INFLATION, ECONOMIC GROWTH AND GOVERNMENT EXPENDITURE NEXUS IN SOUTH AFRICA

by

SHARLOTTE VALOYI

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SUPERVISOR: Prof. R Ilorah

CO-SUPERVISOR: Mr S Zhanje

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DECLARATION

I declare that this dissertation **INFLATION, ECONOMIC GROWTH AND GOVERNMENT EXPENDITURE NEXUS IN SOUTH AFRICA** hereby submitted to the University of Limpopo, for the degree of Master of Commerce in economics is my own work and that all the sources that have been used or quoted in the paper have been indicated and acknowledged by means of complete references.

Surname, initials

Date

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ABSTRACT

The reality is that the South African GDP is not within the range of what is projected the previous years. As the proposed expenditure for 2017/18 totals R1.56 trillion according to the 2017 budget speech, the treasury also need to reduce spending by a total of R26 billion over the next two years. Economic growth continues to be below expected levels in South Africa and unemployment is very high. The relationship between inflation, economic growth and government expenditure is important in both developing and developed countries. Like in any other economy in the world, the South African government's most important role is to promote economic growth, and also to sustain high economic growth with low inflation (Brand South Africa, 2015). The study is completely based on secondary data. The methodology is quantitative which includes econometrical tools.

For this purpose, this study applied Augmented Dickey-Fuller (ADF) and Phillips Perron unit root tests, Choice of the lag length, Johansen-Juselius Co-integration analysis, VEC Granger Causality/Block exogeneity Wald test, Vector Error Correlation Model, Diagnostic tests, Stability tests, Impulse response and Choleski/Variance decomposition methodology. From the findings, the results derived by applying Johansen-Juselius Co-integration indicate that there is a long-term relationship between the rate of inflation, economic growth and government expenditure, and also that both government expenditure and inflation impact negatively on economic growth. The results indicate that government expenditure encourages inflation impacting negatively on investment and the country's GDP. Granger causality runs jointly from all three variables inflation, government expenditure and investment to the dependent variable (economic growth)

Key words: inflation, economic growth, government expenditure, Johansen Juselius co-integration analysis, South Africa.

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CHAPTER 1

INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

The relationship between inflation, economic growth and government expenditure is important in both developing and developed countries. The South African government has an important role to promote a sustainable high economic growth rate with low inflation. The existing research studies on the government expenditure-economic growth nexus have yielded a series of conflicting results. Some researchers such as Dandan (2011), Al-Mazrouei and Nejmeh (2012), Al-Fawwaz (2015), have found that the impact of government spending on economic growth is positive, while other researchers such as Olulu (2014), Olabisi and Funlayo (2012) concluded that the impact of government spending on economic growth is negative. Common among economies, government expenditure remains a major component of Gross Domestic Product (GDP). The South African government spends significantly on education, health, roads, bridges, defence, among others.

Economic theory does not have rigid conclusions about the impact of government spending on economic performance. Certainly, economists do agree that there are instances when lower levels of government expenditure would be most appropriate for the economy and other instances when higher levels of government expenditure would be desirable. Generally, though, if government spending is very low, there would presumably be very little economic growth because activities such as enforcing contracts, protecting property, and developing of infrastructure among others would be very difficult (Gisore, Kiprop, Kalio, & Ochieng, 2014).

The reality in South Africa is that the GDP is not often within the range projected in previous years calling therefore, for adjusted expenditures, for example, the proposed expenditure for 2017/18 totals R1.56 trillion according to the 2017 government budget. The treasury also needs to reduce spending by a projected total amount of R26 billion over the next two years (2018/2019). Economic growth

continues to be below expected levels in South Africa, resulting in high unemployment (National Treasury, 2016).

A cut or reduction in current expenditure on economy and an increase in capital expenditures are beneficial for growth. Second, government should reorient capital expenditures from commercial projects to public expenditure, where basic infrastructure such as transportation, communication and utilities should be priority. Third, based on the observation that efficient recipients of capital government expenditures are crucial for successful fiscal policy, government shoud foster the development of the new private sector and clearly define the fate of all state-owned enterprises (Volkov, 1998).

A larger government expenditure is likely to be an obstacle to efficiency and economic growth because the taxes necessary to support government expenditures distort incentives to work and to invest, absorb funds that otherwise would have been used by the private sector in profitable investment opportunities, generally reduce efficicient resource allocation, and hence reduce the level of output. In addition, government eperations are often carried out inefficiently, and the regulatory process imposes excessive burdens and costs on economic system. Thus, countries with greater expenditure as a proportion of output experience lower economic growth (Lahirushan & Gunasekara, 2015).

1.2 STATEMENT OF PROBLEM

There are some conflicting views and disagreements amongst economists between the relationship between economic growth and government expenditure. Economists identify several factors that contribute to the growth of a nation's output such as the growth in the number of the workforce, increase in the number of plants and equipment and economic productivity. To ensure well functioning markets and stimulate economic growth, the government must expand its resources to enforce contracts, maintain national security, protect against criminals and provide valuable public goods. Theoretically, there are two competing schools of thought defining this causal relationship between government spending and economic growth. Firstly, Keynes (1936) regards government expenditure as an exogenous variable which

can be used to generate national income and this will make public expenditure a cause rather than an effect of national income.

Tang (2009) concluded that causal relationship should run from public expenditure to national income. Contrary to the Keynesians view, the Classical economists such as Adam Smith (1990) introduced the notion of the invincible hand and argue for the limitation of government spending in the economy. In this view, there is no causality between government spending and economic growth which postulate that the government's fiscal policy does not have any effect on the growth of national output. Therefore, if the country wishes to see economic growth, the Classical view requires the government to avoid the risk of distorting the resource allocation through government intervention and allow the free markets to rein (Tang, 2009).

According to Mongale (2016), the South African government is often faced with challenges of cutting down its expenditure to satisfy international credit ratings and other organisations like the International Monetary Fund (IMF) and maintaining low interest rates to meet trade unions and the electorates demand to protect jobs at all costs. An increase in government expenditure and subsequently public debt, increases the interest rate, which simultaneously reduces inflationary pressures and output. Keynesians though argue that a rise in government expenditure will increase demand and thus economic growth (Gisore, Kiprop, Kalio, & Ochieng, 2014).These conflicting statements necessitate the study of the effects of the relationship between government expenditure, growth and inflation in South Africa.

1.3 MOTIVATION FOR THE STUDY

The motivation for this study is drawn from the fact that government expenditure is the major component of GDP and also that government plays an important role in the economy such as providing goods and services, ensuring stability and economic growth. Government expenditures can influence the dynamics of Gross Domestic Product (GDP) through its consequences for the effectiveness of resource allocation and accumulation of productive resources. Both of these conditions assume the influence on the productivity of private sector. For example, an increase in

government expenditures on a public intermediate good (e.g. building road, bridge or financing of secondary education) firstly, via taxes or borrowing, withdraws financial resources from the private sector. Secondly, at the time this public intermediate good becomes freely available and fully effective, it effects the productivity of the companies and labor force which use this good. This can lead to decreased costs (especially transaction costs) of production and frees up funds for new investments in physical and human capital and may enhance the productivity of existing factors of production. On the contrary, underdeveloped infrastructure may distort the industry structure making it less efficient. Lack of a dense road network can cause unproductive centralization and vertical integration of the production process. (Volkov, 1998).

Although there are many other components of national income in the country, government expenditure is regarded as an influential component in determining economic growth. This study is therefore meant to contribute to the existing body of knowledge in economic theories and empirical studies. Inflation and economic growth are the most concern of most countries of the world, and South Africa is one of them. Thus; inflation and economic growth have gotten attention since the classical period of time. Macroeconomists, policy makers and central monetary authorities of all the nations need to know whether inflation is beneficial to growth or detrimental to growth. The common objective of macroeconomic policy is a low inflation rate which usually creates an environment conducive to rapid economic growth. Low inflation may facilitate economic growth by encouraging capital accumulation and increasing price flexibility. Given the fact that prices are sticky downwards, a moderate rise in the level of prices will provide greater relative price flexibility required for an efficient allocation of resources (Tobin, 1972). The study can also help other emerging countries understand the importance and role of government spending especially on the economic growth.

The motivation of this study stems from the weak economic growth that the country has been experiencing lately, coupled with the concern over government spending in South Africa. Investigating only the effect of government spending on economic growth is not enough; the different factor should also be added to observe their relationship with economic growth. Earlier studies in South Africa considered only

the relationship between government expenditure and economic growth, and also relationship between inflation and economic growth. This is the first study to our knowledge that investigated jointly the relationship between inflation, economic growth and government expenditure in South Africa.

How government allocates its funds to different sectors is important, and the nation deserves to know how much government is spending. From the literature, some expenditure items are more growth enhancing, government expenditure on investment and productive activities contribute positively to the growth. Government spending on capital formation, development assistance, private investment and a proxy for trade-openness all have positive and significant effect on economic growth. Government expenditures can have negative effects as well on the economy. For example, it could lead to a higher debt burden, weighing heavily on the national budget. It could also cause inflation and tax increases, creating a non-conducive environment for investment. (Black et al, 2005)

Understanding the factors capable of promoting economic growth is very important. In this regard, government expenditure needs to be analysed to determine if it is indeed a determinant factor to promote economic growth. A study by Mongale (2016), also served as a motivation for this study, as it noted and recommended that the South African government should try to cut down spending and manage the country's finances optimally by taking into consideration the nature of government expenditure and by reducing rent-seeking activities.

1.4 RESEARCH AIM AND OBJECTIVES

1.4.1 Aim of the study

The aim of this study is to determine the relationship between inflation, government expenditure and economic growth in South African Economy during the period between 1981 and 2015.

1.4.2 Objectives of the study include:

- Determining whether a long run relationship between inflation, economic growth and government expenditure exists in South African economy
- Examining the causal relationship between inflation, government expenditure and economic growth
- Determining the challenges of government expenditure in South Africa
- Determining whether government expenditure spur economic growth
- To suggest policies to moderate government spending, reduce inflation and promote economic growth

1.5 RESEARCH QUESTIONS

- Is there a long run relationship between inflation, government expenditure and economic growth?
- Is there a causal relationship between inflation, government expenditure and economic growth in South Africa?
- What are challenges of government expenditure in South Africa?
- Does government expenditure spur economic growth?
- Which policies can moderate government spending, reduce inflation and promote economic growth?

1.6 STRUCTURE OF THE STUDY

This dissertation is organised into five chapters. The first chapter is about introducing the study area, showing the scope of the study and background of the study, formulating the study problem. Following the introduction in chapter one, chapter 2 examines the theoretical and empirical aspects of inflation, economic growth and government expenditure. Chapter three discusses the specifications of inflation, economic growth and government expenditure model for the empirical analysis. It shows how the how data is analysed and the description of each variable. Chapter four contains information about the data, presents the results of the estimated

equations, econometric techniques, interpretations, and discussions on them. Chapter five, finally concludes the study with some policy recommendations.

1.7 SIGNIFICANCE OF THE STUDY

The study on the relationship between inflation, economic growth and government expenditure in South Africa is important since government expenditure is regarded as a major component of Gross Domestic Product, and also inflation is one of the major impact on the economic growth. Achieving sustainable rapid economic growth is the objective of most countries. It has been a problem to achieve such objective due to many factors that effects economic growth. Among many variables that can be stated as the determinant of economic growth is inflation. This study is very important to macroeconomists, financial analysts, academicians, policy makers and central bankers officials in understanding the responsiveness of GDP to the change in general price level and thus come up with the relevant policies so as to keep prices at the reasonable rate that stimulate production.

This title is relevant and timely given that the South African economy is often faced with recession, increase in inflation and a double edged sword like challenges of cutting down its expenditure to satisfy international credit ratings and other organizations like the International Monetary Fund (IMF) against the interests of the trade unions and the electorates who will want to protect jobs at all cost.

CHAPTER 2

LITERATURE REVIEW

2. INTRODUCTION

This chapter contains definitions of terms, and results of other empirical studies and theories that explain the relationship between inflation, economic growth and government expenditure.

2.1 DEFINITION OF CONCEPTS

2.1.1 Economic growth

Economic growth is the most crucial measure of the performance of an economy. It generally includes a rise in the volume of goods and services that an economy produces over a period of time. It is measured by the annual rate of change in the gross domestic product (Munyeka, 2014). Mohr et al (2008) explains economic growth as the value of all final goods and services produced within the borders of the country in a given period of time. Wuyts (2011) holds that the attainment of high and sustainable economic growth is one of the macroeconomic objectives countries aspire to achieve besides realization of full employment, while Nuruddeen and Ibrahim (2014) consider economic growth as a powerful instrument for the attainment of a rise in living standards and greater consumption of goods and services. Economic growth tackles problems of unemployment and income inequality, reducing poverty. Economic growth may be considered to be the principal source of improving the standard of living of citizens of a country. Economic growth can be measured in real terms if adjusted for inflation and in nominal terms if not adjusted for inflation (Swan, 1956).

