TECHNICAL PAPER DRAFT

THE EFFECTS OF FISCAL POLICY SHOCKS IN LESOTHO USING SVAR AND SVEC

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A Technical Paper Submitted in Partial Fulfillment of the Award of MEFMI Graduate Fellow Certificate

Month: December **Year:** 2019

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Abstract

When expenditure flows do not match revenues at a given time, governments can meet their intertemporal budget constraints through debt financing, ceteris paribus. The literature indicates that there is a causal linkage between fiscal policy and debt dynamics, which, if ignored, could result in underestimation of the effects of fiscal policy shocks. Furthermore, fiscal policy shocks could have both permanent and transitory effects on endogenous variables. These issues have been overlooked during the analysis of effects of fiscal policy shocks in Lesotho. As a result, this paper employs the time series data for Lesotho over the period 1982 - 2018 to analyse the effects of fiscal policy shocks under debt feedback using the structural vector autoregressive (SVAR) model. It also determines the long run impact of such shocks on endogenous variables using the structural vector error correction (SVEC) model. The SVAR model with and without debt feedback have produced similar results though the magnitudes of responses are slightly different. These short run empirical results have shown that government revenue and expenditure increased following a positive shock to government revenue or expenditure, while economic output was left statistically insignificant. In the SVEC model, positive shocks to government revenue and expenditure expanded economic output in the long run. Thus, the Government needs to increase economic output even further by allocating more resources to productive spending and expand the tax base.

CHAPTER 1

INTRODUCTION

1.1. Introduction

This paper analyses the effects of fiscal policy shocks under debt feedback using data from 1982 to 2018. The study is developed under the backdrop of consequences emanating from the 2008/09 global financial crisis that saw Lesotho's revenue decline significantly due to falling revenue shares from the Southern African Customs Union (SACU). Despite this, government expenditure in Lesotho has continued to increase and with it, the size of public debt. Since the Government plays an important role with fiscal policy as a tool to stabilise Lesotho's economy, there is a need to avoid high levels of debt that may endanger fiscal sustainability. It is on these grounds that this research is undertaken.

1.2. Background

In recent years, fiscal policy has dominated the attention of economists and policy makers, both in developed and developing nations. With the 2008/09 global financial crisis, governments undertook rigorous measures to stimulate their economies. Among such measures, included the need to adjust fiscal policy. This was important because sustainable fiscal policy can achieve a variety of objectives. First, it promotes non-inflationary economic growth and low levels of government deficit. Second, it helps to attain high growth by lowering the burden of debt and real interest rate through better tax system and reduces macroeconomic instability and unpredictability (Rena and Kefela, 2011).

Despite the existence of fiscal policy as an instrument of macroeconomic policy, many countries still experience budget constraints that force them to rely on borrowing. This has led to the accumulation of debt, which negatively affects the economy. For example, in 2009, Greece experienced unsustainable primary fiscal deficits and high levels of public debt that eventually put the country into debt distress. As a result, the Government had to apply austerity measures on the budget and that negatively affected the economy (Papadamou and Tzivinikos, 2017). In addition, according to the International Monetary Fund (IMF), (2016) Brazil also suffered from the recession in 2009 and again in 2014 due to the 2010 political corruption scandal. The consequences of these recessions included accumulation of public debt-to-gross domestic product (GDP). The debt-to-GDP ratio in South Africa (for both Central Government (CG) and external publicly guaranteed debt) also increased by an average of 16.45 percent from 2008 until 2018 and with it, the CG debt accounted for a one-off rise of 26.02 percent in 2008 (World Bank, 2018). After 2008, Lesotho was also affected by, among other factors, falling revenue receipts from the SACU, significant drawdown of foreign reserves and increasing debt levels (IMF, 2016).

In the literature, different schools of thought, Keynesian and 'non-Keynesian'[1], postulate diverging outcomes based on the effects of fiscal policy shocks. The magnitude of the fiscal contribution into the economy depends on the fiscal multiplier. Afonso (2002) stated that the Keynesian effect exists when an increase in government expenditure directly expands consumption and investment, and indirectly increases consumption through a fall in taxes that would have increased disposable income. It assumes that a rise in government expenditure will increase aggregate demand in the short term and such situation happens in the absence of fiscal adjustments. The Keynesian paradigm also exists when expenditure is reduced at the time of low levels of debt-to-GDP ratio, or during presence of low levels of fiscal deficit. When the government experiences sustainable levels of fiscal deficit and those of debt, a reduction in expenditure negatively affects consumption which directly contracts aggregate demand. This analysis refers to contractionary fiscal policy which results into contractionary effects, showing a linear relationship in the variables.

The non-Keynesian effect deals with rational expectations in which a reduction in government expenditure is thought to be permanent with the assumption that tax will be increased later on. This assumption will expand savings in the short run, and lead to a rise in income and hence an expansion on consumption and investment in the long run. Furthermore, existence of high levels of debt-to-GDP ratio during expenditure cut may cause a decline in the risk premium and hence a fall in the real interest rate, leading to a rise in investment, and an increase in aggregate demand (Afonso, 2002). Based on the non-Keynesian effect, where the contractionary fiscal policy reacts in the long run, it thus shows that fiscal multiplier works faster with shocks to government expenditure than to taxes (Alesina and Ardagna, 2010). Furthermore, the IMF (2016) and Ilzetzki (2011) found that prior to the 2008 global financial crisis, fiscal multipliers in less developed countries were lower than those in developed countries while the tax multipliers for less developed countries were almost zero. Other studies such as Ilzetzki, Mendoza and Végh (2011) found output to respond more to changes in government expenditure in developed countries than in developing ones.

1.3. Problem Statement

The effects of fiscal policy shocks also depend on the causal relationship between fiscal policy and debt dynamics. Favero and Giavazzi (2007) argue that government expenditure and revenue are likely to respond to rising debt levels in order to stabilise it. This calls for the inclusion of debt path in the analysis of the effects of fiscal policy shocks in order to satisfy the government intertemporal budget constraint[2]. Otherwise, the computation of impulse responses without debt feedback could produce incorrect estimates. In the case of

[1] Non-Keynesian paradigm, as pointed out firstly by Giavazzi and Pagano (1990) and then by Afonso (2002) among others, refers to effects of fiscal policy on private consumption that do not follow standard Keynesian approach.

[2] The government intertemporal budget constraint refers to future government expenditure (including interest payments) that is financed by future taxes and new debt.

Lesotho, although public debt and government primary balance as ratios of GDP, have been volatile in the past, they have experienced similar trends in the years after 2007, with both variables trending upwards from 2010 (see Figure 3). This could indicate that fiscal policy shocks are responding to debt feedback and therefore it is imperative to analyse their effects under debt feedback. Furthermore, it is necessary to impose relevant restrictions based on the structure of Lesotho's economy in order to identify the fiscal policy shocks from the structural vector autoregressive (SVAR) model (Holland, Marçal and Prince, 2019; Blanchard and Perotti, 2002). The SVAR model is relevant for this study since it takes into account the identifying restrictions for structural shocks to be computed through impulse response functions. It is also important to analyse the long run impact of fiscal policy shocks on endogenous variables using the structural vector error correction (SVEC) model. This model helps to separate the short run and long run restrictions on structural innovations that have permanent and transitory effects (Gunasinghe et al., 2019).

1.4. Research Objective

The main aim of this paper is to analyse the dynamic effects of fiscal policy[3] shocks in Lesotho using annual time series data from 1982 to 2018. The sub-objectives are as follows:

- To use the institutional information on taxes to calculate the output elasticity of tax revenue that is used as a proxy for the Lesotho-based identification scheme in the estimation of the SVAR.
- To analyse and compare the impulse responses due to fiscal policy shocks in the SVAR model that has included debt feedback with the one that has excluded it.
- To examine the impulse responses due to fiscal policy shocks in the SVEC model that accounts for existence of long run relationship among endogenous variables.

1.5. Research Hypothesis

The study tests the following main hypotheses:

- *Null hypothesis 1:* Fiscal policy shocks respond to the level of public debt whose evolution is determined by government intertemporal budget constraint.
- *Alternative hypothesis 1:* Fiscal policy shocks do not respond to the level of public debt whose evolution is determined by government intertemporal budget constraint.
- *Null hypothesis 2:* Fiscal policy shocks have long run impact on endogenous variables.

[3] The study considers both fiscal policy variables, namely, real government revenue and real government expenditure

- *Alternative hypothesis 2:* Fiscal policy shocks do not have long run impact on endogenous variables.

1.6. Justification of the Study

The empirical studies (Holland, Marçal and Prince, 2019; Ilzetzki, 2011; Favero and Giavazzi, 2007; Blanchard and Perotti, 2002; Jooste, Liu and Naraidoo, 2013; Gunasinghe et al, 2019) on the effects of fiscal policy shocks with the use of SVAR and SVEC have gained great importance in recent years. . However, fewer studies have been written on developing countries, including countries in the MEFMI region. In the case of Lesotho, Damane, Hlaahla and Seleteng (2018) conducted a study analysing the effects of fiscal policy shocks on macroeconomic variables using the SVAR model. However, unlike their study, this paper contributes to the empirical research in several ways. First, it calculates the automatic response of tax revenue to economic output using the institutional information on government revenue in order to identify the SVAR model for Lesotho. Second, it incorporates debt dynamics in the estimation of the SVAR model to better inform policy decisions given the relationship between debt level, government expenditures and revenues over time. Third, it compares the impulse responses due to fiscal policy shocks from the SVAR model with debt feedback and the one without it. Lastly, it estimates the SVEC model to determine the long run effects of fiscal policy shocks on endogenous variables. To the best of the author's knowledge, this is the first study in Lesotho to follow the above-mentioned identification scheme, include the debt feedback in the estimation of the SVAR model, and use the SVEC model to test for long run structural relationships between endogenous variables.

1.7. Definition of key concepts

1.7.1 Fiscal policy

As explained by Rena (2006), fiscal policy is a tool that the government uses to adjust taxation and spending which in turn affect the national economy. The government can use either expansionary or contractionary fiscal policy instrument. Under contractionary fiscal policy, the government may run budget surpluses due to increase in taxes and decrease in spending. Budget deficits emanate when the government decreases taxes and increases spending.

1.7.2 Public debt[4]

The IMF (2013) defines the public debt or "total debt liabilities" as:

[4] The domestic debt securities (other than shares) have been valued at market value while the loan liabilities (external and domestic) are valued at nominal value.

> "… all liabilities that are debt instruments. [That is,] a debt instrument is defined as a financial claim that requires payment(s) of interest and/or principal by the debtor to the creditor at a date, or dates, in the future".

As mentioned under the definition of fiscal policy, the accumulation of budget deficits over time results in the high debt trajectory. The country may be in high debt distress if corrective measures are not put in place (IMF, 2013).

1.8. Organisation of the Paper

The rest of the paper is organised as follows: Chapter 2 gives details of the economic context of Lesotho in terms of evolution of fiscal policy, debt trajectory and economic growth. Chapter 3 reviews the literature on the effects of fiscal policy shocks while Chapter 4 provides the methodological framework. Chapter 5 presents the regression results from the estimated SVAR and SVEC models. Chapter 6 discusses the corresponding results derived in Chapter 5. Chapter 7 concludes by highlighting the main findings and offering policy recommendations and areas for further research.

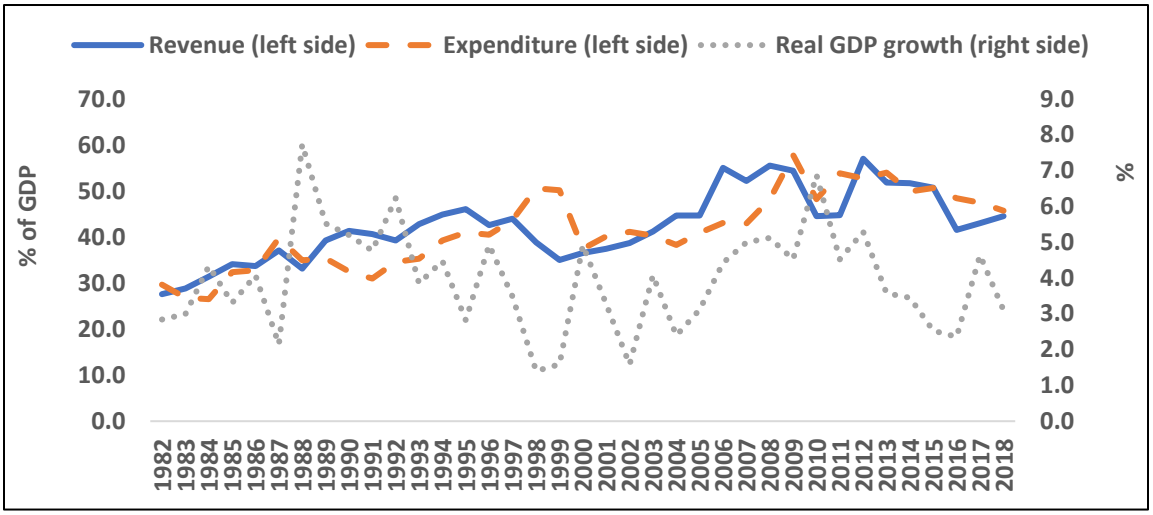
CHAPTER 2

LESOTHO'S ECONOMIC CONTEXT

2.1 Developments in Economic Growth and Fiscal Policy

Lesotho has experienced fluctuations in real GDP growth since 1982 (see Figure 1). The real GDP has grown by 4.0 percent on average, from that time until 2018. During 1980s and 1990s, the country observed high growth due to improvements in the primary sector, which were mainly driven by agriculture and remittance inflows from South African mines. With agriculture, the produce from 'wool and mohair' and 'farming', among other factors, contributed 24.5 percent of GDP and agriculture took the largest share of the primary sector by that time. With remittances, most of them emanated from Basotho men who worked at South African mines. This factor income from abroad contributed largely to gross national income (GNI) such that it was worth measuring the economic well-being of Lesotho using GNI rather than GDP (Ministry of Development Planning, 2012).

Figure 1: Trends in Real GDP Growth and Fiscal Policy Variables



Source: (IMF, 2019)

Since the 1990s, the construction industry under the secondary sector also performed well. This was due to the implementation of the Lesotho Highlands Water Project's (LHWP) Phase I[5] that started in 1991, and the execution of the Metolong Dam Project from 2009 to 2015. The former project (a bilateral project between Lesotho and South Africa) was implemented in two (2) phases: Phase IA was completed in 1998 while Phase IB ended in 2003. The Phase IA comprised construction of Katse Dam, delivery tunnel to South Africa, construction of Muela Dam, and Muela Hydropower Station. Muela Hydropower Station

[5] The dam construction of LHWP's Phase II was expected to commence in 2018 while preparation for the hydropower component was still underway (Lesotho Highlands Development Authority, 2013).

supplied electricity to Lesotho while the water from the two (2) dams was transferred to South Africa. The Phase IB involved the construction of Mohale Dam and the delivery tunnel from Mohale Dam to Katse Dam[6]. The construction industry further improved during the expansion of the health facilities funded by the United States' (US) Millennium Challenge Account over the period 2007 – 2013, and due to health services financed through public-private partnership initiative (Haas, Mazzei and O'Leary, 2010; Millennium Challenge Corporation, 2018).

