	8.712349	6.712222	5.875127	7.306214	2.238941	69.15515
4	0.417423	8.662659	7.409014	5.589690	7.065632	2.517387	68.75562
5	0.418755	8.608423	7.428910	5.557401	7.083268	2.513833	68.80817
6	0.420572	8.800264	7.395895	5.571260	7.131934	2.818548	68.28210
7	0.423193	8.996869	7.344162	5.685252	7.051454	3.077843	67.84442
8	0.424706	9.070177	7.292723	5.852154	7.019483	3.144811	67.62065
9	0.425323	9.076610	7.288211	5.983248	7.040825	3.143875	67.46723
10	0.425652	9.072909	7.310230	6.060664	7.053917	3.139318	67.36296

Cholesky Ordering: LNGDP LNGDBT LNGSPD LNINF LNINT LNTR

ANNEXURE G: LETTER FROM THE LANGUAGE EDITOR

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16 November 2018

To whom it may concern

This is to confirm that I, the undersigned, have language edited the thesis of

Sanusi Kazeem Abimbola

for the degree

PhD Economics

entitled:

An econometric analysis of fiscal policy and monetary policy interdependence: comparative study between Nigeria and South Africa

The responsibility of implementing the recommended language changes rests with the author of the dissertation.

Yours truly,

Linda Scott