2.1.2 Government expenditure

Government expenditure is regarded as a major component of gross domestic product, and it involves spending money on things such as education (schools),

health (clinics and hospitals), defense, roads and bridges, among others. Its purpose is to provide goods and services that the private sector cannot supply. Government expenditure represents the engine of economic growth by contributing to an increase in the productive capacity of the local economy, especially if it is directed correctly toward important economic sectors (Al-Fawwaz, 2015).

Figure 2.1 shows the South African government spending from January 2014 to July 2016. Government Spending in South Africa increased from 634731 ZAR Million in the second quarter of 2016 to 638176 ZAR Million in the third quarter of 2016. Government spending in South Africa averaged 307381.19 ZAR Million from 1960 until 2016, reaching an all-time high of 638176 ZAR Million in the third quarter of 2016 and a record low of 65991 ZAR Million in the first quarter of 1960 (Trading Economics, 2017).

Figure 2.1: South African government spending

Source: www.TRADINGECONOMICS.COM South African Reserve Bank

2.1.3 Inflation

Inflation is referred to as the pervasive and sustained increase in the aggregate level of prices of goods and services measured (Geyser & Lowies, 2001). Repetitive price increases reduce the purchasing power of money and other financial assets with

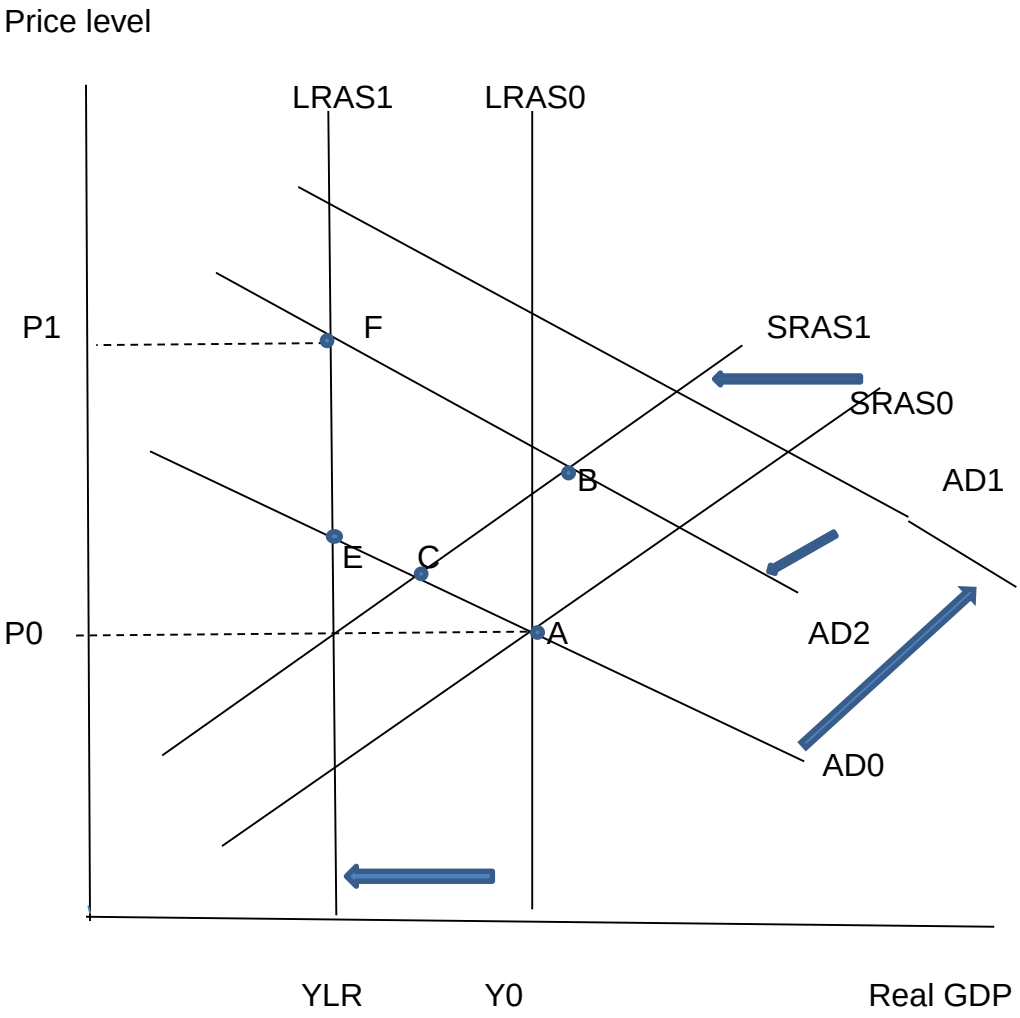
fixed values, creating serious economic distortions and uncertainty. Inflation results when actual economic pressures and anticipation of natural developments cause the demand for goods and services to exceed the supply available at existing prices, or other available output is restricted by faltering productivity and market place constraints. In South Africa, inflation is measured by the consumer price index (CPI) (Geyser & Lowies, 2001).

2.2 Theoretical literature on inflation, economic growth and government expenditure

The relationship between inflation, economic growth and government expenditure has been broadly investigated in both theoretical and empirical literature. The theoretical discussion of this relationship takes us to the issue of government budget constraint which is the restriction that the government is unable to perform its duties such as service delivery or the purchase of goods without having a source of funds to finance such activities. Obviously, the way government chooses to finance its activities has important consequences for the economy (Baye & Jansen, 1995). The government could raise funds either by borrowing funds through the sale of government bonds or other government certificates, raising taxes, or printing money. Government expenditure through any of these methods of raising revenue will, in the short run, actually lead to growth of the economy, that is, cause real GDP to rise, and increase the price level as well. In the long run, though, nominal wages and other input prices will increase due to increase in the price level, causing the real GDP to return to its original position before the increase in government expenditure (Musgrave & Musgrave,1989). In the case of income tax financed government expenditure, a rise in government purchases may either increase or decrease the real GDP in the short run depending on the reaction of investment to the income tax. Please see figures 2.2 & 2.3 adopted from (Baye & Jansen, 1995) for illustrations of the effect of tax financed government expenditure (most frequently used in South Africa) on growth (measured by the GDP) and inflation measured by price movements, both in the short and long runs.

2.2.1 Government expenditures financed by income taxes

Figure 2.2: Effect of government expenditures financed by Income taxes



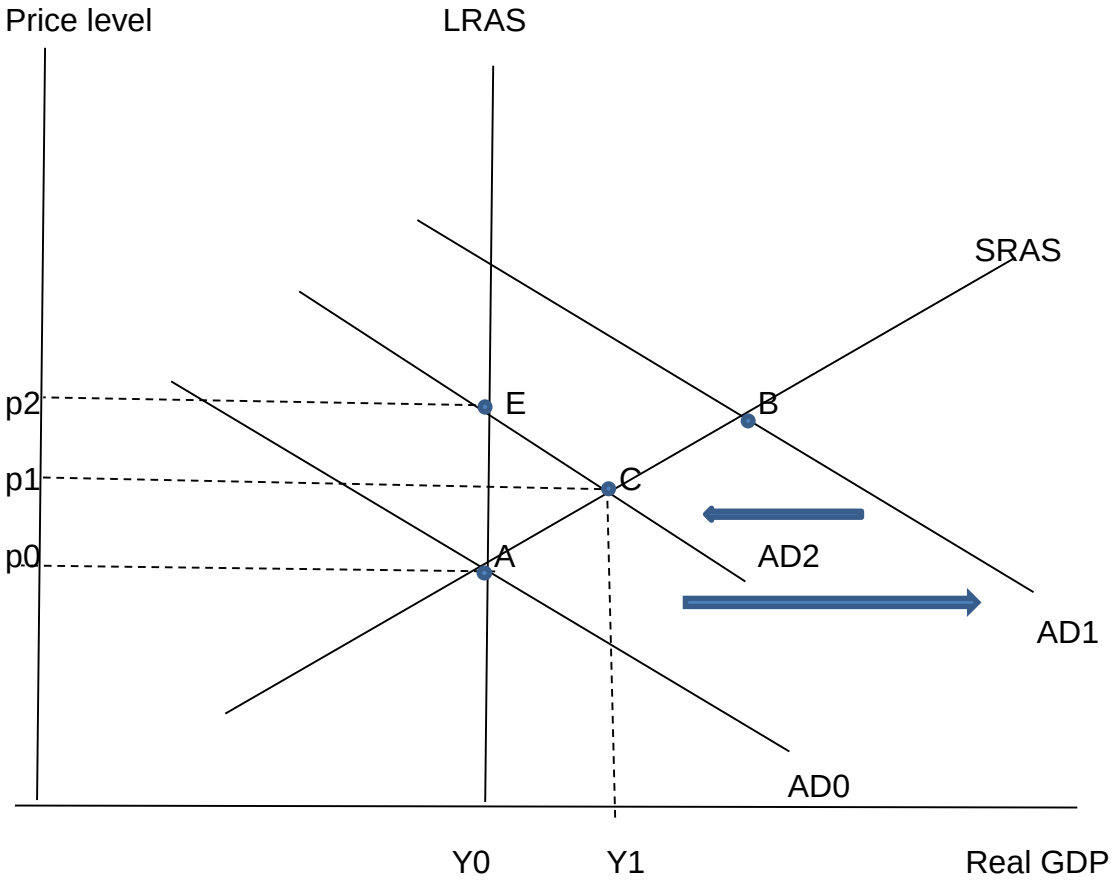
Source: Baye & Jansen, 1995

Figure 2.2 shows the effect of an increase in government purchases financed by an income tax, which does affect aggregate supply. The initial equilibrium it at point A at the intersection of AD0 and SRAS0. When the government increases purchases of goods and services, aggregate demand shifts to AD1, but the income tax reduces consumption and investment, which causes aggregate demand to shift to the left to either AD2 or AD0. In addition, the increase in income taxes reduces short-run aggregate supply from SRAS0 to SRAS1, and decreases long-run aggregate supply from LRAS0 to LRAS1. If the rise in government purchases of goods and services more than offsets the decline in investment and consumption, the short-run equilibrium will be at point B, where AD2 and SRAS1 intersect. In this case, the tax

and spend policy has the short-run effect of increasing real GDP and the price level compared with the initial situation at point A. However, if the reduction in investment and consumption exactly offsets the rise in government purchases, aggregate demand will return to AD0. In this case, the short-run equilibrium is at C, where real GDP is lower than at point A. The new short-run equilibrium is at either point B or point C, indicating that the short-run real GDP may rise or fall. Most income tax legislation include provisions known as investment tax credits. Investment tax credits are introduced to keep investment from declining extremely due to higher tax, thereby increasing the possibility that the actual short-run equilibrium will occur at point B. In the long run input prices rise, which ultimately leads to an equilibrium at point E or F. Thus, regardless of the short-run effects, the long -run effect is a reduction in real output to YLR and increases in price.