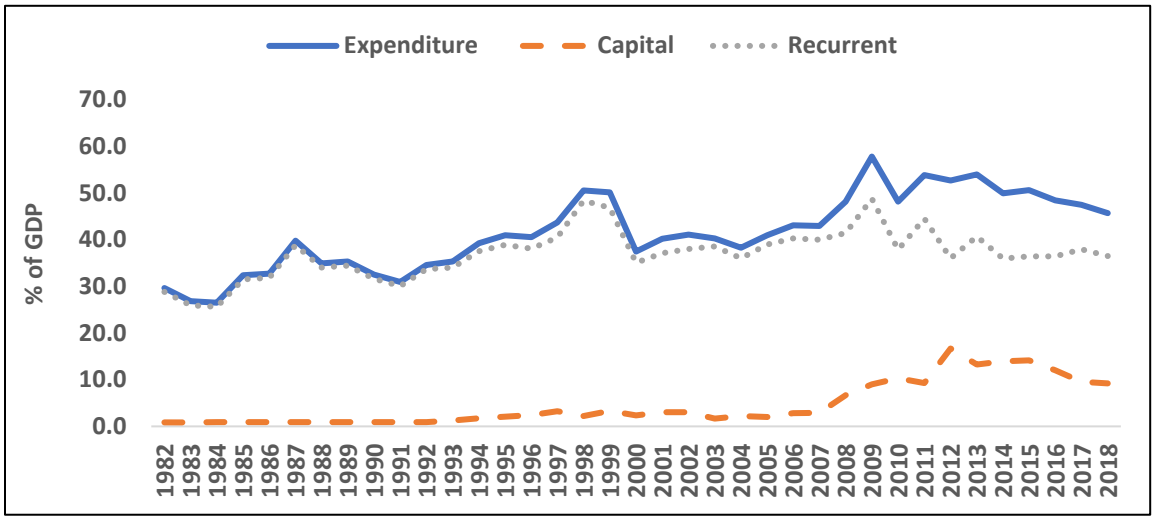
In addition, manufacturing has been significantly contributing to economic growth since the commencing of the African Growth and Opportunity Act (AGOA) agreement in 2000 and showed a peak in 2008. Before then, textile and garments manufacturing created most jobs in the country and remained a consistent driver of economic growth after AGOA. . The tertiary sector has experienced growth from different industries including public administration. In particular, the Government's intermediate consumption, compensation of employees and purchases of goods and services, have persistently been growing over time and thereby contributing to economic growth (Ministry of Development Planning, 2012; Tralac, 2018).

Nevertheless, politics in Lesotho have brought uncertainties in economic growth since independence in 1966. The country has experienced a military dictatorship in 1986 (Matlosa and Sello, 2005), which was followed by sluggish structural reforms (IMF, 1995) and insufficient dent on poverty (Motsoene, 2016). There was also an economic downturn in 1998 due to political unrest and its aftermath affected foreign grants inflows to the Government as most international communities moved out of the country. Some sectors also underperformed especially the retail and wholesale industry. Most shop-buildings were burned causing a decline in employment and a shortfall on tax revenue. Subsequently, the Government was forced to undertake major structural reforms including liquidation and privatisation of state-owned enterprises that contributed to the accumulation of public debt. These structural changes forced the Government to finance costs related to liquidation of enterprises and buying of shareholding from privatised entities (Matlosa and Pule, 2003; Matlosa and Sello, 2005).

The Government of Lesotho has also played an important role in the development of the economy by providing infrastructure and public goods. Figures 1 and Figure 2 also illustrates Lesotho's fiscal policy management over the years. . During the 37-year period, the Government budgetary operations have been volatile, constituting fiscal deficits and surpluses in some years. They have recorded the fiscal surplus of 0.9 percent of GDP on average over the period under consideration, reflecting stable growth on revenues that however got disturbed by the 1998 political upheaval.

[6] The cost for Phase IA amounted to US$2.4 billion (or M14.1 billion) while the Phase IB's cost was US$624.3 million (or M4.16 billion (Haas; Mazzei; O'Leary, 2010). End of period exchange rate has been used (Ministry of Finance, 2018).

Figure 2: Trends in Government Expenditure Components



Source: (IMF, 2019)

On average, government revenue registered 42.4 percent of GDP from 1982 to 2018. Pre-1998 era, the main drivers of revenues were income tax, general sales tax (GST) and SACU receipts. Post the 1998 era, more tax revenues were collected after the establishment of Lesotho Revenue Authority in 2003, introduction of value-added tax[7] (VAT) in the same year, and implementation of 2002 SACU revenue-sharing formula in 2006 (Government of Lesotho, 2007). During the first fiscal year of VAT implementation, the tax revenue collection almost doubled when compared with GST (Lephoto, 2003).

Furthermore, Government spending averaged 41.6 percent of GDP between 1982 and 2018.. The recurrent spending took the largest average share of 34.2 percent, while capital recorded the remaining 7.4 percent. This high spending was due to the following outlays: first, the implementation of Phase I of LHWP from 1991 to 2003; second, the costs related to privatisation of state-owned enterprises; last, the Metolong Dam Project from 2009 to 2015 at an average of 4.6 percent of GDP. Following the poor management of state-owned enterprises and the aim of the Government to make room for the private sector participation in the economy, Government initiated the privatisation programme in 1994, whose actual implementation was only observed in 1999. The privatisation costs[8] included the Treasury Bond (about 4.2 percent of GDP) financing of liquidated Lesotho Agricultural Development Bank and the privatised 1999 Lesotho Bank (Government of Lesotho, 2010). Table 1 elaborates the state-owned enterprises that were privatised. The first entity involved in the Privatisation Programme was Lesotho Airways Corporation whose operational assets were privatised to South African company in 1997. The last entity in

[7] VAT replaced GST in 2003

[8] Other parts of privatisation costs were financed through Government's counterpart contributions (related reports are confidential).

Table 1, Lesotho Telecommunications Corporation, was privatised in 2001. . The Government remained with what was called a 'golden share' until this entity was completely privatised in 2008 with the Government holding a share of 30 percent.

Table 1: Privatised or Liquidated selected State-Owned Enterprises 1997 - 2001

Year	Enterprises Name	Action taken	GOL share-holding	Rescuing Company
1997	Lesotho Airways Corporation	Operational assets privatised	N/A	Privatised to South African-based company
1998	Lesotho Flour Mills	Privatised	10%	Seaboard Corporation of the US
1998	Marakabei Lodge	Sub-leased for 3 years	N/A	MCM Enterprises (South Africa company and local investor)
1999	Lesotho Bank (LB)	Privatised	30%	LB sold assets and transferred liabilities to new Lesotho Bank (1999), then sold to Standard Bank of South Africa
1999	Orange River Lodge	Disposed off	N/A	Local investor
2000	Plant and Vehicle Pool Services	Vehicle pool services Privatised	20%	Imperial Fleet Services (Lesotho) of South Africa
2000	Minet Kingsway (PTY) Ltd	Privatised	5%	Aon Risk Services of the Netherlands
2000	Lesotho Agricultural Development Bank	Liquidated	N/A	Asset Recovery Company contracted to recover outstanding debts and pay unclaimed deposits
2001	Lesotho Telecommunications Corporation	Privatised and a second cellular phone operator license was issued	30%	Zimbabwean – based company, but GOL remained with Golden share (completely privatised in 2008)

Source: (Ministry of Finance, 2018)
* GOL stands for Government of Lesotho

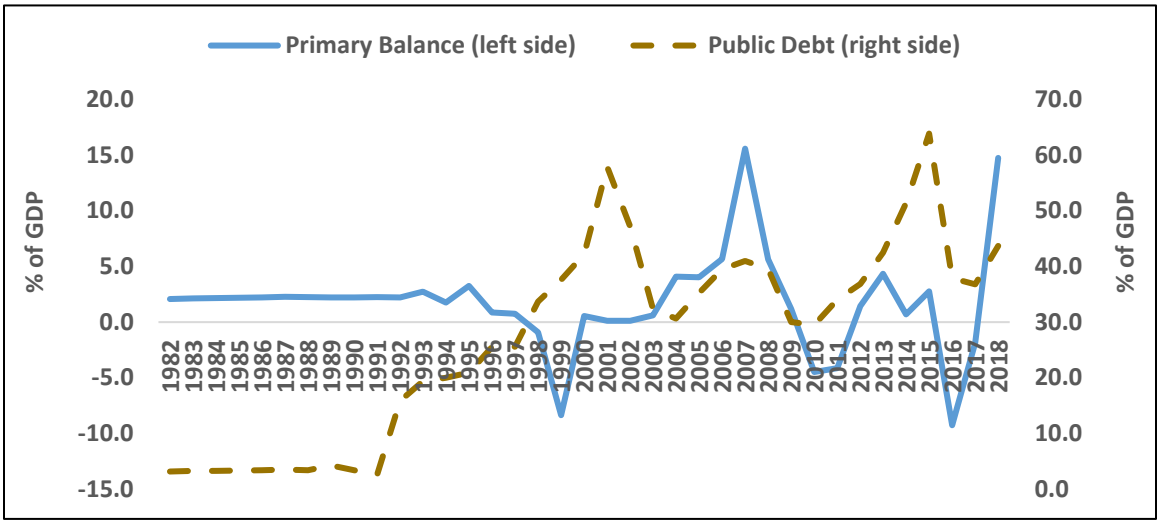
2.2 Evolution of Public Debt and Primary Balance

Governments borrow when revenues are short of expenditure and the bank deposits are not enough to finance the deficit. Such borrowings can be done either from foreign or domestic creditors. In the case of Lesotho, the public debt trajectory has most of the time not been in distress as shown Figures 3 and Figure 11 in the Appendix. Figures 3 shows that the public debt-to-GDP ratio and the ratio of primary balance[9] to GDP from 1982 to 2018 in Lesotho have been volatile over the years. From 1982 to 2015, the outstanding stock of public debt constituted an average of 27.1 percent of GDP, while the primary balance registered a positive average of 1.8 percent of GDP. The larger component of the country's public debt comes from external creditors (79.5 percent in 2018) and it has shown an upward trend, as depicted by Figure 11. Key Government projects, which were loan-financed, included publicly guaranteed loans that have been on-lent to parastatals and private enterprises (see Table 2). These projects were implemented by, among other entities, Water and Sewerage Authority, Lesotho Electricity Corporation (LEC), Lesotho

[9] The primary fiscal balance is measured by subtracting expenditure (excluding interest payments) from revenue.

Airways Corporation, and Lesotho Highlands Development Authority (LHDA)[10] (Lesotho Privatisation Unit, 2002; Ministry of Finance, 2018).

Figure 3: Evolution of Public Debt and Primary Balance for 1982-2018



Source: (Central Bank of Lesotho, 2019; International Monetary Fund, 2019)

[10] Some of these companies have changed their names, for example, 'Lesotho Electricity Corporation' changed its name in 2006 to 'Lesotho Electricity Company', and in 2010, 'Water and Sewerage Authority' changed to 'Water and Sewerage Company'.

Table 2: Selected Loan – financed Projects from 1982 to 2015

Enterprise	Agreement Year	Projects
Lesotho National Development Corporation (LNDC)	1983 - 2010	Factory Shells, Loti Brick development, Reconstruction of LNDC Centre, Resuscitation of Basotho cannery, and First and Second line of credit to LNDC
Lesotho Highlands Development Authority (LHDA)	1986, 1987, 1991, and 1994	Water transfer concessionary finance, and United States (US) Treasury bond for European Investment Bank' loan
Lesotho Housing and Land Development Corperation (LHLDC)	1990, 1997	Thetsane development area I and II
Water and Sewerage Authority (WASA)	1992, 1996-1997, 2002, 2004, 2011	Infrastructure engineering. Maseru Water Supply Phase I and II, Water sector improvement project, and Five towns water supply
Basotho Enterprise Development Corporation (BEDCO)	1993	BEDCO loan
Co-operative Lesotho Limited	1997	Co-operative Lesotho Limited project
Lesotho Electricity Corporation (LEC)	1998-1999, 2002, and 2009	LEC payment to ESKOM[11], Electricity development fund, Electricity supply (Nien Hsing), and LEC
Lesotho Flour Mills	1998	Long term working capital Flour Mills
Maluti Highlands Abattoir (MHA)	1999	Rehabilitation of MHA
Telecom Lesotho	2000, 2008, and 2011	Telecommunication line to Mohale Dam, Replacement of Sebaboleng exchange, Replacement of Maseru Pentex Morija, and Telecom national
Imperial Fleet Services (IFS)	2000	Loan capital to IFS

Source: (Ministry of Finance, 2018; Lesotho Privatisation Unit, 2002)

During the early years from 1982 until 1999, the public debt stock averaged 48.2 percent of GDP mainly driven by concessional external debt (92.1 percent), of which multilateral creditors took more than 85percent. Since 1982 until 1997, fluctuations in the primary fiscal balance were not worrisome as most years were in surpluses with exception of 1987 and 1988 whose high spending led to the first credit agreement between the IMF and the Government. With the aim of improving economic activity and balance of payments, the Government continued to engage on a series of IMF's[12]' structural adjustments. Table 3 gives details of loans from the IMF. The first credit, the Structural Adjustment Facility, was approved during the fiscal year 1988/89 to the tune of SDR3.0 million or an equivalent of M10.05 million[13]. The most recent loan (Extended Credit Facility) was approved in 2010/11 and was disbursed for three (3) years. This loan was triggered by the aftermath of the 2008 global financial crisis whereby the fall in SACU receipts put a downward pressure on net international reserves (IMF, 2016; Foulo and Grafton, 1998).

[11] ESKOM – combines abbreviations from both English name (Electricity Supply Commission) and its translation in Afrikaans.
[12] The IMF's Government Finance Statistics framework classifies the loans from the IMF as on-lent loans from the Central Bank to the Ministry of Finance. They form part of domestic loans.
[13] Loans were approved in Special Drawing Rights and the conversion using 'end of period' exchange rate has been used (Ministry of Finance, 2018).

Table 3: List of Loans by the IMF from 1988 to 2011 in Maloti Million

Date of Approval	Program Name	Amount approved (or CUD*)	Amount disbursed	Disbursement Period
1988/1989	Structural Adjustment Facility	10.05	10.05	1-year
1989/1990	Structural Adjustment Facility	15.51	15.51	1-year
1990/1991	Structural Adjustment Facility	11.76	11.76	1-year
1991/1992	Enhanced Structural Adjustment Facility	18.90	18.90	1-year
1992/1993	Enhanced Structural Adjustment Facility	28.07	28.07	1-year
1993/1994	Enhanced Structural Adjustment Facility	39.25	39.25	1-year
1994/1995	Enhanced Structural Adjustment Facility	45.60	0.00	1-year
1995/1996	Stand-By Credit Facility	45.28	0.00	1-year
1996/1997	Stand-By Credit Facility	47.45	0.00	1-year
2000/2001	Poverty Reduction and Growth Facility	364.58	364.58	3-year
2010/2011	Extended Credit Facility	763.20	628.96	3-year

Source: (IMF, 1988 - 2011)

* CUD = committed undisbursed debt

From 2000 until 2018, public debt registered an average of 40.6 percent, which has accumulated as a result of, among other drivers, the IMF's structural adjustments and Loti depreciation against major foreign currencies in which external public debt was denominated. Apart from exchange rate depreciation, other drivers of debt accumulation included two (2) big projects, the LHWP and the privatisation of state enterprises project. Much spending in relation to privatisation was incurred towards the remuneration of the affected employees and buying of shareholding. During the same period, the primary balance registered huge deficits. Given this relationship, the fiscal policy in Lesotho has influenced the stock of public debt in some years. In 1998 and 1999, the primary deficit registered 11.9 percent of GDP and 16.1 percent of GDP, respectively. The deficit was mainly driven by a significant fall in revenues and high spending on 1998 political unrest (among other things). The revenue fell by 2.3 percent annually in those years while spending increased by 27.8 percent and 7.6 percent, respectively. In 2001, the adverse effect of exchange rate (mainly US Dollar to Loti) on the external public debt significantly increased the outstanding stock of public debt to 104.6 percent of GDP. Similarly, the primary balance consistently registered a deficit from 2009 to 2011 reaching a peak of 8.8 percent in 2011. This deficit was due to the fall in SACU receipts, following the aftermath of 2008 global financial crisis.

Furthermore, the country's creditworthiness has been volatile, recording negative, stable or positive outlook since the beginning of its rating period in 2002 by the Fitch Ratings Agency. A full list of credit ratings from 2002 to 2018 by the Fitch Ratings Agency is shown under Table 4. The credit rating in terms of long-term local currency (LTLC) was

assigned to BB in 2002 and B+ for long term foreign currency (LTFC), and their outlook was assigned to be stable. These ratings were due to sound macroeconomic environment as reflected by robust performance of the SACU receipts, strong economic growth and strong export-led growth (Fitch Ratings Agency, 2002-2019). However, the country was downgraded twice in terms of LTLC, in September 2006 and in July 2011. This was due to, among other factors, the drastic fall in the SACU receipts from 2006 and the uncertainty to the fiscal policy environment due to the then upcoming national elections in 2012 (Fitch Ratings Agency, 2002-2019).

Table 4: Fitch's Credit Ratings for Lesotho from 2002 - 2019

Date	Rating						Outlook on LTFC and LTLC		CMA Ceiling Lesotho position
	LT foreign currency		LT Local currency		ST Foreign currency				
02-Sep-02	assigned	B+	assigned	BB	assigned	B	assigned	stable	N/A
26-Sep-03	affirmed	B+	affirmed	BB	affirmed	B	changed	positive	N/A
30-Nov-04	upgraded	BB-	upgraded	BB+	affirmed	B	revised	stable	N/A
04-Nov-05	affirmed	BB-	affirmed	BB+	affirmed	B	assigned	negative	N/A
18-Sep-06	affirmed	BB-	downgraded	BB-	affirmed	B	revised	stable	N/A
19-Aug-07	affirmed	BB-	affirmed	BB	affirmed	B	assigned	stable	A
19-Nov-08	affirmed	BB-	affirmed	BB	affirmed	B	assigned	stable	A
31-May-11	affirmed	BB-	affirmed	BB	affirmed	B	revised	negative	A
01-Jul-11	affirmed	BB-	affirmed	BB	affirmed	B	downgraded	negative	A
22-May-12	affirmed	BB-	affirmed	BB	affirmed	B	assigned	negative	A
20-May-13	affirmed	BB-	affirmed	BB	affirmed	B	revised	stable	A-
18-Nov-13 to 24-Apr-15	affirmed	BB-	affirmed	BB	affirmed	B	affirmed	stable	A-
23-Oct-15	affirmed	BB-	affirmed	BB	affirmed	B	revised	negative	A-
04-Dec-15	affirmed	BB-	affirmed	BB	affirmed	B	affirmed	negative	**A-**
22-Apr-16 to 24-Aug-18	affirmed	B+	affirmed	BB-	affirmed	B	affirmed	stable	**A-**
19-Aug-19	affirmed	B	downgraded	B+	affirmed	B	affirmed	stable	**A-**

Source: (Fitch Ratings Agency, 2002-2019)

The most recent ratings during the review period was in 2019. This rating affirmed the LTFC at B, downgraded the LTLC to B+ and kept the short-term foreign currency unchanged at B. The outlook on LTFC and LTLC has remained stable. The key rating drivers included the unending political unrest and deterioration in fiscal balance to a deficit of 4.3 percent in 2018/19. The deterioration emanated from the projected decline in the SACU receipts and subsequently the accumulation of debt liabilities coupled with the fall in deposits that were used to finance the deficit (Fitch Ratings Agency, 2002-2019). Other debt ratings such as the IMF debt sustainability analysis (DSA) conclude that Lesotho was

at moderate risk of debt distress between 2007[14] and 2017 and low risk of debt distress, afterwards. However, this rating was revised back to moderate risk of debt distress as a result of, among others, an increase in the level of public debt and high fiscal deficits (IMF and International Development Association, 2007; IMF and the World Bank, 2019).

[14] The DSA of the IMF that worked jointly with the World Bank was first introduced in 2006 and Lesotho's first DSA report was produced on annual basis starting from 2007.

CHAPTER 3

LITERATURE REVIEW

3.1 Introduction

This chapter discusses theoretical and empirical literature on fiscal policy and debt feedback on which this study revolves. The chapter begins by presenting fiscal policy theories and models of government budget constraint. It also provides evidence of fiscal policy shocks from both developed and developing countries where the SVAR and SVEC models were applied.

3.2 Theoretical Literature

Fiscal policy is an important tool that is used by governments to promote macroeconomic stability during economic recession (Boiciuc, 2015). The New Keynesian theory shows that the increase in government expenditure and a decrease in taxes stimulate the aggregate demand and boost the economy out of depression (Gujarati, 2004). However, the neoclassical regards such theory as budget burden on future generation since accumulation of government deficit requires debt financing. The literature then offers different views on the economic effects of public debt on macroeconomic variables. Studies indicate that government debt stimulates aggregate demand and economic growth in the short run but crowds out capital and reduces national income in the long run (Elmendorf and Mankiw, 1998). Papadamou and Tzivinikos (2017) point that the continuous growth in debt will force governments to implement fiscal stimulus and austerity measures that will stabilise the debt. However, if fiscal surpluses (more specifically, the primary surpluses – non-interest budget balance) exhibit a positive correlation to changes in debt-to-GDP ratio, it means that the government is making some adjustments to raise revenue or reduce non-interest outlays. Such behaviour is expected to counteract the debt dynamics. As highlighted by Bohn (1998), the country can be said to have sustained its debt-to-GDP ratio if fiscal policy changes would satisfy the government intertemporal budget constraint. Such behavior reflects the Keynesian effects of fiscal policy shocks.

Furthermore, if primary surpluses and debt-to-GDP ratio exhibit a non-linear relationship, contractionary fiscal policy may turn out to be expansionary thereby reflecting a Ricardian Equivalence within a non-Keynesian effect (Ilzetzki, 2011). The Ricardian Equivalence highlights that, given an assumption of rational expectations, the decrease in government expenditure during high levels of debt will lead to consumers saving more money for future tax hikes and thus reflecting no increase in consumption and aggregate demand in the short run. However, the non-Keynesian further postulates that the long run interest rate is therefore expected to rise due to existence of high levels of debt and thus discouraging investors' spending. In this scenario, private consumption will eventually increase and in turn expands aggregate demand. The growth in aggregate demand and increase in inflation due to the expansionary effects will reduce the ratio of debt-to-GDP. The reduction in this

ratio will depend on the magnitude of autonomous components of debt, real interest rate and GDP growth rate. The debt-to-GDP ratio will fall if real interest rate is less than GDP growth rate and vice versa (Ilzetzki, 2011). In the case where real interest rate is greater than GDP growth rate, very large primary surpluses over time will be required to stabilise debt levels by putting them into a declining path towards the established threshold[15] (Favero and Giavazzi, 2007). This process satisfies the government intertemporal budget constraint.

Romer (2012) shows that the government budget constraint is satisfied if a set of policies affect either future government revenue or future government expenditure. In this case, the government will have to choose whether to increase future taxes or reduce future expenditure in order to have enough revenue to service the debt. Romer (2012) also states that there are different models in which the government budget constraint applies including the Ramsey model, the Diamond overlapping-generations model, the Ricardian Equivalence (referring to it as a baseline model), the tax-smoothing model, and other models. Following the Ramsey model, the government budget constraint is satisfied if the real rate of interest is greater than the economic growth rate such that the present value of government debt is either positive or constant over time, and hence, its limit cannot be positive. Thus, a positive debt implies that the outstanding stock of debt is declining as more future primary surpluses are produced.

However, under certain circumstances, the government budget constraint is not always satisfied. This situation happens if the future real rate of interest on debt is less than the future economic growth rate, the government current spending does not affect future primary deficits, or the government debt is increasing over time and the government just decides to ignore the situation. These conditions apply in the case where the government decides to run the Ponzi scheme[16] that is explained by the Diamond overlapping-generations model. Under this model where the economy is dynamically efficient, agents run surpluses such that their spending is always less than their income over time. Given the Diamond approach on accumulating surpluses, the Ricardian equivalence model also emphasises that, the government budget constraint does not have to be satisfied since the households' perception about the future taxes on bonds are catered for by the bond repayments including the interest receipts on bonds. The Ricardian view takes the assumption of the Ramsey-Cass-Koopmans model that the household's consumption cannot exceed a total of its savings and the initial debt stock. Thus, the household accumulates more savings over time that are in turn used to finance government deficits,

[15] The SADC threshold for debt-to-GDP ratio is 60 percent (Southern African Development Community, 2001).

[16] Ponzi scheme refers to the people who, as the economy booms, saves their money and never withdraw from savings until the retirement age thereby allowing government to borrow those savings. The government can refinance the debt by rolling it over and over as the refinancing risk is very low, that is, the interest rate does not increase (Romer, 2012).

and the corresponding debt is never amortised by the government. This implies that there is no need for the government to impose policy decisions that will affect the future of fiscal policy.

Alternatively, the tax-smoothing model, developed by Barro (1979), depicts the distortions related to tax or revenue collection that need to be minimised in order to satisfy government budget constraint. If the path of the government expenditure is certain, the government budget constraint is not affected since the distortion costs are minimised by the smooth tax rate. Similarly, in the case of uncertainty regarding this path, given the need for the government to minimise the costs related to tax distortions, the government budget constraint is again not affected since the tax rate is a random walk. However, issuance of contingent debt may lead to high inflation in the long run when the government expenditure is increased or vice versa, and thus, affecting government intertemporal budget constraint and the Ricardian equivalence does not hold.

However, the Ricardian equivalence exists when expansionary fiscal policy does not affect aggregate demand. This situation, in which government purchases are exogenously determined, happens when the amount of tax cut results in the exact amount of future tax payments. On the contrary, in the case where the government purchases are endogenous, contractionary fiscal policy turns out to be expansionary. Thus, a small rise in tax may lead to large fall in the expected government expenditure such that households' consumption increases, and hence, an expansion of aggregate demand. Under both assumptions, the government intertemporal budget constraint is therefore satisfied.

Based on the model by Persson and Svensson (1989), debt accumulation may be induced by the fact that future government spending declines as more government debt is incurred over time following the winning decisions of one group of policymakers over the other. This means, as per Barro's model, that for a given level of debt, there are higher levels of government expenditure than their counterpart tax levels. However, the model by Tabellini and Alesina (1990) portrays that both behaviour of policymakers' groups may expand government debt over time, particularly external debt. Both models satisfy government intertemporal budget constraint as the Ricardian Equivalence fails.

3.3 Empirical Literature

The literature has also provided empirical evidence regarding the effects of fiscal policy shocks using SVAR (with or without debt feedback) and SVEC models. Tables 5 and 6 provide details of these studies from developed and developing economies, respectively, by showing the countries of interest, year of publication for each study, the authors of the papers, type of the model used in the autoregressive family, data periodicity and list of variables used to run the model. An emphasis has been put on the macroeconomic variables that have been affected by government expenditure, government revenue and government debt which include GDP, inflation and interest payments, amongst others.

3.3.1 Effects of Fiscal Policy Shock in Developed Economies

Studies using SVAR and SVEC models to analyse the effects of fiscal policy shocks in developed countries show different depending on the use of sampling frequency, variables, number of countries as shown in Table 5. For instance, with the use of Australian data under the SVAR and the SVEC models, Gunasinghe et al. (2019) found that GDP was not affected by either a positive shock to indirect tax or government expenditure. On the US study conducted by Favero and Giavazzi (2007) using SVAR with debt feedback, it was noticed that there was stability on fiscal policy. Thus, a positive shock to government expenditure was moderated by a rise in taxes over time and a significant growth in GDP. These findings are in line with Afonso and Sousa (2011) in their study of a panel of four countries (US, UK, Germany and Italy)[17] using the Bayesian SVAR with government debt in the model. They found that a positive shock to government spending was also moderated by increasing revenue while GDP increased marginally. The growth in GDP in both studies maintained a positive impact except for the difference in the magnitude of the effect. This behaviour depicts the Keynesian effect of fiscal policy and shows the importance of including debt in the model. However, Ravnik and Žilić (2011) observed a different result using Croatian data. In their research that used the SVAR without debt feedback, they concluded that a positive shock to government expenditure, apart from own positive response, did not impact on all variables since they all became insignificant. These results provide evidence of the importance of including debt in the model since the findings of this nature could be biased (Favero and Giavazzi, 2007).

Alternatively, Papadamou and Tzivinikos (2017), using the model with debt dynamics, found that a negative shock to government total expenditure (including recurrent and capital) and a positive shock to taxes increased tax contemporaneously and persistently in the case of Greece. They found that, GDP decreased marginally in the short run and then became insignificant while there was a significant fall in public debt over time. From the non-Keynesian theory, it is expected that a contractionary fiscal policy during high levels of debt will result into expansionary effects, but with Greece the findings are different from this theory. Greece experienced high levels of debt, which forced the government to implement severe austerity measures that impacted negatively on social cohesion. The authors have concluded that the effects were in line with Keynesian effects. Thus, the findings by Papadamou and Tzivinikos (2017) are similar to those of Favero and Giavazzi (2007) and Afonso and Sousa (2011). Furthermore, the effects of a rise in Government spending to interest rate in Favero and Giavazzi (2007) decreased persistently but declined marginally in the study conducted by Afonso and Sousa (2011). Similarly, in the Favero and Giavazzi (2007) study, inflation responded negatively on the impact and became insignificant over time whereas the impulse response functions (IRFs) under Afonso and Sousa (2011) reflected a positive response on the housing and stock prices. Thus, the

[17] Within this range, each country had a different data sample period

response of macroeconomic variables follows the path the government may decide to follow. Following the shock, the government may leave the debt-to-GDP ratio to grow or adjust taxes and spending in order to stabilise the debt path.