2.2.2 Government expenditures financed by Consumption taxes

Figure 2.3: Effect of government expenditures financed by Consumption taxes

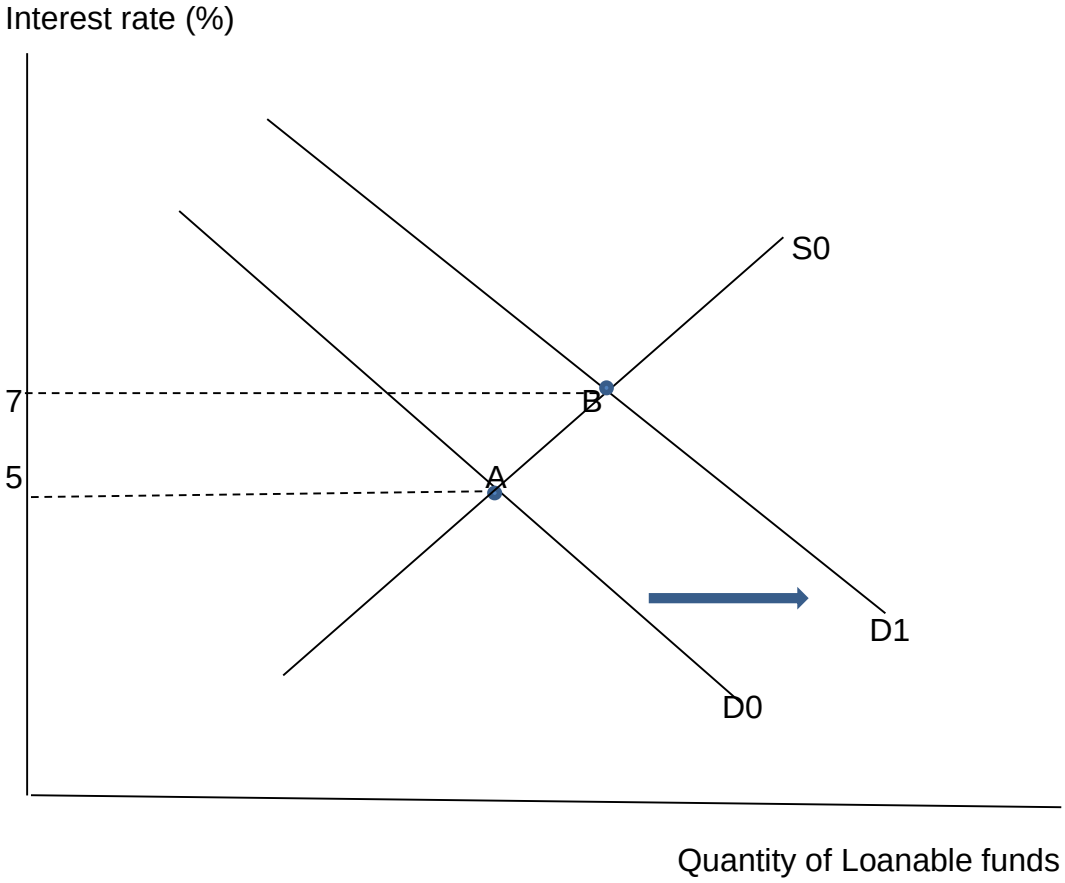


Source: Baye & Jansen, 1995

Figure 2.3 shows the effect of an increase in government purchases financed by an increase in consumption taxes when the taxes do not affect aggregate supply. The initial equilibrium is at point A. The increase in government purchases causes aggregate demand to rise from AD0 to AD1. The increase in consumption taxes, however, causes an aggregate demand to decrease to AD2. The increase in consumption taxes discourages consumption, which tends to shift aggregate demand back to the left. Thus, short-run equilibrium is at point C, where the price level and real GDP are higher than at point A but lower than at point B when due consideration was not given to the impact of the consumption tax on consumption. In the long run wages rise, which results in a long-run equilibrium at point E. Thus, in the long run, aggregate output is unaffected by the increased government purchases financed by consumption taxes, but the price level rises.

2.2.3 Government borrowing in the Bond market

Figure 2.4: Effect of Government borrowing in the Bond market



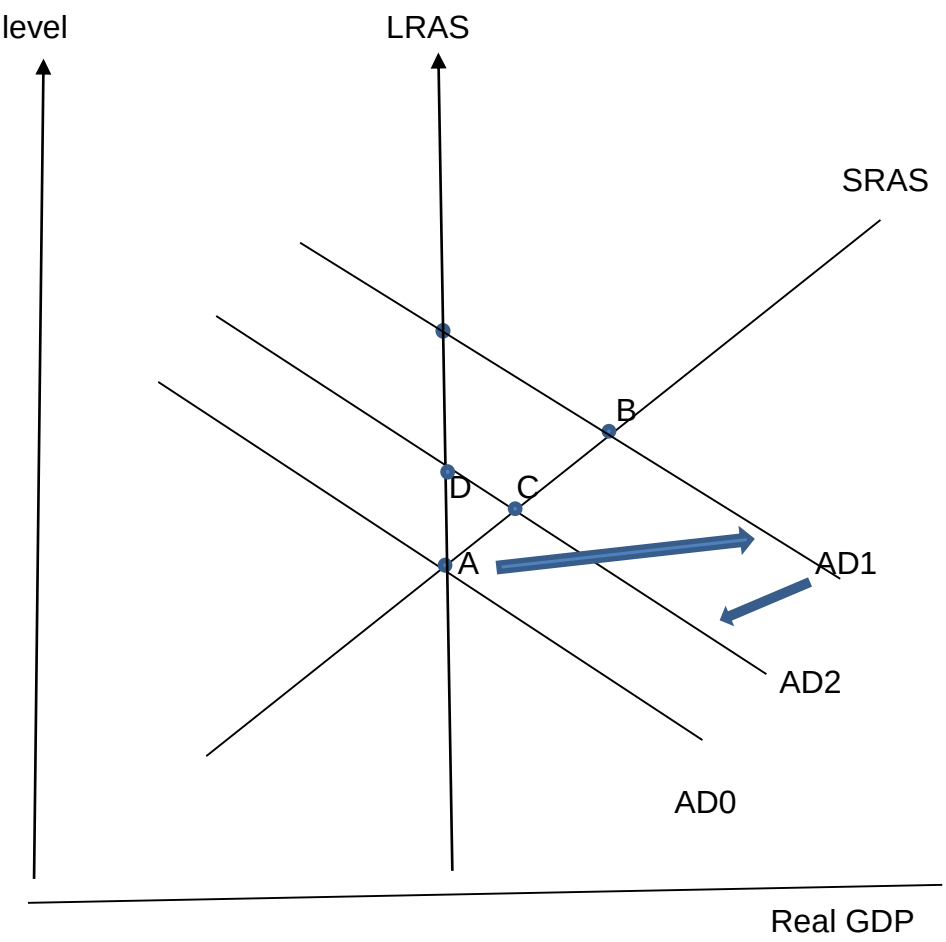
Source: Baye & Jansen, 1995

Figure 2.4: shows what happens when the government borrows to finance an increase in government expenditures, and to see this impact we need to consider activities in the loanable funds market. The initial equilibrium is at point A, the point of intersection of the demand and supply of loanable funds with an equilibrium interest rate of 5 percent. When the government increases its borrowings to finance increased government expenditures, the demand for loanable funds rises from D0 to D1. The equilibrium then rises from point A to point B and the interest rate rises from 5 to 7 percent which reduces investment and consumption. This example indicate that government borrowing increases the nominal interest rate, However the increase in the nominal interest rate is, holding other things constant, a rise in the real interest rate. With no change in expected inflation, the increase in the real interest rate represents a rise in the real cost of borrowing funds for investment purposes or to finance the purchase of consumer durables, which tends to reduce consumption and investment spending and hence reduce aggregate demand.

Two schools of thought exist on whether it will make any significant difference to the economy if the government choses to finance its spending by borrowing instead of raising taxes. According to Keynesian view, government spending financed by borrowing has a larger effect on aggregate demand than taxed financed government spending, meaning that deficit financing is more expansionary than tax financing because taxpayers do not recognize that government debt is simply deferred tax liabilities and that in future government will have to increase taxes to repay the debt and pay debt services. According to the Ricardian view, the effects of deficit financing are not as clear-cut nor as large as Keynesian suggested. The Ricardian mean that there is no difference between tax financing and deficit financing in terms of the effect on the economy. Borrowing and tax financing are equivalent and the outcome will be the same as well whether government choses to raise spending with deficit finance or tax financing.

2.2.4 Crowding out

Figure 2.5: Effect of Crowding out



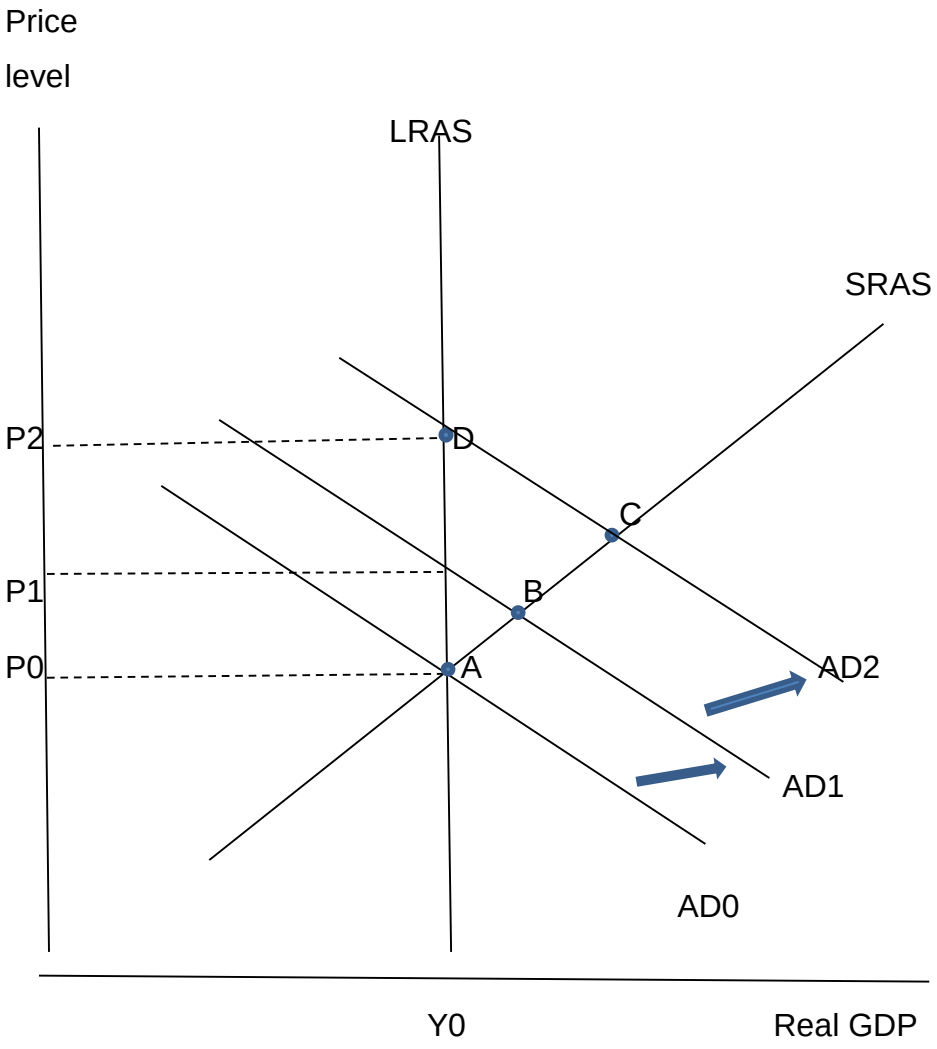
Source: Baye & Jansen, 1995

Figure 2.5 shows the crowding out effect, the initial equilibrium is at point A, representing the point of intersection of long-run aggregate supply curve (LRAS), and short-run aggregate supply curve (SRAS). An increase in government expenditures increases aggregate demand from AD0 to AD1. Therefore, when government borrows funds to pay for spending this lead to an increase in the interest rate, and by doing so, this also lead to a decline in consumption and investment demand. This is shown by a decrease in aggregate demand from AD1.The partial crowding out occurs when aggregate demand shifts back only to AD2, the new short-run equilibrium is indicated by point C. In this case the, net short-run effect of an increase in government purchases financed by borrowing is the movement from

point A to point C. In the long-run the equilibrium will be at point B, where output returns to its initial level and the price level increases further. Complete crowding out occurs when aggregate demand shifts all the way back to AD0, and both the short-run and the long-run equilibrium remains at point A.

2.2.5 Government purchases financed by money creation

Figure 2.6: Effect of government purchases financed by money creation



Source: Baye & Jansen, 1995

Figure 2.6: shows the effect of financing an increase in the government expenditure through the money creation. The initial equilibrium is at point A, representing the point of intersection of aggregate demand curve, AD0 and the short-run aggregate supply curve, SRAS, with price level given by P0, real GDP given by Y0. An increase in government expenditures increases aggregate demand from AD0 to AD1. The increase in the money supply that financed the increase in the government expenditures has two effects which tend to increase aggregate demand further from AD1 to AD2. Firstly, it lowers interest rates. Holding everything else constant, including the expected inflation rate, the decline in the interest rate translates into a fall in the real interest rate which stimulates investment spending and consumer spending. Secondly, it raises consumer wealth, which exerts a positive effect on consumer spending. The short-run effect of the government expenditures financed by money creation is shown by the movement from A to C, which implies a higher price level (P1) and greater real GDP. The diagram illustrates that government expenditures financed by an increase in the money creation has a strong stimulating effect on real GDP in the short run. The price level also increases considerably in the short run due to the increase in the money supply. The long run effect of the government expenditures financed by money creation is shown by point D, where the price level has risen to P2 but real GDP has returned to Y0. Two schools of thought also exist on financing government expenditures through money creation, Monetarists view the shift from B to C to be relatively large, whereas Keynesians view the shift as being rather small.