Furthermore, Favero and Giavazzi (2007) found that a positive shock to revenue under the model with government debt led to insignificant responses in GDP and inflation while interest rate increased. This conclusion is different from the IRFs of Ravnik and Žilić (2011). They found that expenditure and interest rate became insignificant, industrial production responded negatively in the short run, and inflation fell in the long run. With similar variables, Afonso and Sousa (2011) noticed that the response of interest rate was different among the four (4) countries, but their inflation increased. Papadamou and Tzivinikos (2017) did not include interest rate and inflation in their model. Nevertheless, these findings show that interest rate, GDP, and inflation in developed countries are responsive to the effects of fiscal policy shocks when debt is included in the model.

3.3.2 Effects of Fiscal Policy Shocks in Developing Economies

Table 6 displays similar studies on the effects of fiscal policy shocks on macroeconomic variables in developing countries that have been undertaken. In the case of Ethiopia, Barassa (2015) conducted SVAR model including debt dynamics. The IRFs, when government expenditure was increased, reflected a positive impact on taxes, GDP and inflation. This study therefore concluded that the fiscal policy in Ethiopia followed the Keynesian effect of fiscal policy. Other studies that produced similar results included Restrepo and Rincón (2012)[18] when using Chile data, and Akpan and Atan (2015) for Nigeria data. Chile and Nigeria studies did not include debt feedback in the model but Chile study also ran the SVEC model. Thus, a positive relationship between the government expenditure and GDP revealed a sustainability in the fiscal policy (Restrepo and Rincón, 2012). Apart from Barassa (2015), other studies did not put the government debt in the model. Contrary to these three (3) studies, Restrepo and Rincón (2012) on Columbia data using the SVAR model found that a positive shock to government expenditure caused GDP to increase marginally and persistently while taxes were insignificant. They therefore included error correction which revealed better SVEC model results on taxes while GDP remained statistically insignificant. With the use of the SVEC model on South African data, Jooste, Liu and Naraidoo (2013) also found similar results where a positive shock to government expenditure increased GDP though its long run effect left GDP to increase at a decreasing rate as it approaches zero. In Lesotho and Brazil, Damane, Hlaahla and Seleteng (2018) and Holland, Marçal and Prince (2019), respectively, noticed that there was no impact on output gap and taxes. These insignificant results could either reflect lack of credible and stable fiscal policy or show some biasness since debt feedback was excluded in the models. The interest rate responded positively under Barassa (2015) but

[18] Restrepo and Rincón (2012) conducted a study on Columbia and Chile. Depending on the availability of data, each country had a different data sample period

insignificantly in the study conducted by Damane, Hlaahla and Seleteng (2018). As a result, it produced a weak stabilising effect as pointed out by Barassa (2015). Moreover, inflation responded positively in the short run in both studies.

Furthermore, expenditure produced mixed results in response to a positive shock to revenue. Restrepo and Rincón (2012) and Akpan and Atan (2015) found that it was insignificant, while Barassa (2015) and Damane, Hlaahla and Seleteng (2018) noticed mixed results and positive response, respectively. GDP and interest rate were concluded to be insignificant in the studies of Columbia and Lesotho, GDP increased while interest rate was insignificant in Nigerian research, but both variables decreased with Ethiopian data (Restrepo and Rincón, 2012; Barassa, 2015; Akpan and Atan, 2015; Damane, Hlaahla and Seleteng, 2018; Jooste, Liu and Naraidoo, 2013). Moreover, Barassa (2015) and Damane, Hlaahla and Seleteng (2018) reported a positive response of inflation in the medium term to increases in revenue yet it remained insignificant in the studies by Restrepo and Rincón (2012) and Akpan and Atan (2015). However, an increase in both expenditure and revenue resulted in the rising debt-to-GDP ratio over time in the study by (Barassa, 2015). Thus, exclusion of debt dynamics in the model produced biased results.

In summary, with respect to the non-Keynesian effect of fiscal policy, some studies (Akpan and Atan, 2015) that excluded debt feedback in the model have shown that a positive shock to taxes produced a positive response on GDP while others (Favero and Giavazzi, 2007; Restrepo and Rincón, 2012 and Damane, Hlaahla and Seleteng, 2018) recorded insignificant responses on GDP. The Keynesian effect was analysed by Afonso and Sousa (2011), Restrepo and Rincón (2012) and Jooste, Liu and Naraidoo (2013). The findings from these studies differ from each other since the responses of fiscal policy shocks depends on the path the governments want to follow. Some governments implement fiscal adjustments with the aim of stabilising the ratio of debt-to-GDP while others allow automatic debt stabilisers to take place.

Table 5: Summary of Empirical Results on Selected Variables for Developed

Countries	Year of study	Author	Model used	Data periodicity	Variables	Empirical Results
Developed Economies						
US	**2007**	**Favero and Giavazzi**	SVAR	1950:1 – 2006:2	government expenditure, government revenue, GDP, inflation, interest payments, and government debt	• Increase in government expenditure: Taxes increase over time, GDP increases significantly, interest payments decrease persistently, while prices fall initially and then become insignificant • Increase in government revenue: government expenditure falls over time, interest payments increase, GDP and inflation become insignificant
US, UK, Germany and Italy	**2011**	**Afonso and Sousa**	Bayesian SVAR	1964:2 to 2007:4	government revenue, government expenditure, exchange rate, private investment, monetary growth rate, stock prices, GDP, GDP deflator, interest rate, profits, wages, private consumption, housing price index, and government debt	• Increase in government expenditure: Taxes increase persistently, GDP increases marginally, consumption slightly increases, investment falls, interest rate falls marginally, housing persistently increase, stock prices rise marginally • Increase in government revenue: GDP persistently falls, consumption falls, investment becomes insignificant and prices slightly increase, interest rate differs between countries (ie US and UK rises)
Croatia	**2011**	**Ravnik and Žilić**	SVAR	2001:01 to 2009:12	government budgetary revenues, government budgetary expenditures, industrial production (proxy for GDP), inflation and short-term interest rate	• Expenditure positive shock: taxes, Industrial production, inflation and interest rate remain insignificant • Revenue positive shock: Expenditure and interest rate become insignificant, industrial production responds negatively in the short term, inflation decreases in the long term
Greece	**2017**	**Papadamou and Tzivinikos**	SVAR	2000:3 to 2014:2	government spending – disaggregated into recurrent and capital, government revenues, GDP, number of unemployed and government debt	• Decrease in total spending (recurrent and capital) and increase in tax: taxes increase over time, GDP decreases significantly in the medium term, public debt responds insignificantly on the impact and fell significantly over time • Decrease in recurrent spending and increase in tax: taxes increase in the short term but not persistently, GDP decrease marginally on the impact, public debt falls marginally in the medium term and responds insignificantly over time • Increase in capital spending and increase in capital tax: taxes increase marginally in the short term, GDP and debt respond insignificantly on the impact, decrease marginally in the medium term and the become insignificant in the long run
Australia	**2019**	**Gunasinghe et al**	SVAR and SVEC	1965–2014	indirect tax, government expenditure, real GDP, Gini index, world output, real exchange rate, and others	• Increase in indirect tax: real GDP remains statistically insignificant under SVAR and SVEC • Increase in government expenditure: real GDP respond insignificantly in both models

Source: Author compilation

Table 6: Summary of Empirical Results on Selected Variables for Developing Countries

Countries	Year of study	Author	Model used	Data periodicity	Variables	Empirical Results
Developing Economies						
Chile and Columbia	**2006**	**Restrepo and Rincón**	SVAR and SVEC	1989:1 - 2005:4	GDP, terms of trade, net taxes, and public spending	*Chile:* 1. SVAR -Increase in government expenditure: taxes and GDP increase in the short run; SVEC – GDP responded positively but marginally 2. Increase in taxes: GDP decrease in the short term, and expenditure responds insignificantly *Columbia:* 1. Increase in government expenditure: SVAR - GDP increases persistently, and taxes respond insignificantly; SVEC – GDP does not respond 2. Increase in taxes: SVAR - all variables respond insignificantly, SVEC – government expenditure increases, but GDP remains constant
South Africa	**2013**	**Jooste, Liu and Naraidoo**	DSGE, SVEC, TVP-VAR	1970:1 – 2010:4	government expenditure, taxes, GDP, interest rates on debt, CPI, household consumption	• rise in expenditure: taxes, interest rate, GDP and household consumption increase but a rise in GDP remains constant over time • rise in taxes: GDP falls
Ethiopia	**2015**	**Barassa**	SVAR	1999/00:1 – 2012/13:4	government expenditure, government revenue, real gross domestic product, public debt, inflation, interest rate and nominal exchange rate, and government debt	• Increase in government expenditure: taxes increase in the long run, GDP increases in the short run, medium and long run but not persistently, prices increase in the short run, and interest rate increases in the medium term • Increase in revenue: expenditure produces mixed results, GDP and interest rate decrease in the medium term, prices increase in the medium term • Increase in expenditure and revenue: debt-to-GDP ratio increases over time
Nigeria	**2015**	**Akpan and Atan**	SVAR	1980:1 - 2010:4	government consumption expenditure real output, inflation rate, real interest rates and private investment	• Increase in capital spending: GDP and inflation increase in the medium term • Increase in economic services: All variables become insignificant • Increase in oil revenue: capital expenditure remains insignificant, GDP increases, while inflation and interest rate respond insignificantly
Lesotho	**2018**	**Damane, Hlaahla and Seleteng**	SVAR	1982 - 2015	government expenditure, output gap, consumer price index, government revenue, interest rate spread, public gross fixed capital formation, and private gross fixed capital formation	• Increase in government expenditure: consumer price index only increases in the short term but insignificant over time, taxes, GDP and interest rate remain insignificant • Increase in government revenue: expenditure and inflation increase in the medium term while GDP and interest rate respond insignificantly
Brazil	**2019**	**Holland, Marcal and Prince**	SVAR and TVAR	1997 - 2018	net tax revenue, government spending, real GDP growth, inflation rate, and the money market interest rate	• 3 variables (tax, spending and GDP) - GDP not affected by increase in government spending did not affect real • 5 variables - increase in government spending raised real GDP contemporaneously and then remained statistically insignificant over time

Source: Author compilation

3.4 Synthesis of the Literature

Studies indicate that the effects of the fiscal shock on other macroeconomic variables using SVAR and SVEC models are likely to differ depending on the path that the government chooses. Meaning there is a link between fiscal policy shocks and other macroeconomic variables including debt. However, if the debt dynamics are excluded from the analysis of fiscal policy shocks on other macroeconomic variables, the regression results will be mis-specified (Favero and Giavazzi, 2007). Most empirical studies have followed the identification method on fiscal policy that was established by Blanchard and Perotti (2002) and Perotti (2007). They have also used the variables of interest - GDP, inflation interest rates and debt - with exception from Papadamou and Tzivinikos (2017) who excluded inflation and interest payments.

Comparing the empirical results of the model without debt feedback to the responses of the model with debt feedback, the heterogeneity of the IRFs is realised. The responses of variables in the model without debt feedback are therefore found to be in line with non-Keynesian effects of fiscal policy shock. Furthermore, under developed economies, the contractionary fiscal policy adopted through recurrent spending cuts produces significant contractionary effects, as GDP declines marginally and debt levels decrease significantly. The expansionary fiscal policy in developing economies also shows expansionary effects. However, Damane, Hlaahla and Seleteng (2018) found shocks to fiscal policy in not affect GDP and might be as a result of the not incorporating debt dynamics in the SVAR model. . It may also be due to the less comprehensive identification scheme that did not include, among others, the automatic response of tax revenue to economic output. They only considered short run relationship between endogenous variables without considering their long run behavior due to existence of cointegration.

CHAPTER 4

METHODOLOGY

4.1 Introduction

This chapter describes the data and the models that are used in addressing the research objectives. It also discusses diagnostic test issues of model checking and identification under model estimation.

4.2 Data

The paper uses the data of Lesotho for annual series from 1982 to 2018. The variables of main interest are real per capita budgetary central government (BCG) expenditure (including interest payments[19]), real per capita BCG revenue, real GDP per capita[20] and debt identity. However, the additional data on the following three variables are needed to calculate debt identity: public debt-to-GDP ratio[21], inflation, and real interest rate. The data on per capita real GDP (*rGDP*), BCG expenditure (*Gexp*) and revenue (*Grev*)[22], and inflation (*Inf*) are from the Central Bank of Lesotho (CBL) and the IMF's World Economic Outlook databases. The nominal interest rate (*Ir*)[23] and public debt (*D*) levels are collected from the debt system called the Commonwealth Secretariat Debt Recording and Management System of the CBL and IMF databases.

4.3 Model Specification

The literature identifies the dynamic effects of fiscal policy shocks using SVAR and SVEC models. This study follows the models applied by Blanchard and Perotti (2002) and Favero and Giavazzi (2007) on the identification strategy of the SVAR model and on the comparison between the computed impulse responses with inclusion of debt identity and those that excluded it, respectively. The paper also adopts an approach similar to that of Holland, Marçal and Prince (2019) and Ilzetzki (2011) on the development of identification scheme and the derivation of output elasticity of tax revenue. Given nonstationary time series of the endogenous variables, it also analyses the existence of cointegration between variables following the approach used by Jooste, Liu and Naraidoo (2013) and Gunasinghe et al. (2019).

4.3.1 SVAR Model without Debt Feedback

The study begins by estimating the following basic vector autoregressive (VAR) model presented in equation (1):

[19] However, interest payments are excluded from BCG expenditure when computing debt identity.
[20] All the real variables are in 2012 constant prices.
[21] The 'public debt-to-real GDP ratio' will also be referred to as 'public debt ratio' in this paper.
[22] The disaggregated data on the components of tax revenue to be used to calculate a proxy of output elasticity of government revenue are available from 1993.
[23] It is derived by dividing net nominal interest payments by gross public debt liabilities.

$$X_t = \sum_{i=1}^{s} G_i X_{t-i} + \varepsilon_t \quad (1)$$

where X_t is a (3x1) vector of endogenous variables (*Grev*, *rGDP*, and *Gexp*) observed at time t; G_i is a matrix of coefficients to be estimated; ε is a (3x1) vector of serially uncorrelated system innovations; and s is the optimal lag length.

The reduced-form residuals ε_t that reflect the linear combination of the structural shocks u_t can be written as follows:

$$A\varepsilon_t = Bu_t \quad (2)$$

where the contemporaneous relationship between ε_t and u_t is presented by matrices *A* and *B*. The identification strategy requires imposing restrictions on matrices *A* and *B*. The matrix form of equation (2) can also be specified as follows:

$$\begin{bmatrix} 1 & -\alpha_{rGDP}^{Grev} & 0 \\ -\alpha_{21} & 1 & -\alpha_{23} \\ -\alpha_{31} & -\alpha_{rGDP}^{Gexp} & 1 \end{bmatrix} \begin{bmatrix} \varepsilon_t^{Grev} \\ \varepsilon_t^{rGDP} \\ \varepsilon_t^{Gexp} \end{bmatrix} = \begin{bmatrix} \beta_{11} & 0 & \beta_{Gexp}^{Grev} \\ 0 & \beta_{22} & 0 \\ 0 & 0 & \beta_{33} \end{bmatrix} \begin{bmatrix} u_t^{Grev} \\ u_t^{rGDP} \\ u_t^{Gexp} \end{bmatrix} \quad (3)$$

where $\varepsilon_t = \left[\varepsilon_t^{Grev}\ \varepsilon_t^{rGDP}\ \varepsilon_t^{Gexp}\right]'$ is described as residuals of the reduced form VAR, while the structural shocks are captured as $u_t = \left[u_t^{Grev}\ u_t^{rGDP}\ u_t^{Gexp}\right]'$. The parameters α_{rGDP}^{Grev} and α_{rGDP}^{Gexp} are the output elasticity of government revenue and expenditure, respectively. They give the automatic responses of government revenue and expenditure to real GDP. The contemporaneous response of government revenue to structural shocks due to government expenditure is estimated by β_{Gexp}^{Grev}. Just like in Holland, Marçal, and Prince (2019), it is assumed that the response of government expenditure to real GDP does not occur within a year, hence $\alpha_{rGDP}^{Gexp} = 0$. Furthermore, it is assumed that the Government of Lesotho does not consider the revenue collection measures before making spending decisions, and as a result, $\beta_{Gexp}^{Grev} = 0$. Using the information in Table 12 in the Appendix, the average output elasticity of tax revenue for Lesotho from 1993 to 2018 is found to be 0.47. It presumed that this output elasticity of tax revenue for Lesotho would not change significantly if it was to be calculated from 1982. It is further assumed that it is a good proxy for the output elasticity of government revenue (α_{rGDP}^{Grev}). This is because the major components of government revenue in Lesotho are tax revenue (accounted for 39.51 percent of total revenue over the period) and the SACU receipts (accounted for 44.31 percent of total revenue over the period) and these two (2) variables experienced a high correlation of 0.89 from 1992 to 2018. Furthermore, the economy of Lesotho highly depends on that of South Africa, whose performance also influences the SACU receipts.

Given that the 3 restrictions $\left(= \frac{k(k-1)}{2}\right)$, where $k = 3$ and it is the number of variables, have been identified (that is, $\alpha_{rGDP}^{Grev} = 0.47$, $\alpha_{rGDP}^{Gexp} = 0$, and $\beta_{Gexp}^{Grev} = 0$), the remaining 6 $\left(= \frac{k(k+1)}{2}\right)$ to be estimated in matrix *A* (the α's) and *B* (the β's) in equation (3) are to be estimated through recursive scheme.

4.3.2 SVAR Model with Debt Feedback

Equation (4) represents the alternative VAR model but with debt accumulation included in the model as D_t,

$$X_t = \sum_{i=1}^{s} G_i X_{t-i} + \sum_{i=1}^{s} \lambda_i D_{t-i} + \varepsilon_t \quad (4)$$

where

$$D_t = \frac{(1+Ir_t)}{(1+Inf_t)(1+\Delta rGDP_t)} D_{t-1} + \frac{exp(Gexp_t) - exp(Grev_t)}{exp(rGDP_t)} \quad (5)$$

where *Gexp* in the debt identity excludes interest payments. The first set of debt identity on the right-hand side of equation (5) refers to the 'autonomous components of debt dynamics'. It is expected that an increase in inflation and/or real GDP growth rate will reduce public debt ratio while a rise in nominal interest rate will accumulate the public debt ratio. These 'automatic debt dynamics' are represented by λ_i in equation (4). The second set of the identity explains the 'debt-stabilising primary balance'. Thus, the higher the initial debt and the higher the difference between nominal interest rate and real growth rate, the higher the primary balance is required to stabilise the public debt ratio (IMF, 2010).

The inclusion of debt in equation (4) provides several benefits. First, during high levels of debt when the nominal interest rate is different from the real growth rate, the debt levels will be stabilised by a feedback of public debt ratio to fiscal policy shocks. Thus, more primary surpluses will be required to reduce debt levels when nominal interest rate is greater than real growth rate. Second, the effects of fiscal policy shocks on interest rate may change the path of debt. For instance, a rise in interest rate may move public debt ratio from its stable evolution[24] to an explosive trend (Favero and Giavazzi, 2007).

The SVAR identification assumptions made in the preceding sub-section are still valid since the inclusion of debt identity in equation (4) does not affect the number of shocks. Thus, the identified system from equation (3) can be represented as follows:

$$X_t = \sum_{i=1}^{s} G_i X_{t-i} + \sum_{i=1}^{s} \lambda_i D_{t-i} + A^{-1} B u_t \quad (6)$$

where matrices *A* and *B* represents the contemporaneous relationship between ε_t and u_t as specified in the previous sub-section.

4.3.3 SVEC Model

The existence of cointegration between endogenous variables is analysed within the vector error correction (VEC) model which is transformed into SVEC after identifying restrictions on the structural shocks; that is, imposing restrictions in the short run and long run matrices. The SVEC model is specified as follows:

[24] Debt is stable when its current level is equal to the previous year level.

$$\triangle X_t = \alpha\beta' X_{t-1} + \Gamma_1 \triangle X_{t-1} + \cdots + \Gamma_{p-1} \triangle X_{t-p-1} + B\varepsilon_t \quad (7)$$

$$u_t = B\varepsilon_t \quad (8)$$

where u_t, similar to the SVAR model, refers to structural innovations; α is a $(K x r)$ short run matrix with *K* denoting number of variables while cointegration rank with transitory effects is represented by r; B matrix measures long run relationship between variables; Γ_j depicts short run coefficient matrix; the reduced rank matrix is measured by $\prod = \alpha\beta'$, where β is the cointegrating matrix; X_t maintains the same definition and ordering as in the SVAR model.

After applying the Beveridge-Nelson decomposition, equation (7) becomes:

$$X_t = \Xi \sum_{i=1}^{t} u_i + \sum_{j=0}^{\infty} \Xi_j^* u_{i-j} + X_0^* \quad (9)$$

Thus, the common trends term (or long run effects of the shocks) is captured by the first part of equation (9), $\Xi \sum_{i=1}^{t} u_i$, and after substituting equation (8), the term becomes $\Xi B \sum_{i=1}^{t} \varepsilon_t$. Furthermore, Ξ_j^* is a reduced rank matrix and it converges to zero as j approaches infinity. Since *B* has to be nonsingular, the long run matrix can have at most r zero columns. To derive the just-identified SVEC model, the long run matrix requires $r\ (K - r)$ restrictions of which $\frac{1}{2}K(K-1) - r\ (K - r)$ restrictions are to be defined, while $\frac{r(r-1)}{2}$ restrictions are to be imposed on matrix *B*. The last column of matrix Ξ_j^* is set to zero because of its absolute summability.

In a case of three endogenous variables (*Grev*, *rGDP*, and *Gexp*) that are $I(1)$ (see Table 7 for the unit root test results), with one cointegrating relationship, that is $r = 1$ (see Table 10 for the cointegration test results), there will be one zero column in the long run matrix. Hence, it is assumed that *Gexp* has transitory shocks and at the same time its shock does not have an immediate impact on *rGDP*. Therefore, the matrices *B* (with 0 restrictions) and ΞB (with 2 restrictions) look like these:

$$\mathrm{B} = \begin{bmatrix} NA & NA & NA \\ NA & NA & NA \\ NA & NA & NA \end{bmatrix}, \quad \Xi B = \begin{bmatrix} NA & NA & 0 \\ NA & NA & 0 \\ NA & 0 & 0 \end{bmatrix} \quad (10)$$

4.4 Model Diagnostic Tests

The model variables are tested for stationarity using the Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) tests. The two (2) tests are used to establish whether the series are either stationary at their levels or their linear combination has cointegration relation, denoted by I(0), or stationary at their first difference, I(1). After ensuring stationarity of the variables, the Schwarz Information Criterion (SC), the Akaike Information Criterion (AIC) and/or the Wald lag-exclusion test are employed to determine the optimal lag length of the basic VAR model. Furthermore, a series of formal tests are undertaken to ensure that the

estimated VAR represents the data generation process adequately. These include tests for model instability (using the autoregressive roots table), residual autocorrelation, non-normality, conditional heteroskedasticity, and the Johansen cointegration test (in the case of SVEC). Lastly, the Cholesky factorisation is used on the reduced form errors to derive the structural innovations based on the imposed restrictions on SVAR while the Beveridge-Nelson decomposition is applied on SVEC. This paper then makes a comparison of the impulse response functions, forecast error variance decompositions, and historical decomposition that are developed under the SVAR without debt feedback and the one including the feedback. It also analyses the impulse response functions and the forecast error variance decomposition from the estimated SVEC model of endogenous variables.

CHAPTER 5

RESULTS

5.1 Introduction

This chapter presents the estimated results. First, the data series are tested for unit root. Second, the reduced-form VAR model without debt feedback including the one with debt dynamics are estimated. Third, the diagnostic tests on VAR residuals are performed. Fourth, the SVAR models are estimated based on restrictions that were imposed on matrices *A* and *B*. Fifth, the impulse response functions, forecast error variance decomposition, and historical decomposition are produced. Lastly, the SVEC model without debt feedback is estimated in order to analyse the cointegration in the variables, and the results from both models are compared.

5.2 Stationarity and Diagnostic Tests

The unit root test results on the main data series are presented in Table 7 while Figure 12 in the Appendix illustrates the trends of these variables both in levels and in first difference form. The *debt identity* is I(0) while *Gexp, Grev* and *rGDP* are I(1) with inclusion of an intercept and a trend. The diagnostic test results from the VAR models without and with debt feedback are reported in Tables 8 and 9. The lag order of one (1) is chosen by all information criteria including AIC (except SC with lag (0)) on both models and the stability condition is satisfied. The joint lag (1) of all coefficients is found to be significant when tested by the Wald lag-exclusion test. On the basis of the LM, normality and heteroscedasticity tests, the residuals from both models are found to be serially uncorrelated, normally distributed and homoscedastic, respectively. In the case of the Johansen cointegration test, the Trace test is significant implying that there is at most one cointegrating equation among endogenous variables (see Table 10).

Table 7: Stationarity Tests

Variable	Levels				Difference			
	ADF Statistic / t-Statistic		PP Statistic / t-Statistic		ADF Statistic		PP Statistic	
Gexp	-0.755187 (0.9606)	Intercept and linear trend	-0.356019 (0. 9856)	Intercept and linear trend	-4.930195* (0.0003)	Intercept	-1.898297** (0.0559)	None
Grev	-1.045365 (0.9244)	Intercept and linear trend	-1.044353 (0.9246)	Intercept and linear trend	-3.671261* (0.0091)	Intercept	-3.671287* (0.0091)	Intercept
rGDP	-3.429223** (0.0664)	Intercept and linear trend	-2.481451 (0.3348)	Intercept and linear trend	-7.094775* (0.0000)	Intercept	-3.466064* (0.0010)	None
Debt Identity	-2.742372** (0.0775)	Intercept	-3.865543* (0.0055)	Intercept	N/A			

Source: Author compilation
Note: The p-values are in parentheses. * refers to significance level at 1 percent and ** at 10 percent.

Table 8: Summary of Diagnostic Tests

	Without debt feedback		With debt feedback	
	Test Statistics	**p-value**	**Test Statistics**	**p-value**
Serial correlation (LM)	0.666856	0.7355	0.501288	0.8655
Normality (JB)	7.419886	0.2838	7.867044	0.2480
Heteroskedasticity (Chi-sq)	47.05041	0.1028	69.85768	0.8658
VAR stability	Satisfied		Satisfied	
VAR lag order (AIC)	AIC=1, SC=0		AIC=1, SC=0	

Source: Author compilation
Notes: LM is Lagrange Multiplier test; JB is Jacque-Bera; AIC is Akaike Information Criterion and Chi-sq is Chi-squared.

Table 9: Wald Lag-Exclusion Test Results

	Without debt feedback				With debt feedback			
	Grev	***rGDP***	***Gexp***	**Joint**	***Grev***	***rGDP***	***Gexp***	**Joint**
Lag 1 (Chi-squared)	46.03231 (0.0000)	17.49998 (0.0006)	14.17229 (0.0027)	71.57246 (0.0000)	43.40939 (0.0000)	17.72375 (0.0005)	15.36570 (0.0015)	72.07802 (0.0000)
Lag 2 (Chi-squared)	7.369668 (0.0610)	1.999332 (0.5725)	0.928898 (0.8184)	10.04301 (0.3470)	7.051907 (0.0703)	2.767936 (0.4288)	1.335135 (0.7208)	10.74290 (0.2937)

Source: Author compilation.
Notes: The p-values are in parentheses

Table 10: Johansen Cointegration Analysis

	Eigenvalue	Trace		Maximum Eigenvalue	
		Test Statistics	**p-value**	**Test Statistics**	**p-value**
None *	0.492485	37.20911	0.0058	23.73799	0.0210
At most 1	0.284543	13.47112	0.0986	11.71918	0.1216
At most 2	0.048823	1.751939	0.1856	1.751939	0.1856

Source: Author compilation
Note: Trace and Maximum Eigenvalue tests indicate that there is 1 cointegrating equation. * refers to rejection of the hypothesis at the 5 percent level.