According to Mishkin (2004), A budget deficit can lead to an increase in the money supply if it is financed by the creation of high-powered money. In the first period, if the deficit is financed by money creation, the money supply will increase, shifting the aggregate demand curve to the right and leading to an increase in the price level. If the budget deficit is still present in the next period, it must be financed all over again. The money supply will increase again, and the aggregate demand curve will again shift to the right, causing the price level to rise further. If the deficit persists and the government resorts to printing money to pay for it, this process will continue. Financing a persistent deficit by money creation will lead to a sustained inflation. In the period when the deficit occurs, there will be an increase in money to finance it,

and the resulting rightward shift of the aggregate demand curve will raise the price level (Mishkin, 2004).

If the deficit disappears in the next period, there is no longer a need to print money. The aggregate demand curve will not shift further, and the price level will not continue to rise. Hence the one-shot increase in the money supply from the temporary deficit generates only a one-shot increase in the price level, and no inflation develops. A deficit can be the source of a sustained inflation only if it is persistent rather than temporary and if the government finances it by creating money rather than by issuing bonds to the public. If inflation is the result, why do governments frequently finance persistent deficits by creating money? The answer is the key to understanding how budget deficits may lead to inflation (Mishkin, 2004). The fear that deficits will lead to inflation is a fear that the government will use money creation, namely printing money and this process is known as monetizing the deficit. Monetizing the deficit is clearly inflationary until the economy moves to a new long-run equilibrium with a higher price level. If monetizing the deficit leads to inflation, why are government tempted to use this means of financing spending? The answer is that money can be created at very low cost to the government, yet individuals are willing to trade goods and services for this money. The profit from printing money, known as seigniorage, is also one of the sources of revenue to the government. Seigniorage in its self is not a bad thing, and a government earns seigniorage in a growing economy even if it merely increases the money supply at a rate that keeps the price level constant. Since an increase in income occurs in a growing economy, this leads to a rise in money demand. The government can increase the money supply to accommodate the rise in demand while keeping the price level constant. However, the great profits that can be made by printing money can tempt a government that has difficulty (or facing some budget issues) paying for its spending to try to print money at a faster rate than the rate of economic growth, and this will lead to inflation (Baye & Jansen, 1995).

Nations with better access to capital markets like the United State (U.S.) or, more generally, nations interested in stable price levels and low inflation rates, will not turn to seigniorage as a major source of funding government spending, The U.S. government currently relies very little on money creation to satisfy its budget constraint, still, there is the danger that any country with a large outstanding debt

may decide to pay off part of the debt by printing new money, thus causing hyperinflation (Baye & Jansen, 1995).

2.3 An extension of the theoretical literature on inflation, economic growth and government expenditure

The relationship between inflation, economic growth and government expenditure has been broadly investigated in both theoretical and empirical literature. Wagner's law and Keynes view are among the most cited their apparently opposing viewpoint on this relation, notwithstanding.

2.3.1 Wagner's law

Wagner's law is named after the German economist Aldolph Wagner (1835-1917). The Law argues that causality runs from economic growth to growth in public expenditure and so public expenditure is considered as endogenous to the growth of national income. According to Henrekson (1993), Wagner's approach emphasizes certain reasons for the need to increase the government expenditure; Firstly, industrialization and modernization would lead to a substitution of public for activities for private activities, and then the need for public protective and regulative activity would increase. In addition, the greater division of labor and urbanization accompanying industrialization would require higher expenditures on contractual enforcement as well as on law and order to guarantee the efficient performance of the economy. Secondly, the expansion of education and cultural services lead to higher government expenditure. Thirdly, there is the government involvement in managing and financing natural monopolies to improve economic efficiency (Henrekson, 1993).

According to Peacock and Wiseman model (1961), Wagner's argument suffers from two serious weaknesses. Firstly, he adopts an organic theory of the state which are not considered to be superior to other explanations of the character of the state, or to be equally applicable to different societies. Secondly, Wagner's concern is in the secular trend of public expenditures. Peacock and Wiseman model noted that there

are some other features of the development of public expenditures, such as the time pattern of expenditure growth, which seem to be significant.

According to Ansari (1993), Wagner's theory is often considered representing a long-term relationship between national income and public expenditure which applied to countries during their early stages of growth and development. The law states that government grows because of increases in demand for public goods as society get wealthier. Also, governments need to manage externalities and control of monopoly as national income increases and this would also increase public expenditure.

2.3.2 Keynesian view

According to Keynesian view cited in Chude and Chude (2013), public expenditures are considered as exogenous factors which can be utilized as policy instruments to promote economic growth in other words, government expenditure can contribute positively to economic growth. An increase in the government expenditure is likely to lead to an increase in employment, profitability and investment through multiplier effects on aggregate demand (Chude & Chude, 2013). Neo-classical view opposes Keynesian view, arguing that government fiscal policy does not have any significant impact on the growth of national output. A counter argument, though is that government fiscal policy (through intervention) helps to improve failures that might arise from the inefficiencies of the market (Nworji, Okwu, Obiwuru, & Nworji, 2012).

Keynesian economic theory argues that inflation may be caused by an increase in the quantity of money in circulation relative to the ability of the economy to supply – its potential output. According to the Keynesians, inflation arises when the elasticity of supply of output in response to a rise in money supply has fallen to zero, or when output is unresponsive to changes in money supply. If there is full employment, and an increase in the money supply, then the condition will be clearly inflationary (World Bank, 2007b).

According to Keynesian theory cited in Gokal and Hanif (2004), Keynesian model provides the growth and inflation relationship through the aggregate supply-aggregate demand (AS-AD) framework, a more comprehensive model for linking

inflation to growth which also postulated a positive relationship between inflation and economic growth, as economic growth increases inflation also increases.

2.3.3 Rostow-Musgrave Model

According Musgrave (1999), at the early stages of a country's economic development, the rate of growth of public expenditure will be very high because the government provides the basic infrastructural facilities (social overheads) (Likita, 1999). Most of these projects are capital intensive, therefore, the spending of the government will increase steadily. The investment in necessities such as education, health, roads, electricity, and water supply can launch the economy from the traditional stage to the take off stage of economic development making government to spend, increasing the amount with time to improve a democratic society (Likita, 1999).

According to Musgrave and Musgrave (1989), the public-sector share in total economic activity has increased over the years. They argue that the growth rate of public expenditure has increased significantly whether viewed in dollar terms, in real terms, on a per capita basis, or as a percentage of GNP. Total public expenditure as a percentage of GNP has shown a more steady upward trend since the end of the nineteenth century, especially the past forty years. The increase in the expenditure has been fuelled largely by the affection on defence and non-defence components and the rise of social security and welfare programs (Musgrave & Musgrave, 1989).

2.4 Empirical literature on inflation, economic growth and government expenditure

Samudram, Naur and Vaithilingam (2008) have investigated the Keynesian view and Wagner's law on government expenditure and economic growth in Malaysia using the Auto-Regression Distributed Lag (ARDL) and bounds test during the period between 1970 and 2004. The results confirmed a long run relationship between total expenditures (which includes expenditure on defense, education, development and agriculture) and Gross National Product (GNP). The study also revealed that with the structural break in 1998, the long run causality is bi-directional for GNP and

expenditure on administration and health supporting both Keynesian view and Wagner's law.

Using panel data in South Eastern Europe during the period between 1995 and 2005 Alexiou (2009) found that four out of the five variables used in the estimation: government spending on capital formation, development assistance, private investment and a proxy for trade-openness all have positive and significant effect on economic growth. Only one out of the five variables namely, population growth was found to be statistically insignificant using time series.

A study on the Nigerian economy using time series data during the period between 1977 and 2012 by Chude and Chude (2009) has found that total expenditure on education is highly and statistically significant and has a positive relationship on economic growth in Nigeria in the long run.

Alm and Embaye (2011) have examined the relationship between growth and government spending in South Africa during the period between 1960 and 2007. The results indicated that per capita government spending is positively affected by external shocks such as wars and oil prices, this also lead to a slow economic growth.

Mamo (2012) has investigated the relationship between inflation and economic growth using the panel data which includes 13 SSA countries during the period between 1969 and 2009. The results showed that there is a negative relationship between economic growth and inflation.

Applying Vector Autoregressive Models (VAR) during the period between 1960 and 2008 in the Nigerian economy, Olabisi and Funlayo (2012) found that the government expenditure on education has failed to enhance economic growth due to the high rate of rent seeking in the country as well as the increase in unemployment rate. Kasidi and Mwakanemela (2013) examined the impact of inflation on economic growth in Tanzania using the time series data during the period between 1990 and 2011. The results indicated that inflation has a negative impact on economic growth, the study also showed that there is no co-integration between inflation and economic growth.

Applying Engle-Granger co-integration approach and the Johansen approach and using quarterly data set during the period between 1992Q1 and 2010Q4 in the Ethiopian economy, Makuria (2013) has found that there is a positive long-run relationship between inflation and economic growth.

A study of the Pakistan economy, by Muhammed and Attiya (2013) using time series data during the period between 1980 and 2010 and applying tools such as Augmented Dickey Fuller (ADF) unit root test, ARDL, Johansen cointegration and Granger-causality test has found that there is a long-run relationship between the rate of inflation, economic growth and government expenditure. In the short-run the rate of inflation does not affect the economic growth, but it does affect the government expenditure. The causality test results indicated that there is unidirectional causality between inflation rate and economic growth, and between economic growth and government spending.

A study on the Nigerian economy using the two-stage least squares (2SLS) method of simultaneous equation model during the period between 1976 and 2006 by Awe (2013) has found that there is a negative relationship between economic growth proxied by Gross Domestic Product (GDP) and Foreign Direct Investment (FDI. It is therefore, recommended that Nigeria should encourage domestic investment to accelerate growth rather than relying on FDI as a main mover of the economy. The Nigerian authorities should also develop a code of conduct on FDI to curb the restrictive business practice of multinationals and limit their repatriation of profits from Nigeria.

Chipaumire, Ngirande, Method and Ruswa (2014) investigated the impact of government spending on economic growth in South Africa during the period between 1990 and 2010 using quarterly data. The results revealed that there is a long run relationship between government spending and growth in South Africa.

A study of three Asian emerging economies namely: India, Indonesia and Vietnam done by Nguyen (2014) using the cointegration and Vector Error Correction Model to time series data during the period between 1970 and 2012 has showed that government spending does have a statistically significant effect on inflation in the long-run in all three countries. In the short-run government spending have a positive impact on inflation for India, which is consistent with the Keynesian view. For

Indonesia government spending have negative short-run impact on inflation and for Vietnam the short-run impact runs from inflation to government spending.

Mohammed and Mansur (2014) examined whether a long-run theoretical relationship does indeed exist between the level of inflation in South Africa and the amount of FDI eventually received by the country. It also attempts to provide insight into the purported macroeconomic benefits of the policy of 'inflation targeting', by ascertaining whether any causality exists between stable inflation levels and improved FDI inflows from a South African perspective using time series techniques to answer their research objectives for the period between 1970 and 2012. The results indicate that there is a long-run inverse relationship between the level of inflation and FDI inflow in South Africa, implying that a rise in the level of inflation would have a negative impact on the amount of FDI received by South Africa. Furthermore, the paper successfully demonstrates that a degree of causality does exist between stable inflation levels and improved FDI inflows from a South African perspective, suggesting that the policy change that occurred with the adoption of 'inflation targeting' by the South African authorities did have a significant impact on the average level of FDI inflow to the country.

Al-Fawwaz (2015) has examined the impact of government expenditure on economic growth in Jordan during the period between 1980 and 2013 where the model was analyzed using the OLS approach. The results indicated that government expenditure has a positive impact on economic growth and therefore support the Keynesian model.

Lahirushan and Gunasekara (2015) have examined the impact of government expenditure on economic growth focusing on Asian countries using the time series data during the period between 1970 and 2013. The study revealed that there is a unidirectional causality from economic growth to government spending and government spending to economic growth.

Rahman (2015) has examined the impact of Foreign Direct Investment (FDI) on the economic growth of Bangladesh using the time series data during the period between 1999 and 2013. Multiple Regression Analyses were utilized to measure the relationship between independent (FDI) and dependent variables (macroeconomic

indicators). The results obtained in this research signify a negative correlation between FDI and economic growth and may be a concern for the government of Bangladesh. The government might focus on required reforms and policy implications to make foreign investment more beneficial.

Mongale (2016) has undertaken a study on the South African economy by employing a trivariate causality model, cointegration and error correction models and using a quarterly data during the period between 2000 and 2015 and found that national government total expenditure has a negative relationship with GDP at market prices.

A study by Hasnul (2016), on the Malaysia economy using the time series data during the period between 1970 and 2014 and applying tools such as OLS technique to find the fixed effects of government expenditure on economic growth has found that there is a negative correlation between government expenditure and economic growth in Malaysia for the last 45 years. In this study, the government expenditure has been disaggregated in to the government operating and development expenditure and the study also classified the government expenditure based on the involved sector. Moreover, the classification of government expenditure shows that only housing sector expenditure and development expenditure significantly contribute to a lower economic growth. Education, defense, healthcare, and operating expenditure do not show any significant evidence of their impact on the economic growth.

Apparently, studies on the relationship between inflation, economic growth and government expenditure show that results vary from one study to another, some results indicate a positive relationship and some indicate a negative relationship. These variations are mainly caused by the fact that they were applying different methods in different areas and during different periods. This study is different from other previous studies, because it investigates the relationship between government expenditure, economic growth and inflation in South Africa. The study period is also longer compared to those considered in other previous studies. This econometric technique used in this study include the Augmented Dickey Fuller (ADF) and Phillips Perron (PP) unit root tests, Choice of the lag length, Johansen-Juselius cointegration test, VEC Granger causality/ Block exogeneity Wald test, Vector Error Correlation

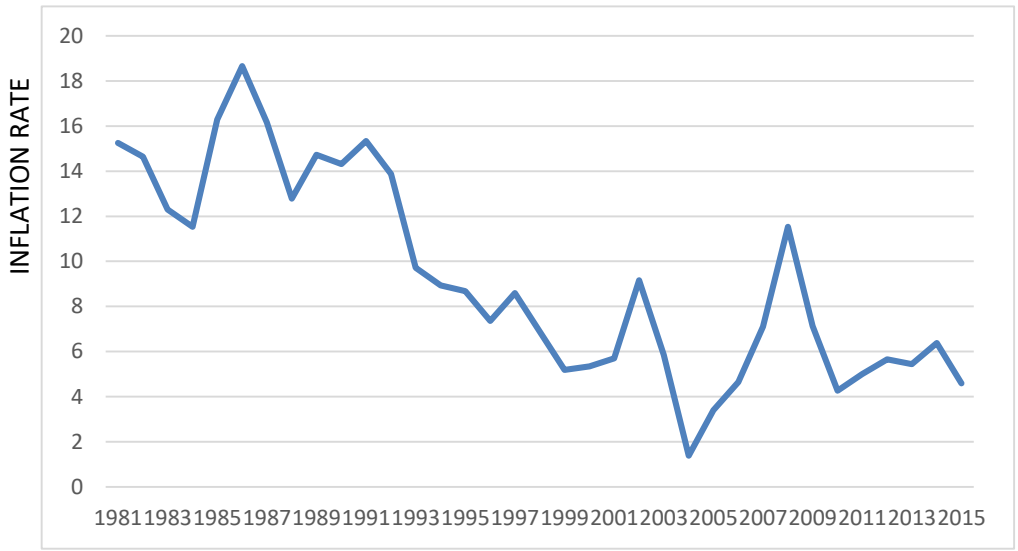
Model (VECM), Diagnostic tests, Stability tests, Impulse response and Choleski/Variance decomposition methodology.

2.5. Trends of the inflation rate, economic growth (GDP) and government spending in South Africa, 1981-2015.

This study looked at three selected variables, namely inflation rate, economic growth (GDP) and government spending during the period 1981 -2015.

2.5.1. Trend of the inflation rate (INFL)

Figure 2.7: The trend of the inflation rate during 1981 – 2015.



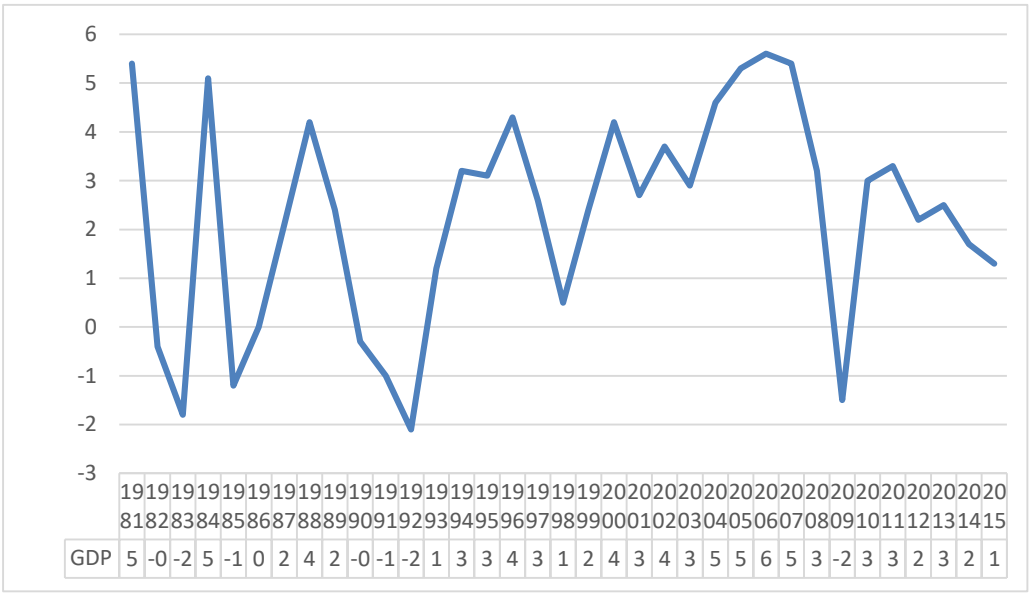
Source: Computation based on data obtained from the South African Reserve Bank (SARB).

Figure 2.7 shows the trend and behaviour of the inflation rate for the period 1981 - 2015. South African inflation rose notably during the 1980s, but the same happened in most parts of the world due to a spate of oil price shocks. Inflation started to decline from the 1990s as sanctions were lifted and the economy gradually liberated,

it is clear from the figure that the inflation rate was at its highest levels during the period 1985 to 1987, reaching an all-time high of 20.70 percent in January of 1986, and reaching its lowest level in history on January 2004 at a record low of 0.20. Since 2002, the South African Reserve Bank embarked on inflation targeting so as to ensure that the level of inflation remains between 3% and 6%. It recovered after that until it increased sharply in 2008 and 2009, this was the result of the global financial crisis which started manifesting itself in late 2007, intensified in 2008 and resulted in the global recession of 2009 (Industrial Development Corporation, 2013). And again, reached its lowest level in March 2015, as prices increased less mostly for transport and food (Trading Economics, 2017).

2.5.2: Trend of the economic growth (GDP)

Figure 2.8: The trend of the economic growth (GDP) during 1981 – 2015.



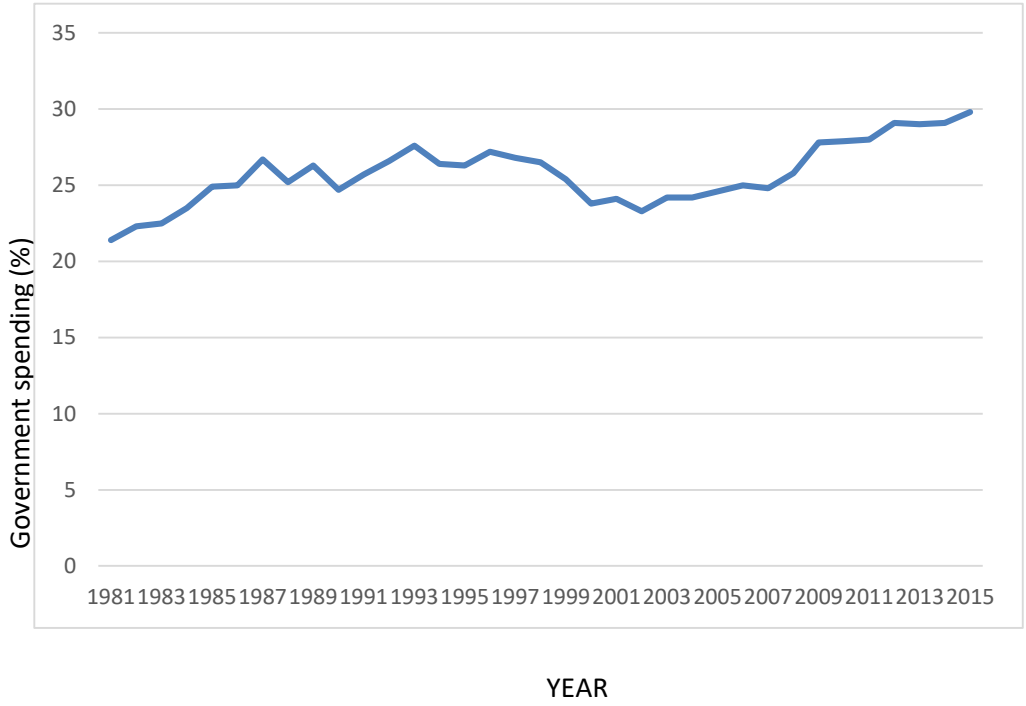
Source: Computation based on data obtained from the South African Reserve Bank (SARB).

Figure 2.8 shows the trend of economic growth (GDP) for the period 1981 – 2015. The general trend in real GDP was upwards during 1994–2007. South Africa's real

GDP growth was negative in the early 1990s (the initial decline that we see in Figure 2.8), but then turned positive and reached over 5% per year in each of the years 2005, 2006 and 2007. The South African economy was badly affected by the global economic crisis of 2008–2009, with calendar 2009 experiencing a drop in the level of GDP and therefore a negative growth rate (-1,5%, A period of recovery followed, with positive growth rates during 2010–2015, but these were still well below the achievements of 2005–2007 (Statistics South Africa, 2017). Gross Domestic Product of South Africa grew 1.3% in 2015 compared to 2014 (Trading Economics, 2017).

2.5.3: Trend of the government spending (GOVE)

Figure 2.9: The trend of the government spending (GOVE) during 1981 – 2015.



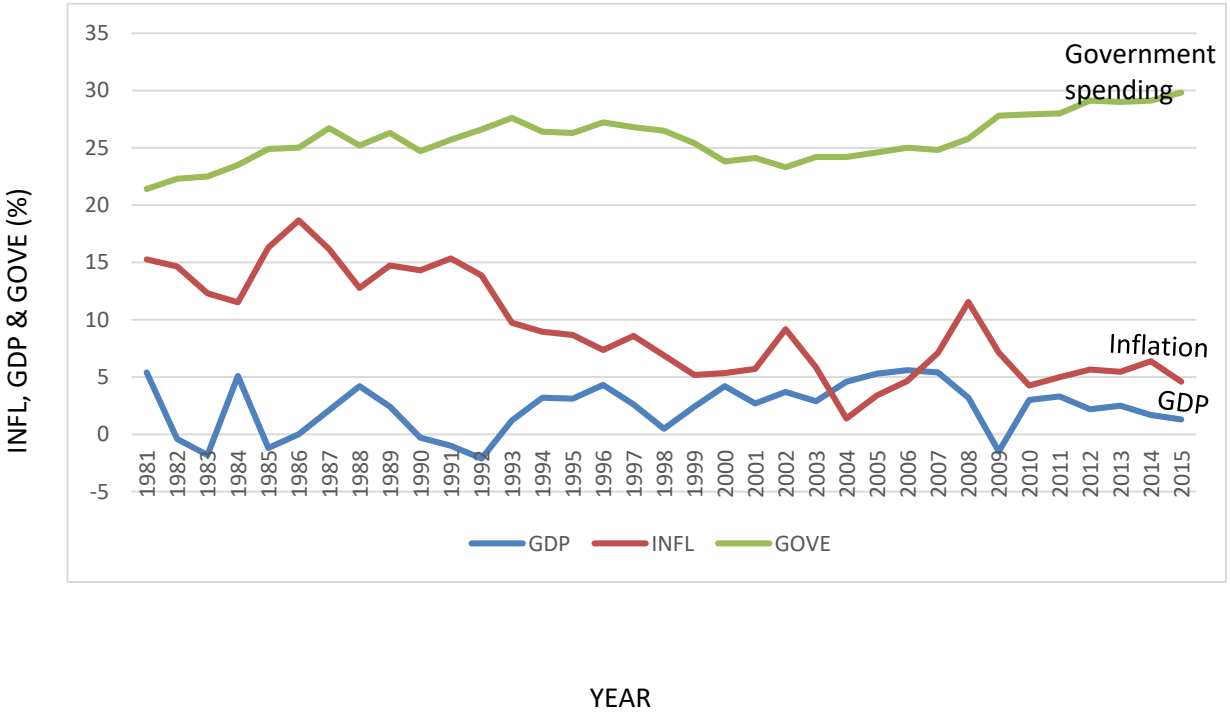
Source: Computation based on data obtained from the South African Reserve Bank (SARB).