5.3 The Impulse Response Analysis under SVAR

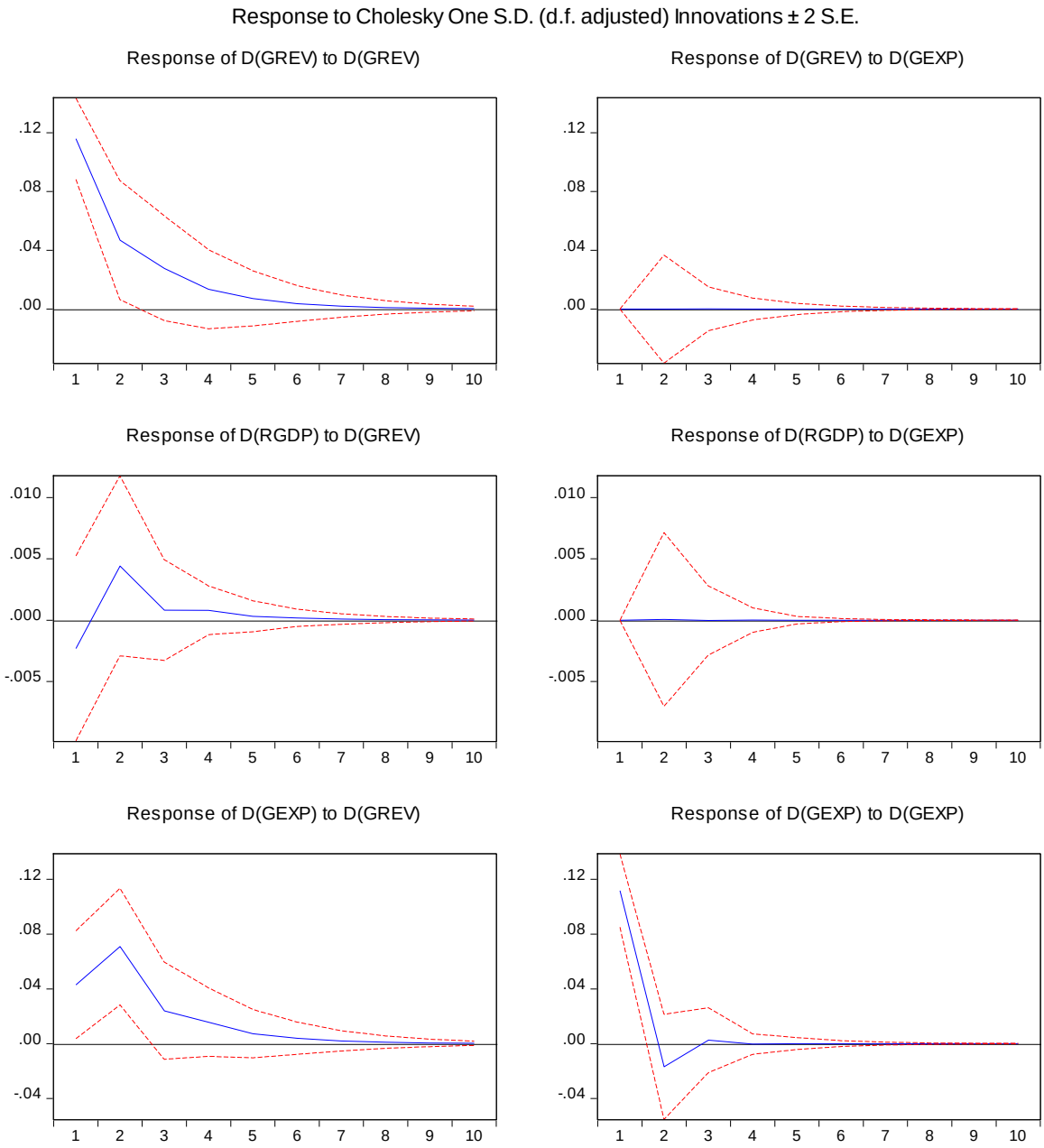
The output results for SVAR models without and with debt feedback are displayed in Table 13 in the Appendix and both models are just-identified. The estimated IRFs of variables to shocks to fiscal policy from these models are demonstrated in Figures 4 and 5, respectively. The response of a variable is statistically significant when boundaries appear on one side of the horizontal line where y-axis equals to zero (0). The first column of IRFs depicts the shocks to *Grev* while the second column displays responses of shocks to *Gexp*.

5.3.1 SVAR Model without Debt Feedback

In the SVAR model without debt feedback, the response of *Grev* to own positive shock of one (1) percent shows a contemporaneous increase of 11.60 percent. The *Grev* further increases by 4.68 percent in the second year and then became statistically insignificant over time. The same shock to *Grev* expands *Gexp* instantaneously at 4.30 percent up to the second year at a rise of 7.09 percent. It then remains statistically insignificant up to the end of the horizon period. The *rGDP* does not respond to a shock to *Grev*. Similarly, a one (1) percent positive shock to *Gexp* does not affect *Gexp* and *rGDP*, but *Gexp* responds

positively to own shock. It goes up instantaneously by 11.18 percent and then becomes statistically insignificant over time.

Figure 4: IRFs of Endogenous Variables in SVAR without Debt Feedback



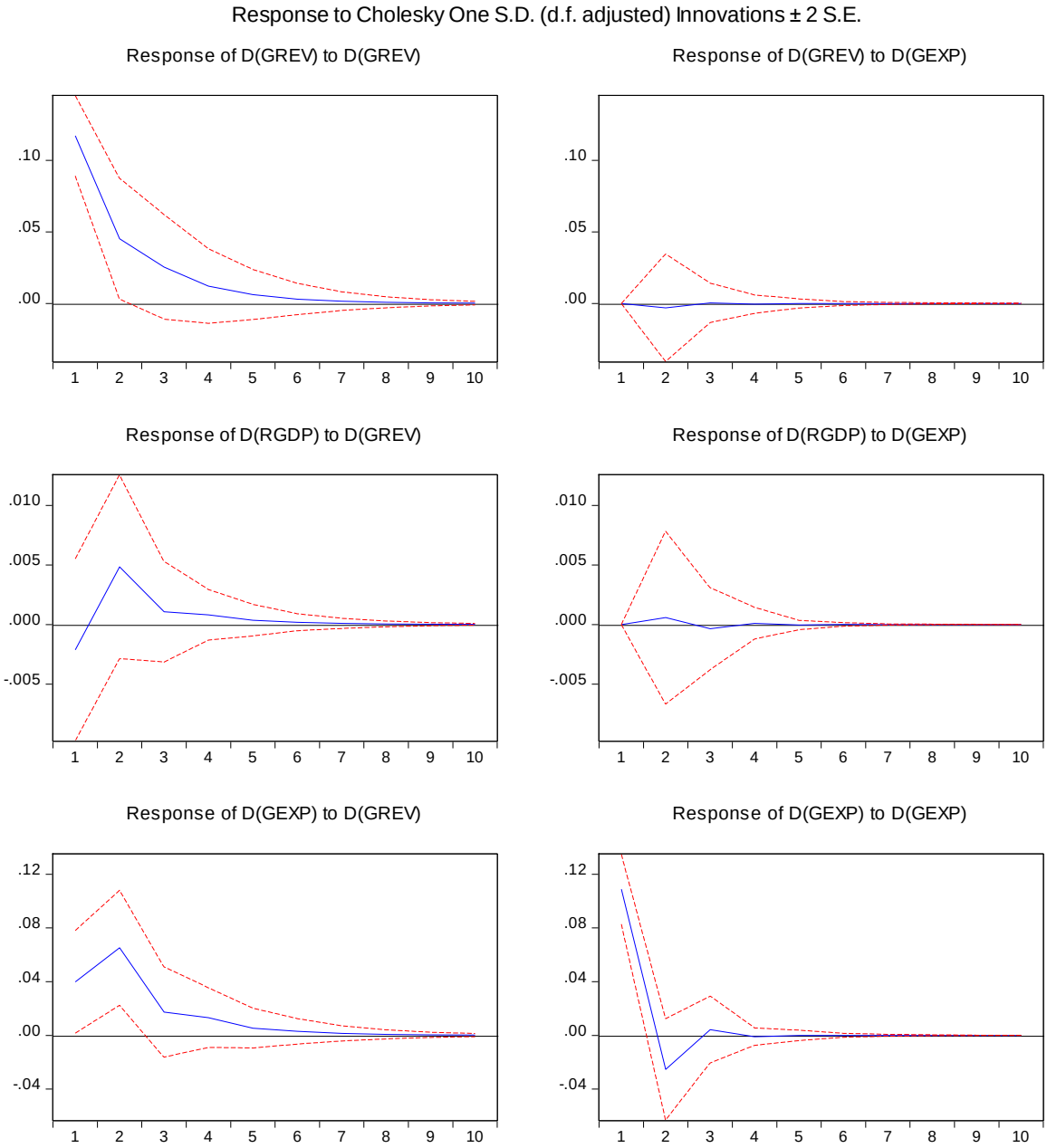
Source: Author compilation

5.3.2 SVAR Model with Debt Dynamics

Under the SVAR model with debt dynamics, *Grev* increases contemporaneously by 11.72 percent to own positive shock of one (1) percent and by 4.53 percent in the subsequent year. It then becomes statistically insignificant over the horizon period. Similarly, under the same shock, *Gexp* expands instantaneously by 3.99 percent, 6.53 percent in the second

year, and then remains statistically insignificant over time, while *rGDP* does not respond at all. Furthermore, a one (1) percent positive shock to *Gexp* does not affect both *Grev* and *rGDP*, but *Gexp* responds positively to own shock as it increases contemporaneously by 10.90 percent and then remains statistically insignificant over time. On average the responses in the SVAR model with debt dynamics are marginally higher in magnitude when compared to the ones in the other model without debt feedback.

Figure 5: IRFs of Endogenous Variables in SVAR with Debt Dynamics



Source: Author compilation

5.4 Variance and Historical Decomposition for SVAR Models

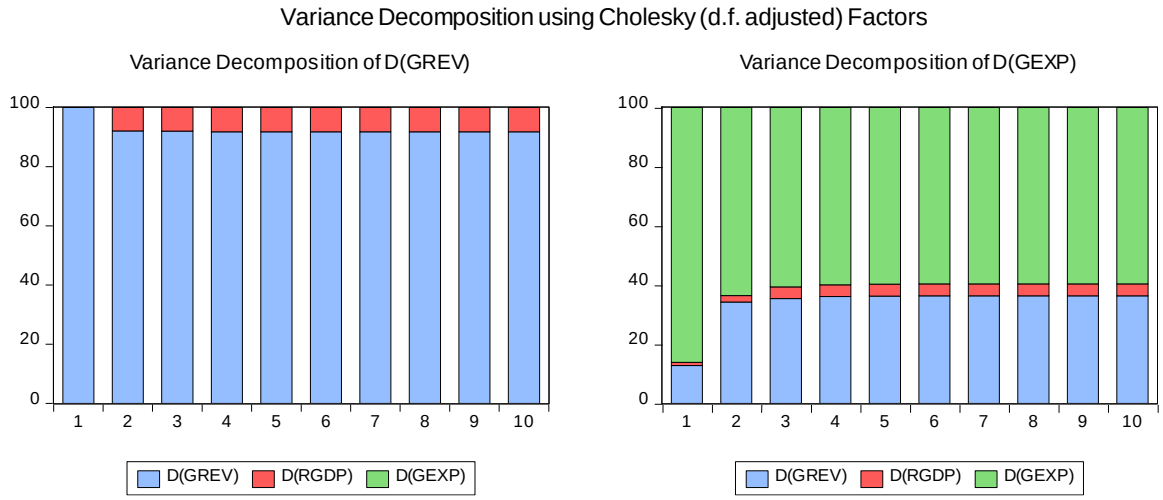
This section reports the forecast error variance decomposition (FEVD) and the historical decomposition with respect to innovations or shocks to fiscal policy. The analysis is conducted under the SVAR model without and with debt feedback over the 10-year horizon period for FEVD and from 1985 to 2018 for historical decomposition.

5.4.1 Forecast Error Variance Decomposition

The FEVD shows decomposition of forecast error variance of the endogenous variables depicting SVAR model without debt feedback in Figure 6 while Figure 7 shows the SVAR model with debt dynamics. The first column in each Figure illustrates the FEVD of *Grev* while the second column displays the FEVD of *Gexp*.

Under the SVAR model without debt feedback, the fluctuations in *Grev* variance are explained by 100.00 percent of its own innovations in the first year. In the second year, *Grev* explains own variance by 92.05 percent, followed by 7.95 percent that is caused by *rGDP*, and innovations emanating from *Gexp* were insignificant. In the medium to long term, in year 5, the fluctuations in the variance of *Grev* are largely caused by own shocks, then by innovations of *rGDP*, while those of *Gexp* were ineffective. Similarly, the fluctuations in variance of *Gexp* are described mostly by own shocks between 86.15 percent in the first year and 59.66 in the last year of the horizon period. The remaining variance (average of 33.63 percent) emanates mostly from *Grev*, whose contribution increases consistently over time, starting from the first year. The *rGDP* only explains marginal fluctuations, and then keeps an upward trend over the horizon period (average of 3.53 percent).

Figure 6: Variance Decomposition of *Gexp* and *Grev* – SVAR without debt dynamics

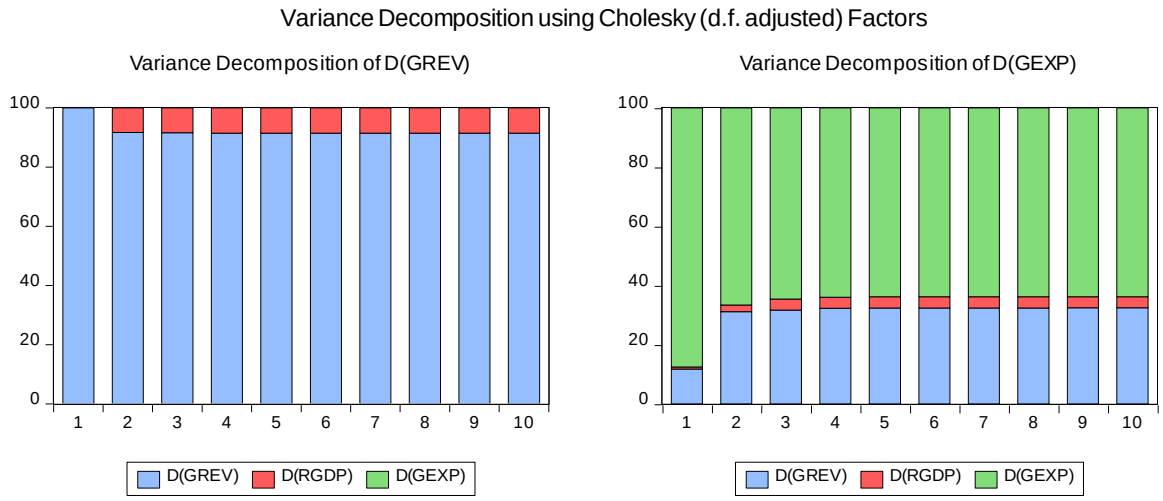


Source: Author compilation

Under SVAR model with debt dynamics, the variance of *Grev* is again explained mostly by own shocks, followed by *rGDP*, and *Gexp* coming at last. Thus, in the first year, no

other variable described the variance of *Grev* than its own shocks. Its own shock continues to explain most of its variance up to the end of the horizon period, ranging from 91.68 percent in second year, 91.42 percent in fifth year and 91.42 in the tenth year. Furthermore, the fluctuations in the variance of *Gexp* are largely explained by own shocks at 87.52 percent in the first year and remains high until the last year of the horizon period at 63.83 percent. Apart from *Gexp*'s own shocks, the *Grev* decribes most of the variance from the first year until the last year, averaging at 30.12 percent, while *rGDP* explains the least fluctuations at an average of 3.29 percent. In general, the SVAR model with debt dynamics exhibits narrow variance path than the model without debt feedback.