Figure 2.9 shows the trend of government spending for the period 1981 – 2015. The figure shows a steady increasing trend from 1981 until around 2001. The robust economic growth experienced from 2002 until the 2008 worldwide economic crisis resulted in substantially increased government revenue inflows. These were used to fund higher expenditure levels, as well as to pay off government debt that had accumulated. Spending increased while total net loan debt decreased from 35.3 per

cent of South Africa's annual level of economic output in 2002/03 to 19.4 per cent of the country's GDP in 2008/09. Government spending increased strongly in real terms, that is, after taking inflation into account, at an average annual rate of 9.8 per cent from 2002/03 to 2009/10. Rapidly expanding budgets were used to broaden access to key public services, particularly for the poor. The world economic recovery from the 2008 recession remains positive, but subdued. This, together with structural challenges in the South African economy, has resulted in muted economic growth in recent years. Sustaining expenditure levels in this economic environment has meant that the annual budget shortfall has exceeded 4 per cent of GDP since 2009/10. By 2013/14, net loan debt levels had increased to approximately 40 per cent of GDP. During 2014 South Africa government spending was higher (National Treasury, 2015).

2.5.4: Trend of the inflation (INFL), economic growth (GDP) and government spending (GOVE)

Figure 2.10: The trend of the inflation (INFL), economic growth (GDP) government spending (GOVE) during 1981 – 2015.



Source: See figures 2.7-2.9

Figure 2.10 shows the trend of inflation (INFL), economic growth (GDP) and government spending (GOVE) in one diagram for the period 1981 – 2015. Consumer price inflation embarked on a generally declining trend over the period 1994 to 2001. Consumer price inflation (headline inflation) averaged 9% in 1994, falling gradually to 5.7% by 2001. The South African economy recorded its fastest growth rates during the period the period 2004 to 2007, with real GDP growth averaging 5.2% per annum. In 2008–2009 inflation rate was higher and economic growth was lower, there was a recession over three quarters when the country became caught up in the global financial crisis. Due to government's excessive public spending boom, the national government debt soared from 27.4 % in 2009 to 42.5% of (GDP) in 2012/13. After the 2008/9 global financial crisis, the government began to run large budget deficits to boost the country's economy, allocated mostly toward social services for the poor, including healthcare and education (Industrial Development Corporation, 2013).

2.6 Challenges of government expenditure in South Africa

South Africa's economic challenges worsened in the first quarter of 2017 as the economy entered a technical recession, this is the first technical recession (two consecutive quarters of negative growth) since 2009 (Amra & Fuduswa, 2017). Using the widely accepted measure of 'recession' as two (or more) consecutive quarters of negative growth (real GDP quarter-on-quarter), this means that South Africa has experienced eight economic recessions since 1961, the longest occurred in 1991-1992, mainly as result of a global economic downturn. In 2008–2009 there was a recession during three quarters when the country became caught up in the global financial crisis.

2.6.1 Technical recession in South Africa

Figure 2.11: South Africa has experienced eight recessions since 1961

Source: STATS SA

In 2017, the economy contracted by 0.7 per cent compared to the previous quarter on a seasonally adjusted and annualised basis. This follows the 0.3 per cent contraction recorded for the fourth quarter of 2016. Compared with the same quarter of 2016, the economy contracted in the first quarter of 2017 by a substantial 1.2 per cent (Amra & Fuduswa, 2017). Expenditure on real gross domestic product decreased by 0,8% in the first quarter of 2017, following a decrease of 0,1% in the fourth quarter of 2016.

2.6.2 Growth in GDP and growth in expenditure on GDP (%) in the first quarter of 2017

Figure 2.12 Growth in GDP (%)

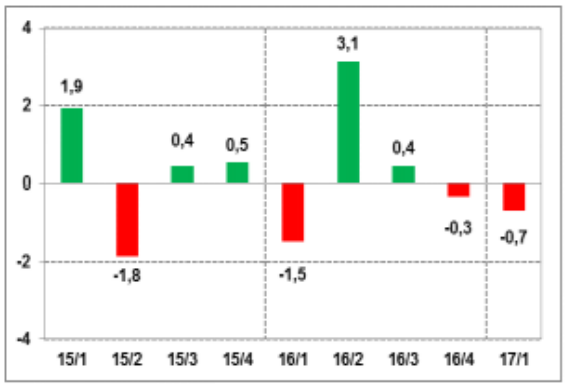
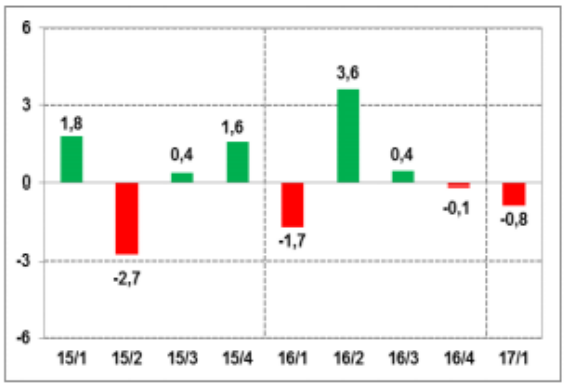


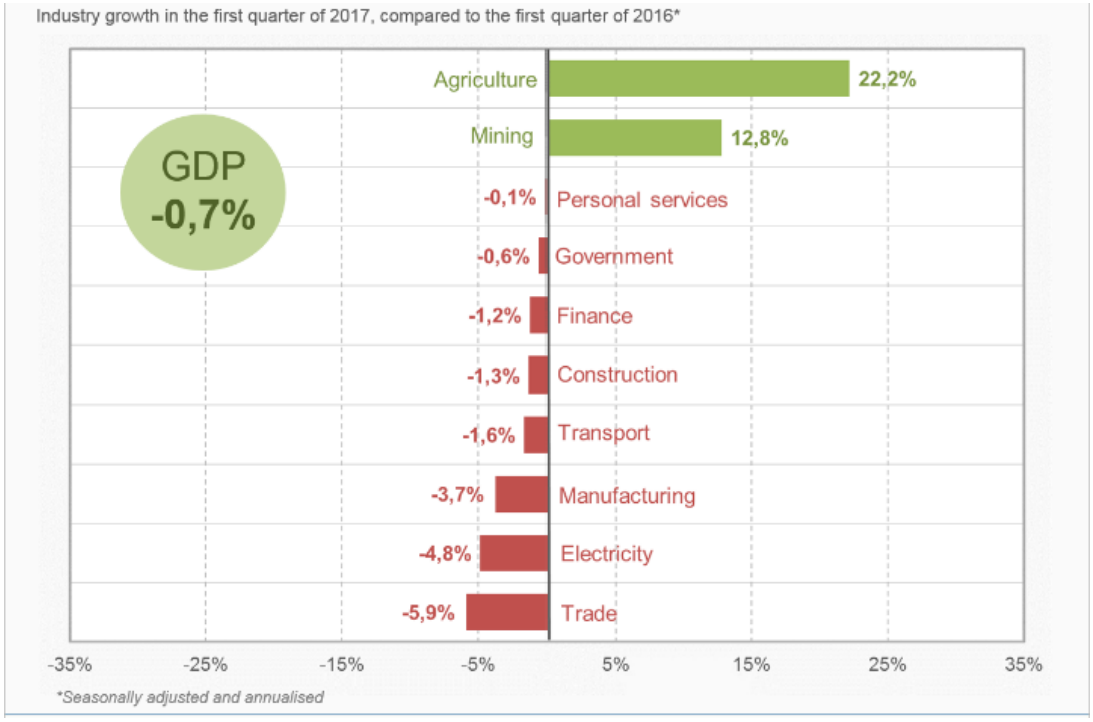
Figure 2.13 Growth in expenditure on GDP (%)



Source: STATS SA

2.6.3 South African Industry growth

Figure: 2.14: Industry growth in the first quarter of 2017, compared to the first quarter of 2016.



Source: STATS SA

Figure 2.14 indicates that the largest negative contributor to growth in GDP in the first quarter was the trade which declined by 5,9% and contributed -0,8 of a percentage point to GDP growth. Electricity decreased by 4.8%. The manufacturing industry decreased by 3,7% and contributed -0,5 of a percentage point. Transport decreased by 1.6%, Construction declined by 1.3%, finance decreased by 1.2%, Government declined by 0.6%, personal services decreased by 0.1%, In contrast the mining and quarrying industry increased by 12,8%, and contributed 0,9 of a percentage point to GDP growth. And the agriculture increased by 22,2%, contributing 0,4 of a percentage point to GDP growth (Statistics South Africa, 2017).

A credit-rating agency, Standard & Poor's (SP) downgraded South Africa to sub-investment grade, in April 2017. The poor performance was driven by contracting household and government spending (Amra & Fuduswa, 2017).

Table 2.1: South Africa credit rating

Agency	**Rating**	**Outlook**	**Date**
Moody's	Baa3	Negative	Jun 09 2017
Fitch	BB+	Stable	Apr 07 2017
Moody's	Baa2	Negative Watch	Apr 03 2017
S&P	BB+	Negative	Apr 03 2017

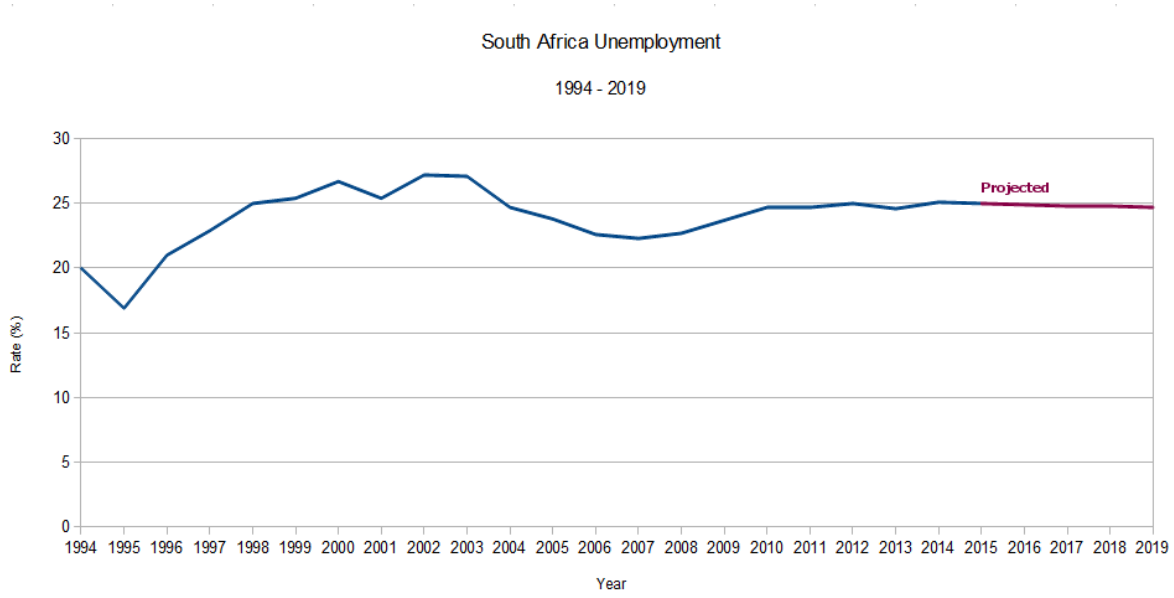
Source: Trading Economics

Table 2.1 shows the government debt credit rating for South Africa as reported by different major credit rating agencies. Standard & Poor's credit rating for South Africa stands at BB+ with negative outlook. Moody's credit rating for South Africa was last reported at Baa3 with negative outlook and Fitch's credit rating was last reported at BB+ with stable outlook. In general, a credit rating is used by sovereign wealth funds, pension funds and other investors to gauge the credit worthiness of South Africa thus having a huge effect on the country's borrowing costs (Trading Economics, 2017).

Continued slow investment and economic growth has resulted in unemployment rising to a 13 year high of 27.7 per cent. Economic growth over the medium term, constrained by weak household spending, low investment and the effects of fiscal consolidation, is expected to be poorer than expected at the beginning of the year, implying fiscal projections presented in the Budget Review in February will not be realized (Amra & Fuduswa, 2017). According to the Statistics South Africa (Stats SA) Technical recession had caused people to lose their jobs. There was a decline in employment in both the March 2017 and June 2017 quarters. The QES recorded consecutive losses of 41 000 jobs and 34 000 jobs over the last two quarters, respectively;

- More bad news looms for job-seekers as the formal non-agricultural sector of the economy reported a decline of 34 000 jobs for the quarter ended June 2017.
- The manufacturing industry reported the highest job loss of 13 000 employees.
- The construction industry reported about 11 000 jobs losses, the community and social services industry with 10 000 jobs, the transport and communication industry with 5 000 jobs and the business services industry with 1 000 jobs

Figure 2.15: South African unemployment rate



Source: Trading Economics

Figure 2.15 indicates that South Africa's unemployment rate came in at 25.0 percent in 2015, unchanged from the previous period's 11-year high, meaning It is the highest jobless rate since the first quarter of 2004 as unemployment rose faster than employment and more people joined the labour force. Historical data shows that South Africa has always had a really high rate of unemployment, entering into the top 10 for the first time in 1997 with an unemployment rate of 22.9%. The country's worst levels of unemployment were experienced in 2002 and 2003, when the rate climbed over 27%; however, relative to other countries, the highest placement in the ranking was in 2000, when the rate of 26.7% was the 5th highest in the world (Trading Economics, 2017).

International Labour Organisation (ILO) projected South Africa to have the 8th highest unemployment rate in the world in 2015. More than 61 million jobs have been lost since the start of the global crisis in 2008. The number of unemployed fell by 37 thousand to 6.18 million while the number of employed declined by 113 thousand to 16.10 million (Trading Economics, 2017). Increasing levels of unemployment is associated with higher dependency on government social grants. Although South Africa does not have an unemployment grant, households have become increasingly dependent on social grants. It has been reported that since

2009 the portion of households stating social grants as the main source of income has increased from 15 per cent to over 20 per cent (Amra & Fuduswa, 2017).

2.7 Does government expenditure spur economic growth?

Government expenditure is an important instrument for government to control the economy. It plays a significant role in the functioning of an economy. The question whether government expenditure spur or retard economic growth has caused an intense debate between policy makers, advocates and studies, and this issue seems to continue. The size of government expenditures and its impact on economic growth, and vice versa, has been a problem of sustained interest for over decades now. The relationship between government expenditure and economic growth has continued to generate series of debates among different scholars in economic literature (Ogundipe & Oluwatobi, 2013). A government can play a key role in strengthening the technological capability of firms through its spending on critical infrastructures, this takes place when technology is endogenously determined as in the new endogenous growth theory. This would positively affect firms' productivity countrywide and boost long-run growth.

An increase in government expenditure or spending heavily on physical infrastructure such as roads, communication, and power can reduce production costs, which will lead to an increase in private sector investment and profitability of firms, thus fostering economic growth, However, this also lead to improvement of economic welfare of the people and facilitate production of goods and services across all sectors of the economy so as to stimulate rapid growth in aggregate output. An increase in government expenditure on social and economic infrastructure can be growth-enhancing, for example government expenditure on health and education raises the productivity of labor and increase the growth of national output. A better educated labour force lead to an increase on the return on research and development and ensures that discoveries are more readily absorbed in the productive structure of the economy. (Ogundipe & Oluwatobi, 2013) (Maku, 2009).

2.8 Policies to moderate government spending, reduce inflation and promote economic growth.

South Africa faces difficult choices in a rapidly changing world. Economic growth, which has steadily weakened over the past five years, is likely to increase moderately over the medium term. Yet this rate of growth will not be sufficient to markedly reduce unemployment, poverty and inequality (National Treasury, 2017) . Government's measured fiscal consolidation is working to narrow the budget deficit and stabilise debt, building confidence in the economy. But substantial revenue under-collection in 2016/17 has imposed sharper limits on public spending (National Treasury, 2017). At the same time, the rise of aggressive unilateralism in advanced economies, and mounting uncertainty over the course of world trade, pose serious threats to the global outlook. Slow economic growth has placed enormous pressure on the public finances. Government remains committed to a measured, prudent course of fiscal consolidation to narrow the budget deficit and stabilise debt. Doing so will reduce the economy's exposure to global volatility (National Treasury, 2017).

Government expenditure is an important instrument for government to control the economy. It plays a significant role in the functioning of an economy both in developed or underdeveloped economies. The size of government expenditures and its impact on economic growth, and vice versa, has been a problem of sustained interest for over decades now. The relationship between government expenditure and economic growth has continued to generate debate among different scholars in economic literature both in developed and underdeveloped (emerging market) economies (Loizides & Vamvoukas, 2004). The following policies need to be implemented to spur economic growth, According to Swanepoel and Schoeman (2003):

2.8.1 Fiscal Policy

Government remains committed to a sound and stable fiscal policy, aimed at ensuring the sustainability of South Africa's economic transformation, promoting jobs and investment, and ensuring that public services reflect Government's priorities. Government's fiscal policy strives to support structural reforms of the South African

economy consistent with long run growth, employment creation and an equitable distribution of income (SARB, 2000). Its goals include promoting investment and export expansion while allowing Government to finance public services, redistribution and development in an affordable and sustainable budget framework. The Government's commitment to sound public finances and a sustainable deficit has protected South Africa from the worst of the current international financial crisis, and has contributed to the structural changes needed to strengthen the long run performance of the economy (National Treasury, 1998).

Fiscal policy objectives are:

- ensuring a sound and sustainable balance between Government's spending, tax and borrowing requirements;
- improving domestic savings to support a higher level of investment and reduce the need to borrow abroad;
- keeping government consumption spending at an affordable level, contributing to lower inflation and a sustainable balance of payments;
- supporting an export-friendly trade and industrial strategy to improve South Africa's competitiveness; and
- ensuring that pay increases within the public sector are market and productivity related, and are fiscally sustainable.

Fiscal policy usually assists in stabilizing the economy through the operation of automatic stabilizers. Government balances tend to increase when output is above trend, and decline when output is relatively low. During a boom, with growth in incomes, consumption, output and employment, government revenue will increase due to higher direct and indirect taxes and lower expenditure such as unemployment insurance benefit payments (Swanepoel & Schoeman, 2003). During a recession, the opposite applies. Growing government borrowing represents a net increase in domestic demand so that this automatic fiscal impact tends to moderate economic downturns. Conversely, falling government borrowing assists to dampen economic booms (Swanepoel & Schoeman, 2003) .

Fiscal policy has been a great success in developed countries and in developing countries. The role of fiscal policy in developed economies is to maintain full employment and stabilize growth. In developing countries, fiscal policy is used to

create an environment for rapid economic growth (Popa & Codreanu, 2010). The various aspects of this includes the following aspects:

- Mobilisation of resources: Developing economies are characterized by low levels of income and investment, which are linked in a vicious circle. This can be successfully broken by mobilizing resources for investment energetically.
- Acceleration of economic growth: The government has not only to mobilize more resources for investment, but also to direct the resources to those channels where the yield is higher and the goods produced are socially acceptable.
- Minimization of the inequalities of income and wealth: Fiscal tools can be employed to bring about the redistribution of income in favor of the poor by spending revenue so raised on social welfare activities.
- Increasing employment opportunities: Fiscal incentives, in the form of tax-rebates and concessions, can be employed to promote the growth of those industries that have high employment generation potential.
- Price stability: Fiscal tools can be used to contain inflationary and deflationary tendencies in the economy.

Fiscal policy is a useful tool for supporting growth. Fiscal policy can play a significant role in supporting strong, lasting and equitable growth. In the aftermath of the global financial crisis, potential output in many affected countries declined sharply. Restoring robust growth is crucial for addressing the fiscal challenges ahead. Fiscal policy can make a significant contribution to lifting potential growth (International Monetary Fund, 2015). At the macro level, fiscal policy helps ensure macroeconomic stability, an essential prerequisite for achieving and maintaining economic growth; at the micro level, tax and expenditure policies can boost growth by altering work and investment incentives, promoting human capital accumulation, and enhancing total factor productivity, it can also boost the employment level. Consistent with earlier studies, fiscal policy is described to encompass overall budget balance, tax, and expenditure policies. Fiscal policy promotes growth through macro and structural tax and expenditure policies (International Monetary Fund, 2015).

2.8.2 Monetary policy

The primary objective of monetary policy in South Africa is to achieve and maintain price stability in the interest of sustainable and balanced economic development and growth. Price stability decreases uncertainty in the economy and, therefore, offers a favourable environment for growth and employment creation. Furthermore, low inflation contributes to the protection of the purchasing power of all South Africans, particularly the poor who have no means of defending themselves against continually rising prices (Mboweni, 2000).

The Bank has full operational autonomy. Monetary policy is set by the Bank's Monetary Policy Committee (MPC), which conducts monetary policy within a flexible inflation-targeting framework. This allows for inflation to be out of the target range as a result of first-round effects of a supply shock and for the Bank to determine the appropriate time horizon for restoring inflation to within the target range. This flexibility does not relieve the Bank of its responsibility with respect to returning inflation to within the target range but allows for interest rate smoothing over the cycle, which may mitigate any output variability from the monetary policy response to the shock (SARB, 2000).

Monetary Policy is defined as the process by which the monetary authority of a country takes charge of the Supply of money, often targeting a rate of interest for the aim of promoting economic growth & stability. The official goals usually consist of relatively stable prices & low level of unemployment. It is regarded to as either being expansionary or contractionary, where an expansionary policy means an increase in the total supply of money in the economy more rapidly than usual, & the contractionary policy means the expands of the money supply more slowly than usual or even decreases it (Uddin & Halim, 2015). Expansionary policy is traditionally employed to try to reduce unemployment level in a recession by lowering interest rates in the hope that ease credit will entice businesses into expanding. Contractionary policy is intended to slow inflation to avoid the resulting distortions & deterioration of assets values (Uddin & Halim, 2015). Briefly, monetary policy, to a great extent, is the management of expectations. It rests on the relationship between the rate of interest in an economy that is the price at which money can be borrowed

or total supply of money. The monetary policy was introduced from the late 19th century, where it was first employed to maintain the gold standard (Himani, 2014).

2.8.3. Investments

The general investment environment remains encouraging. A G20 country, South Africa is regarded as a country with low-risk investment destination for investors looking for a foothold into Africa. As the continent's largest African investor, South Africa sends more than 25% of its manufactured products into the continent. Through investment incentives and industrial financing interventions, the government actively seeks to boost commercial activity and attract foreign capital. According to the World Investment Report by the United Nations Conference on Trade and Development (2015), global foreign direct investment slowed by 16% to $1.23-trillion in 2014, In line with this, the report said foreign direct investment flows into South Africa declined by 31.2% to $5.8-billion in 2014, down from $8.3-billion in 2013. This was off earnings of about R42-billion in foreign direct investment in 2011, which was more than four times the amount in 2010 (United Nations, 2015). South African main exports are metals and minerals. Machinery and transportation equipment make up more than one-third of the value of the country's imports. Other imports include automobiles, chemicals, manufactured goods, and petroleum, its principal international trading partners of (besides other African countries) are: China, the United States, Germany, Japan, and the United Kingdom (Brand South Africa, 2015).

The relationship between foreign direct investment and economic growth has been an interest topic for decade now. Physical investment both public and private is a significant driver of growth in all economies and also holds the key to improvements in productivity. The role of investment in the economic growth process has gone through several phases. Economic growth and development rely essentially on a country's ability to invest and make efficient and productive use of its resources. Private investment has been an engine for employment and income creation and it also has a role to play in the delivery of both infrastructure and social services. Investments play an important role in enhancing the economic, briefly, there cannot be growth without investment of sufficient amount and quality. In short, investment is

both a result (driver)t and cause of economic growth. Efficient and stable private investment activities provide a lot of opportunities to developing countries, including OIC countries (Bayraktar, 2003).

Investment are associated with both economic and social rewards. Although financing private investment can require variety sources, its bulk continues to be funded by domestic savings. However, having access to foreign sources of capital play an increasingly significant role for the private sector in both developing and developed countries. Hence, international sources of capital have become a significant part of private investment in developing countries in recent years. Long-term investment flows, especially foreign direct investment (FDI), are crucial in complementing the national development efforts of developing countries, especially to consolidate infrastructure development, enhance technology transfer, grow productive linkages and increase overall competitiveness (Bayraktar, 2003). Public investment in basic infrastructure, such as roads, ports, and telecommunications, that supports private investment projects, is likely to have a major effect on the economic growth and this can lead to the attraction of further private investment. Public investment in infrastructure can act as a powerful catalyst to enhance private investment and growth. Encouraging investment in the country can promote the economic growth. It was investigated that high private investment are associated with high demand growth, availability of financing, low fiscal deficits, price stability and low external indebtedness. In fact, private investors respond positively to economic growth. While growth of demand is crucial reasons for investment, on the other hand high level of inflation rate deter investors because of the unpredictably attending distorted relative level of prices (Bayraktar, 2003).