Figure 7: Variance Decomposition of *Gexp* and *Grev* – SVAR with debt feedback



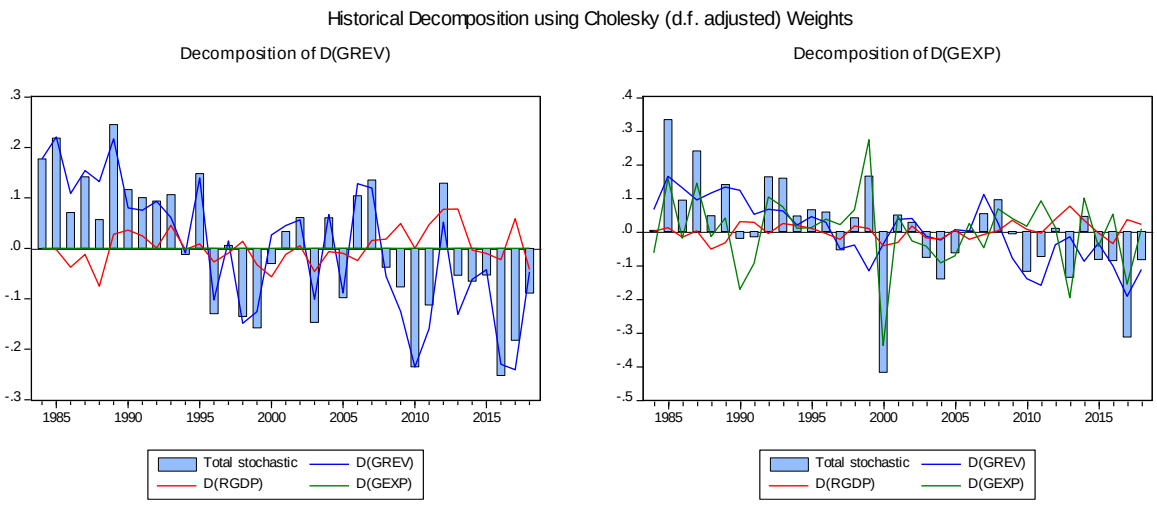
Source: Author compilation

5.4.2 Historical Decomposition

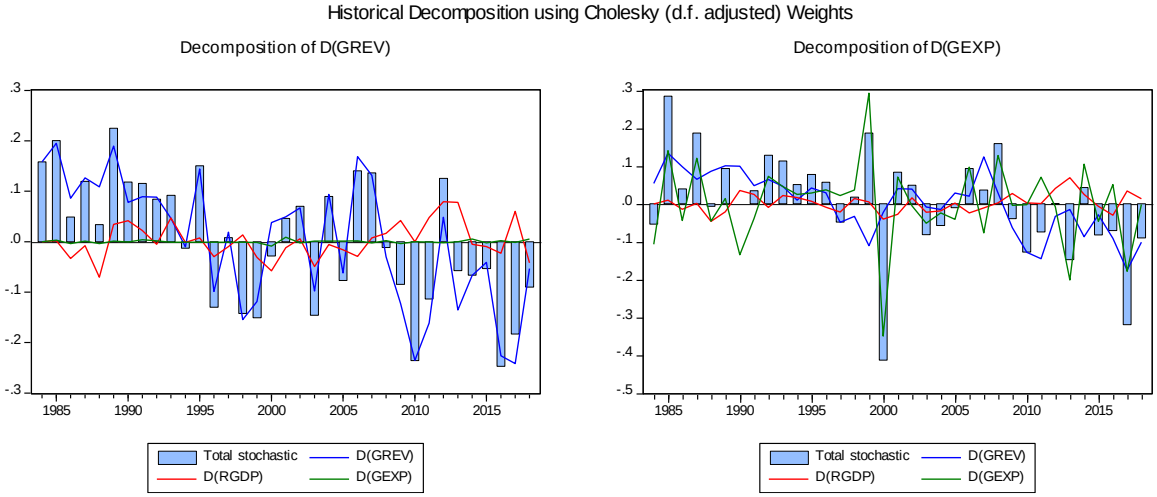
The historical decomposition, in Figure 8, represents variations of the endogenous variables that can be explained by variations in the structural shocks using SVAR model without debt feedback and SVAR model with debt dynamics. Based on the study by Kilian and Lütkepohl (2017) historical decomposition explains the path of each endogenous variable in relation to one or combined structural shocks. The historical decomposition of *Grev* is demonstrated in the first column while the second column illustrates the historical decomposition of *Gexp*.

Figure 8: Historical Decomposition of *Gexp* and *Grev*

SVAR model without debt feedback



SVAR model with debt dynamics



Source: Author compilation

Under the SVAR model without debt feedback, in 1989, much of the surge of 21.72 percent in *Grev* was mostly explained by effects of *rGDP* shocks followed by own shocks. In 2010, a fall of 23.55 percent in *Grev* was attributable to the effects of own shocks and partly by those of *rGDP*. Apart from historical decomposition of *Grev*, the path of *Gexp* was also explained by some structural shocks. In 2000, a significant fall of 42.66 percent in *Gexp* was mostly caused by the effects of own structural shocks and partly by those of *Grev*. The effects of r*GDP* shocks were statistically insignificant over the horizon period. Nevertheless, in the SVAR model with debt dynamics in 1989, an increase of 22.49 percent in *Grev* was mainly caused by own shocks and partly by the effects of *rGDP* shocks. In 2010, a decline of 23.58 percent in *Grev* was only explained by significant effects of own shocks. Under historical decomposition of *Gexp*, in 2000, it fell by 41.32 percent that was largely explained by own shocks and partly by shocks of *Grev* and *rGDP*. In 2017, a decline

in Gexp was emanated from the effects of the shocks of Grev and from own shocks, while rGDP was not statistical different from zero. The historical decomposition of *Grev* in both models exhibited rather similar results with exception of the magnitude of the variations of the endogenous variables. The magnitude of the effects of structural shocks on *Gexp* in the SVAR model without debt feedback were, on average, slightly larger than the effects in the other model.

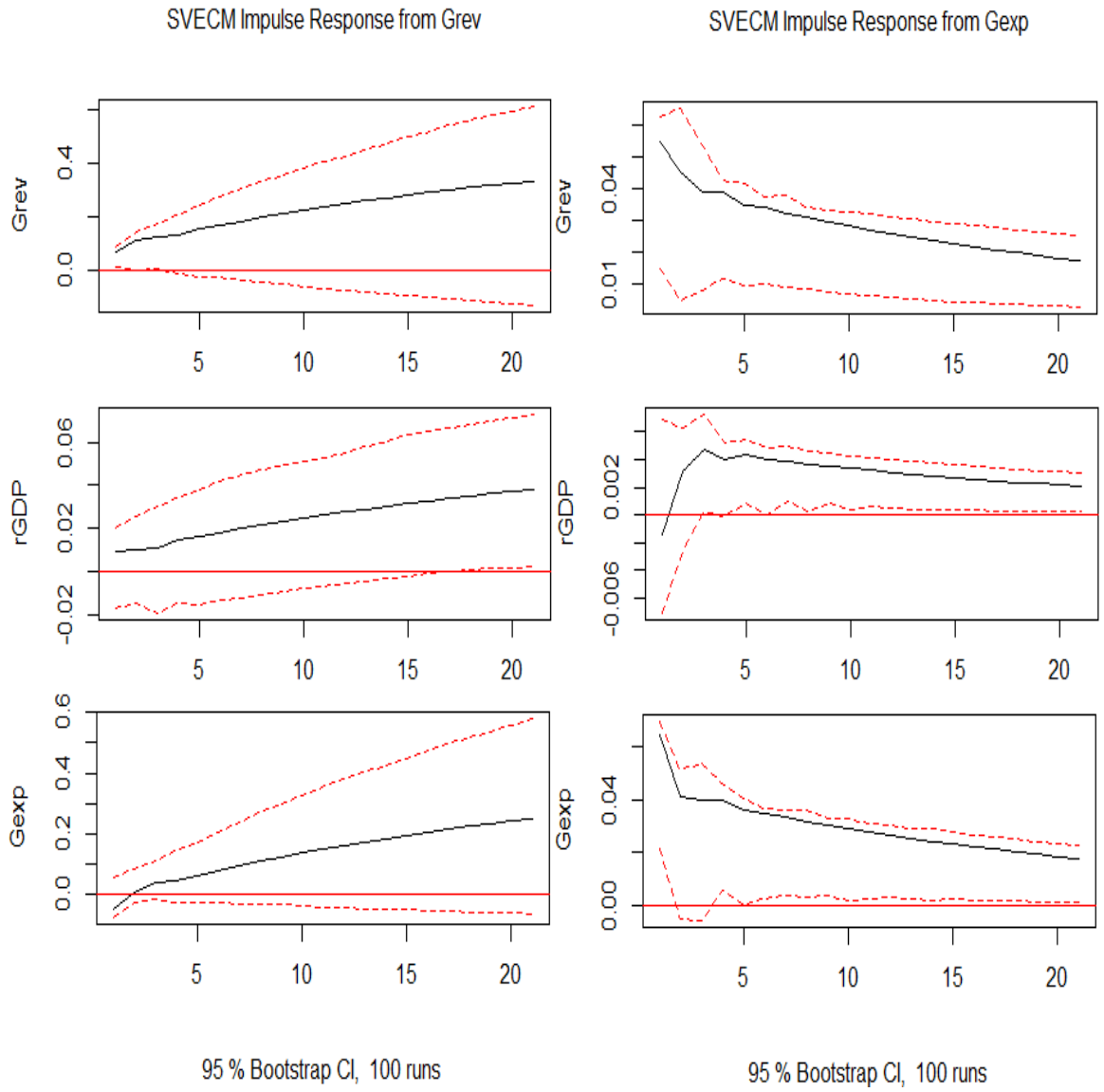
5.5 The SVEC Model Results

The output results of the SVEC model of endogenous variables are presented in the Table 14 in the Appendix. The estimated IRFs on the shocks to *Grev* and *Gexp* are illustrated in Figure 9. The first column corresponds to the responses of shocks to *Grev* while the second one depicts the shocks to *Gexp* and its responses. The FEVD of the endogenous variables is illustrated in Figure 10.

5.5.1 The Impulse Response Analysis

The *Grev* increases contemporaneous to own positive shock, though marginally, and becomes statistically insignificant in the second year. It rises again in the third year, and thereafter, remains statistically insignificant over time. The same shock to *Grev* does not affect *rGDP* in the short to medium term but causes it to rise in the long run after year 15. *Gexp* remains statistically insignificant over the horizon period. Similarly, the effects of a positive shock to *Gexp* increases *Grev* instantaneously and over the horizon period. *rGDP* only responds positively to the same shock in the fifth and seventh year, becomes statistically insignificant in the sixth and eighth year, and increases up to the end of the horizon period. *Gexp* responded instantaneously and positively to own shock, remains statistically insignificant in the second and third year, and increases again from the fourth year 4 onwards. Thus, the responses of the shock to *Grev* diverges over time while those of *Gexp* converges up to the end of the horizon period.

Figure 9: IRFs of Endogenous Variables in SVEC



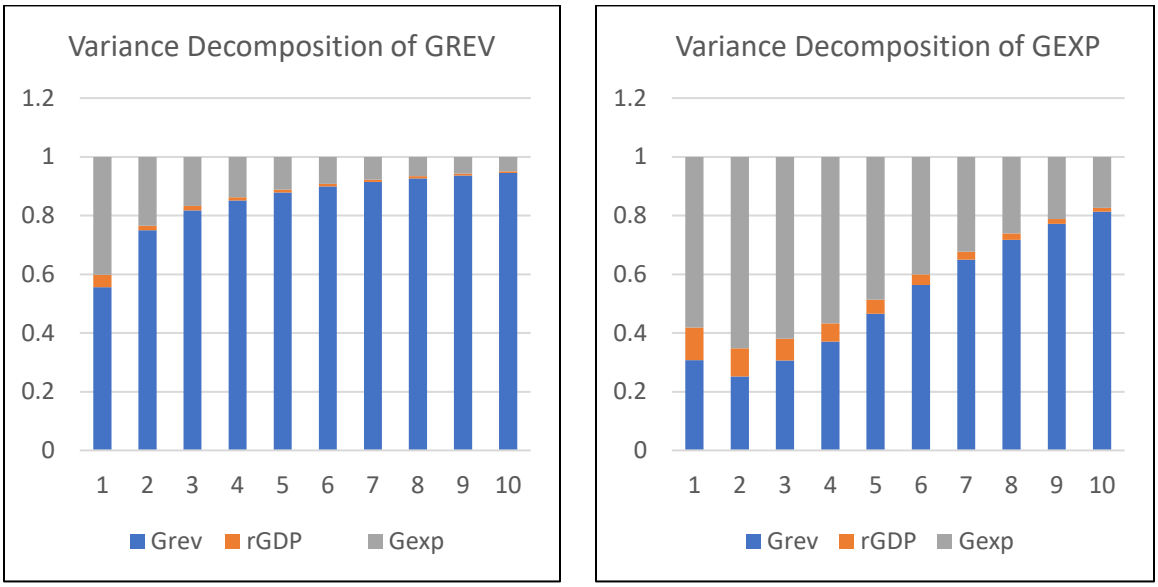
Source: Author compilation

5.5.2 Forecast Error Variance Decomposition

The fluctuations in the variance of *Grev* are caused by 55.59 percent of its own innovations in the first year, by 40.17 percent of *Gexp* shocks and marginally by those of *rGDP* at 4.25 percent. In the fifth year, *Grev*'s own innovations increase to 87.84 percent while *Gexp* remains the second in explaining the fluctuations in the variance of *Grev* with 11.11 percent and lastly coming *rGDP* at 1.05 percent. During the tenth year, the variance of Grev is explained mostly by own shocks at 94.47 percent and less by other variables where *rGDP* comes last. Moreover, the fluctuations in the variance of *Gexp* emanate mostly from own shocks from the first year at 58.17 percent up to the fifth year at 48.69 percent, after which

case, *Grev* takes the lead in explaining most of the variance of *Gexp*, recording 81.27 percent in year 10.

Figure 10: Variance Decomposition of *Gexp* and *Grev* in SVEC



Source: Author compilation

CHAPTER 6

DISCUSSION

6.1 Introduction

This chapter discusses the findings from the regression results estimated using the SVAR and the SVEC models. It provides an analysis of the effects of the fiscal policy shocks by demonstrating how the economy operates and describes the behaviour of the Government of Lesotho towards its economy, and then shows the channels through which fiscal policy affects aggregate demand. It also acknowledges the limitations of this study that could have affected the results and their discussion.

6.2 The Results of the SVAR and SVEC Models

Shocks to government revenue and expenditure put a constraint on the future taxes and spending that are necessary to meet the government intertemporal budget constraint, depending on the path the Government decides to take. The responses of endogenous variables to fiscal policy shocks have thus reflected these future paths using the SVAR models without and with debt feedback, and also through use of the SVEC model.

Under the positive shock to government revenue, indicating a contractionary fiscal policy, the SVAR models with and without debt feedback have produced rather similar results though the magnitudes of responses are slightly different. In both the SVAR models, the government revenue increased contemporaneously, and the government expenditure expanded in the medium term, while economic output was not affected. However, in the SVEC model, the same shock resulted in the expansion of economic output in the long run. Thus, the SVEC results are similar to other studies in developing countries such as Ethiopia and Chile (Barassa, 2015; Restrepo and Rincón, 2012), where economic output remained statistically significant[25]. Nevertheless, the Keynesian theory advocates that government revenue does not affect aggregate demand directly but only through other mechanisms like investment spending via interest rate effects. The theory further portrays that a shock to government revenue would have a smaller effect on aggregate output than an equivalent shock to government expenditure. In Lesotho's case, this theory is justified where the shocks to government revenue has empirically affected aggregate output under the SVEC model. Damane, Hlaahla and Seleteng (2018) and Holland, Marçal and Prince (2019) found opposite results. However, unlike their results whose boundaries, especially those under government revenue shocks in the SVAR models, diverge in the long run, this paper has found them converging. A contractionary fiscal policy under the SVEC model has thus ended up being expansionary, as detailed by an increase in government revenue, which led

[25] Restrepo and Rincón (2012) found a similar result in the case of Columbia under the model that omitted debt feedback.

to expansionary economic output and aggregate demand in the long run. This situation is consistent with non-Keynesian paradigm (see Alesina and Ardagna, 2010).

The positive shock to government expenditure, showing an expansionary fiscal policy, produced rather similar impulse responses except for magnitude of the impulses between the two SVAR models, with and without debt feedback. Under both SVAR models, government expenditure responded positively and instantaneously to own shock but only for the first year and remained statistically insignificant thereof. The government revenue and economic output were not affected by this shock in both SVAR models. A similar result regarding economic output is found by Holland, Marçal and Prince (2019) in the case of Brazil (under the SVAR model with debt feedback) and by Damane, Hlaahla and Seleteng (2018) in the context of Lesotho (under the SVAR model without debt feedback). However, under the SVEC model, a positive shock to government expenditure increased government expenditure contemporaneously, left it insignificant in the second year but from the third year onwards, government expenditure responded positively until the end of the horizon period. The same shock affected government revenue positively instantaneously and over time but did not impact on economic output in the short term; instead economic output expanded from year 5 onwards. Thus, the expansionary fiscal policy has ended up being expansionary, meaning that a positive shock to government expenditure increased economic output and aggregate demand. In this case, the Keynesian effect is satisfied, together with the government intertemporal budget constraint such that a rise in government expenditure has been compensated with an increase in government revenue. Similar results from the SVEC model were found by Restrepo and Rincón (2006) and Jooste, Liu and Naraidoo (2013).

6.3 Limitations

There are some limitations observed in this study just like in any other research. First, the annual data, instead of quarterly data, was used to estimate the effects of fiscal policy shocks due to unavailability of other quarterly time series data from the Government's database. Some variables of interest, including economic output and debt stock levels did not have the full quarterly series needed to run the regression model for a period before 2007. Lastly, this study used the external public debt, a component of total public debt (a variable in debt identity), as denominated in the local currency instead of the loan currency. Thus, the exchange rate effects have been incorporated in the levels of stock through this currency conversion.

CHAPTER 7

CONCLUSION AND RECOMMENDATIONS

7.1 Conclusions

This study aimed at examining the effects of fiscal policy shocks under the SVAR and SVEC models. It has been found that the shocks to fiscal policy have noticeable but marginal effects on endogenous variables when the debt dynamics are included in the SVAR model than when debt feedback is omitted. While the effects of a positive shock to government revenue on government expenditure were statistically significant in the medium term, the same shock did not impact on the economic output over the horizon period. A positive shock to government spending also did not stimulate government revenue and economic output. In the SVEC model, shocks to both government revenue and government expenditure caused economic output and aggregate demand to expand in the long run. A rise in economic output under a positive shock to government revenue reflected non-Keynesians effects. Similarly, a positive shock to government expenditure stimulated economic output, and hence, consistent with Keynesian paradigm.

7.2 Recommendations

This study recommends the Government of Lesotho to find means that increase government revenue and aggregate demand since a shock to government revenue is found to stimulate economic output in the long run. The government revenue can be increased by expanding the tax base and improving the tax administration. The Government also needs to prioritise spending by reducing recurrent outlays and increasing investment expenditure in order to stimulate aggregate output. This is because a shock to government expenditure has increased economic output in the long run. The fiscal policy is therefore effective in the long run, and in turn, the government intertemporal budget constraint will be satisfied.

7.3 Areas for Further Research

This study has used annual data, so other future studies can use quarterly data as it becomes available to capture the effects of quarterly structural shocks to fiscal policy. Moreover, a more disaggregated data in terms of government expenditure and government revenue may later be analysed. The government spending can be disaggregated into expenses and non-financial assets while the government revenue may comprise taxes and non-taxes. Lastly, future studies may explicitly incorporate the responses of exchange rate and observe the behaviour of debt accumulation path.

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APPENDIX

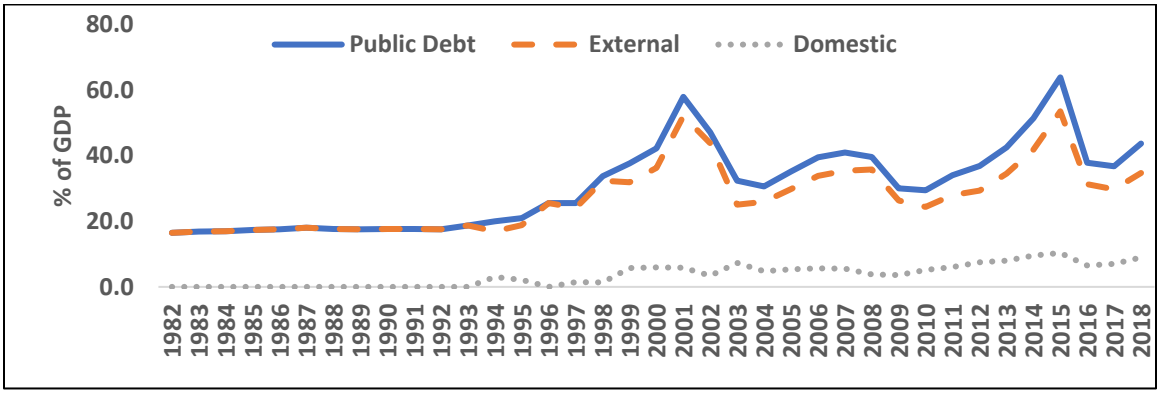
Table 11: Lesotho-Based Identification Scheme

	Tax-base elasticity		Output elasticity		Tax shares			Output elasticity of Tax Revenue
	PIT	CIT	DT	VAT	PIT	CIT	VAT	
	A	*B*	*C*	*D*	*E*	*F*	*G*	*F=ACE+BCF+DG*
1993	1.2896	0.4935	0.6933	1.0616	0.1004	0.0365	0.1168	0.2262
1994	0.5106	1.0667	1.1504	0.1289	0.0952	0.0376	0.1040	0.1155
1995	1.1674	0.9480	1.6692	1.2915	0.0965	0.0365	0.0974	0.3717
1996	1.4078	-0.8137	1.4468	-1.9657	0.1168	0.0303	0.0718	0.0611
1997	0.7638	1.5647	1.4683	5.4035	0.1154	0.0339	0.1054	0.7770
1998	2.4325	-4.3278	0.3431	0.3476	0.1263	0.0288	0.1099	0.1009
1999	2.4356	-4.9715	0.2566	0.0565	0.1348	0.0260	0.1119	0.0574
2000	0.1534	7.4416	1.8114	1.3627	0.1217	0.0550	0.1122	0.9283
2001	1.3410	0.0029	1.6971	0.6006	0.1366	0.0471	0.1039	0.3735
2002	0.6664	-0.6120	1.2281	1.9541	0.1286	0.0370	0.1097	0.2917
2003	0.7107	2.7340	5.3698	5.4069	0.1525	0.0691	0.1411	2.3595
2004	1.1382	0.3071	0.9213	3.9649	0.1366	0.0581	0.1562	0.7791
2005	-2.1757	7.0743	-0.2287	-0.2105	0.1350	0.0462	0.1443	-0.0379
2006	1.2447	-1.2310	0.6221	1.0043	0.1171	0.0330	0.1284	0.1943
2007	0.5090	3.4649	1.0071	0.8411	0.0900	0.0373	0.1039	0.2637
2008	0.7979	0.7717	1.4090	0.9361	0.1004	0.0414	0.1128	0.2635
2009	-0.0846	3.7323	3.5455	0.9341	0.0856	0.0700	0.1048	0.9986
2010	4.3111	-4.1529	0.6295	1.6448	0.1207	0.0509	0.1335	0.4142
2011	2.1702	-0.7974	1.0354	0.5465	0.1498	0.0450	0.1392	0.3756
2012	0.4115	2.3966	2.4379	3.5661	0.1169	0.0467	0.1276	0.8452
2013	1.3210	-0.5955	0.1901	0.3455	0.1114	0.0427	0.1229	0.0656
2014	0.8288	0.2873	1.0745	2.2817	0.1176	0.0428	0.1456	0.4501
2015	0.2291	3.0124	3.4874	0.7069	0.1173	0.0747	0.1442	0.9808
2016	-1.2376	3.2359	0.5597	0.3737	0.1172	0.0939	0.1599	0.1487
2017	0.8987	1.1001	-0.6037	-0.1673	0.1087	0.0858	0.1554	-0.1419
2018	3.4305	-2.4757	1.2638	2.6361	0.1408	0.0593	0.1799	0.8993
							Average (F) =	**0.4678**

PIT	Personal income tax
CIT	Corporate income tax
DT	Direct taxes
VAT	Value added tax

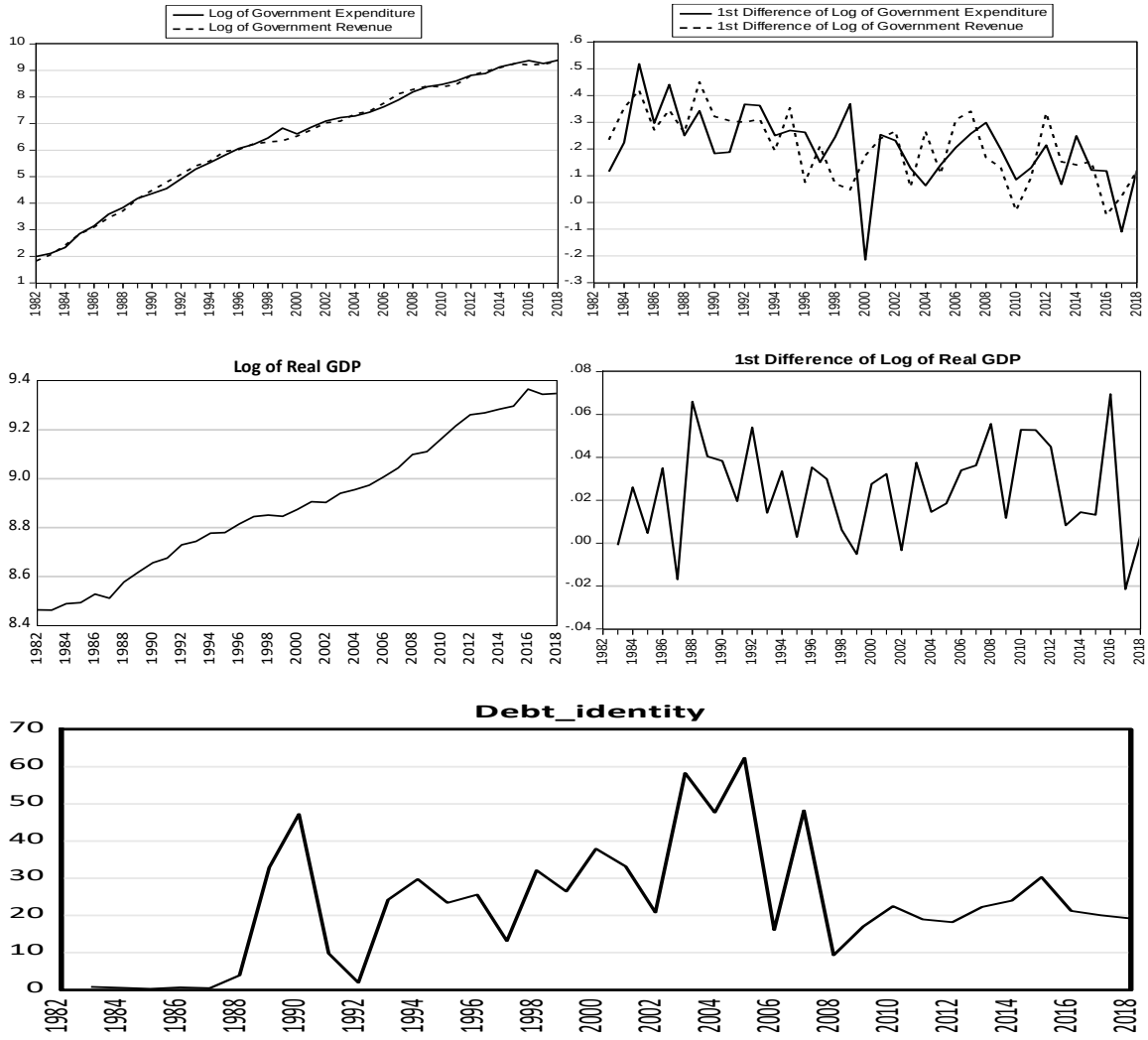
Source: (Central Bank of Lesotho, 2019); **(IMF, 2019)**

Figure 11: Evolution of Public Debt by Residence for 1982-2018



Source: (Central Bank of Lesotho, 2019; IMF, 2019)

Figure 12: Trends of Variables in Levels and First Difference



Source: Author compilation

Table 12: Output Results of SVAR Models

Structural VAR Estimates (without Debt Feedback)					Structural VAR Estimates (with Debt Feedback)			
Date: 11/24/19 Time: 11:35					Date: 11/24/19 Time: 11:20			
Sample (adjusted): 1984 2018					Sample (adjusted): 1984 2018			
Included observations: 35 after adjustments					Included observations: 35 after adjustments			
Estimation method: Maximum likelihood via Newton-Raphson (analytic derivatives)								
Convergence achieved after 7 iterations					Convergence achieved after 7 iterations			
Structural VAR is just-identified					Structural VAR is just-identified			
Model: Ae = Bu where E[uu']=I					Model: Ae = Bu where E[uu']=I			
A =					A =			
1	-0.47	0			1	-0.47	0	
C(1)	1	C(3)			C(1)	1	C(3)	
C(2)	0	1			C(2)	0	1	
B =					B =			
C(4)	0	0			C(4)	0	0	
0	C(5)	0			0	C(5)	0	
0	0	C(6)			0	0	C(6)	
	Coefficient	Std. Error	z-Statistic	Prob.	Coefficient	Std. Error	z-Statistic	Prob.
C(1)	0.028392	0.034778	0.816394	0.4143	0.028597	0.034727	0.823482	0.4102
C(2)	-0.380296	0.164597	-2.310460	0.0209	-0.348060	0.158463	-2.196481	0.0281
C(3)	0.022499	0.033497	0.671678	0.5018	0.019175	0.034944	0.548734	0.5832
C(4)	0.117509	0.014045	8.366599	0.0000	0.118672	0.014184	8.366599	0.0000
C(5)	0.022201	0.002674	8.301401	0.0000	0.022534	0.002715	8.300748	0.0000
C(6)	0.112474	0.013445	8.365742	0.0000	0.109438	0.013081	8.366021	0.0000
Log likelihood	136.3007				136.3654			

Source: Author compilation

Table 13: Output Results of SVEC Model

SVEC Estimation Results:
==========
Call:
SVEC (x = vecm, LR = LR, SR = SR, r = 1, lrtest = FALSE, boot = TRUE, runs = 100)

Type: B-model
Sample size: 34
Log Likelihood: 153.427
Number of iterations: 11

Estimated contemporaneous impact matrix:

	Grev	rGDP	Gexp
Grev	0.064109	-0.01772	0.054495
rGDP	0.008948	0.01945	-0.001466
Gexp	-0.046837	0.02821	0.064470

Estimated long run impact matrix:

	Grev	rGDP	Gexp
Grev	0.50418	-0.01786	0
rGDP	0.05837	0.02305	0
Gexp	0.42745	0.00000	0

Source: Author compilation