Foreign Direct Investment (FDI) is a crucial part of the massive private investment which is responsible for driving economic growth around the world, especially in the past two decades. Different policy makers have taken into account various incentives and policies to attract foreign direct investment. Foreign direct investment is part of a broad a solution aiming at sustaining high economic growth rate, rising employment opportunities and improving living standards of both developed and developing countries. This approach can, therefore be an important factor in enhancing and development potential of the host developing countries, Because of the role it played

over the past two decades and still playing in the economy foreign direct investment is wanted by most if not all (Dabour, 2000).

The net benefits from foreign direct investment do not grow automatically, and their significant vary according to host country and condition. The features that hold back the full benefits of foreign direct investment in some developing countries include the level of general education and health, the technological level of host-country enterprises, insufficient openness to trade, weak competition and inadequate regulatory frameworks. On the other hand, a level of technological, educational and infrastructure achievement in a developing country does, other things being equal, equip it better to benefit from a foreign presence in its markets. All benefits of foreign direct investment are a key component for successful and sustainable economic growth and also a part of a method to social improvement, playing a crucial role on growth, it contributes to higher economic growth, which is the major instrument for reducing poverty. Foreign Direct Investment (FDI) is regarded as the fundamental part for an open and successful international economic system and a major mechanism for development (Kastrati, 2013).

Human capital investment is described as a major catalyst for achieving accelerated economic growth and reducing level of extreme poverty especially in developing countries. Human capital investment is a key instrument of sustaining long-run economic growth and improved productivity. human capital investment also play role in the economy as an end or objective of development, it is a way to achieve the potential of people by enlarging their capabilities and this necessarily implies empowerment of people, allowing them to participate actively in their own development (Olayemi, 2012).

2.9 SUMMARY

This chapter discussed the theoretical and empirical framework which outlines the relationship between inflation, economic growth and government expenditure. Most of the existing literature available on the relationship between inflation, economic growth and government spending has revealed that inflation can influence government spending and economic growth in either positive or negative way

through various channels. Moreover, the causality relationship can run from both sides in different periods as well as in different countries. This chapter also discussed South Africa's trends of the inflation, economic growth and government expenditure. The South African inflation rose notably during the 1980's, and started to decline from the 1990's as sanctions were lifted and the economy gradually liberated. South African economy was found to have badly affected by the global economic crisis of 2008-2009, with calendar 2009 experiencing a drop in the level of GDP and therefore a negative growth rate. Government spending increased strongly in real terms, that, is after taking inflation into account, at an average annual rate of 9.8% from 2002/03 t0 2009/10.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter describes the research methodology and the steps followed in conducting the research which are: data collection, data analysis and estimation procedures that will be carried throughout the study, as well as the model used in the study.

3.2 Model Specification

The E-views 9 statistical package was used to analyze the data. In this study the time series regression analysis was conducted by utilizing Johansen cointegration test to determine the long-run relationship. The research study estimated the relationship between inflation, economic growth and government expenditure in South Africa depicted by the following relationship.

$$GDP = f(INFL, GOVE, INV) \quad 3.1$$

Equation 3.1 in functional form represents the relationship between the dependent variable (economic growth) and independent variables (inflation, government spending and investment) which is line with study such as Muhammed and Attiya (2013).

$$GDP_t = \alpha + \beta_1 INF_t + \beta_2 GOVE_t + INV_t + \mu_t \quad 3.2$$

Where:

GDP = economic growth rate

INF = CPI (consumer price index)

GOVE = government expenditure

INV = investment level

μ_t = Error term (The error term is included in the equation to provide for other factors that may influence the relationship of the selected variables)

3.3 Data sources

This study relies largely on secondary data. The data used was collected from the South African Reserve Bank (SARB), Statistics South Africa Annual publications and World Investment Reports (WIR). The data consists of 35 years' annual observations of percentage changes in inflation, economic growth and government expenditure of the South African economy.

3.4 Estimation techniques

The estimation applied in this research study included the following, the mostly applied econometric techniques unit root tests: Augmented Dickey-Fuller (ADF) and Phillips Perron test (PP) which is followed by the choice of the lag length, and the application of Johansen Co-integration test, Vector Auto Regression (VAR), Vector Error Correction Model (VECM), VEC Granger causality/Block exogeneity Wald test, Diagnostic tests, Stability tests, Impulse response and Choleski/Variance decomposition methodology.

3.4.1 Unit root tests

The model applied in this research study contains economic variables that are of time series in nature, therefore the empirical analysis starts by examining the statistical properties of these variables. In most studies where time series data analysis was used, it was observed that these time series contain a unit root. In the same vein the study uses the Augmented Dickey-Fuller test (ADF) and Phillips Perron (PP) technique to test for the presence of unit root in the time series variables. Such tests are appropriate in this study because if regression results prove to be non-stationary then this will likely result in false research results.

3.4.1.1 The Augmented Dickey-Fuller (ADF) test

The Augmented Dickey Fuller (ADF) test is based on the null hypothesis that a series is not stationary (that is has a unit root) against the alternative that it is stationary. If you reject the null hypothesis, you conclude that the time series is stationary. A time series is stationary if the mean and autocovariances do not depend on time. A series that achieves stationarity after first-differencing is said to have a unit root, and to be integrated of order one. The ADF approach tests for a unit root, and controls for higher-order serial correlation in a series (Shafuda, 2015). The first-difference terms, a constant, and a linear time trend are included in the ADF test specification. Augmented Fuller Dickey (ADF) requires a determination of the order of integration of the variables of interest. The ADF test is given by the following equation:

$$\Delta X_t = a + bX_{t-1} + \sum cj\Delta X_{t-1} + e_t$$

Where, X_t, denotes the respective variables of interest, Δ is the difference operator, while a, b and c are parameters to be estimated. The tests are based on the null hypothesis (H_0): X_t contains a unit root. If the calculated ADF statistics are less than (higher than in the obsolete term) their test critical values, then the null hypothesis (H_0) is rejected and the series is stationary. Dickey and Fuller (1979, 1989) devised this procedure of formally testing for non-stationarity (unit root). The key insight of their argument is that testing for non-stationarity is equivalent to testing for the existence of a unit root (Shafuda, 2015). The ADF test has been criticized because it does not allow for the presence of structural breaks. It is possible for the ADF test to erroneously reject the unit root hypothesis if the series has structural breaks.

3.4.1.2 Phillips-Perron (PP) test

An alternative unit root testing approach that can be used in the context of models with weakly dependent errors is that of Phillips (1987) and Phillips & Perron (1988), known as the Phillips Perron [PP] unit root test. In contrast to the ADF approach, the

PP test deals with serial correlation in the errors by employing a nonparametric serial correlation correction factor, which is based on a consistent estimate of the long-run variance of the error process (Castro, Rodrigues, & Taylor, 2013). Phillips-Perron (PP) test usually suffer from severe size distortions when there are negative moving average errors. Although the size of the Dickey-Fuller test is more accurate, the problem is not negligible (Perron & Serena,1996). Perron (1989) shows that "failing to allow for an existing break, leads to a bias that reduces the ability to reject the unit root hypothesis, which is otherwise false.

3.4.2 The choice of lag length

After the unit root test, this study determined the choice of the lag length in the VAR. An important preliminary step in model building-is the employment of the Johansen Cointegration methodology when selecting the VAR lag order. In this research study the selection criteria such as Likelihood Ratio (LR), the sequential modified LR test statistic (each test at 5% level) Final prediction error (FPE), Akaike Information Criteria (AIC), Schwartz Information Criterion (BIC), and alongside with the Hannan-Quinn Criterion (HQC) proposed by Sims (1980) were used. The optimal lag length determined was applied when estimating the Vector Error Correction Model (VECM).

3.4.3 Johansen Cointegration test

Johansen cointegration methodology applied in this research study allows a researcher to test a hypothesis consisting of one or more coefficients in the cointegrating relationship by viewing the hypothesis as a restriction on the matrix. If there exist r cointegrating vectors, only these linear combinations or linear transformations of them, or combinations of the cointegrating vectors, will be stationary. In fact, the matrix of cointegrating vectors β can be multiplied by any non-singular conformable matrix to obtain a new set of cointegrating vectors. Unlike Engel-Granger the Johansen setup does allow the testing of hypotheses about the equilibrium relationships between the variables. There are two statistics that can be used in conducting Johansen cointegration test which are trace test and maximum eigenvalue test (Brooks C. , 2008).

Trace test (λ_{trace}) is a joint test where the null represents the number of cointegrating vectors which is less than or equal to r against an unspecified or general alternative that there are more than r cointegrating vectors. It starts with p eigenvalues, and then successively the largest is removed. Maximum eigenvalue test $(\lambda_{\max})$ conducts separate tests on each eigenvalue, and has as its null hypothesis that the number of cointegrating vectors is r against an alternative of $r+1$ (Brooks C. , 2008).

3.4.4 Vector Error Correction Model (VECM)

If cointegration has been found between series this signify the existence of long term equilibrium relationship between them meaning that the VECM technique must be applied. Vector Error Correction Model (VECM) is applied to evaluate the short run properties of the cointegrated series. If cointegration does not exist, VECM is no longer required and the VECM Granger causality tests are conducted to establish causal links between variables (Asari, Baharuddin, Jusoh, Mohammad, Shamsudin, & Jusoff, 2011).

Enders (2010) derived visual structures of VECM and in this study the structure is contextualised as follows:

$$\begin{bmatrix} \ln GDP_t \\ \ln INF_t \\ \ln GOE_t \\ \ln INV_t \\ (1) \end{bmatrix} = \begin{bmatrix} \gamma_{11}\gamma_{12}\gamma_{13}\gamma_{14} \\ \gamma_{21}\gamma_{22}\gamma_{23}\gamma_{24} \\ \gamma_{31}\gamma_{32}\gamma_{33}\gamma_{34} \\ \gamma_{41}\gamma_{42}\gamma_{43}\gamma_{44} \\ (2) \end{bmatrix} \begin{bmatrix} \ln GDP_{t-1} \\ \ln INF_{t-1} \\ \ln GOE_{t-1} \\ \ln INV_{t-1} \\ (3) \end{bmatrix} + \begin{bmatrix} \alpha_{11}\alpha_{12}\alpha_{13}\alpha_{14} \\ \alpha_{21}\alpha_{22}\alpha_{23}\alpha_{24} \\ \alpha_{31}\alpha_{32}\alpha_{33}\alpha_{34} \\ \alpha_{41}\alpha_{42}\alpha_{43}\alpha_{44} \\ (4) \end{bmatrix} \begin{bmatrix} \beta_{11}\beta_{21}\beta_{31}\beta_{41} \\ \beta_{12}\beta_{22}\beta_{32}\beta_{42} \\ \beta_{13}\beta_{23}\beta_{33}\beta_{43} \\ \beta_{14}\beta_{24}\beta_{34}\beta_{44} \\ (5) \end{bmatrix} \begin{bmatrix} \ln GDP_{t-1} \\ \ln INF_{t-1} \\ \ln GOE_{t-1} \\ \ln INV_{t-1} \\ (6) \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \\ (7) \end{bmatrix}$$

Where:

Column 2 represents short run coefficients

Column 4 represents adjustment coefficients

Column 5 represents long run cointegrating vectors

In this study the VECM model is estimated using Eviews 9 statistical package

3.4.5 VECM Granger causality/Block exogeneity Wald test

To determine the causality between inflation, economic growth and government expenditure the study applied Vector Error Correction Model (VECM)/(VAR) Granger causality/Exogeneity Wald test. The Granger causality is essentially used to test for causality between subsets of the variables and has become common in the empirical literature following their use in Sims (1980) to test the block exogeneity of the real sector in Vector Autoregressions (VAR's) fitted with real and monetary variables for both Germany and the U.S.A. Such test is routinely performed using Wald criteria that are thought to be asymptotically chi-squared, as indeed they are in stationary or trend stationary systems. In other research work, Phillips and Durlauf (1986), Park and Phillips (1988, 1989), and Sims, Stock, and Watson (1990) have all shown that the asymptotic theory of Wald tests is typically much more complex in systems that involve variables with stochastic trends. In general, one can expect the limit theory to involve nuisance parameters and nonstandard distributions both of which substantially complicate inference procedures, as originally pointed out in the Phillips-Durlauf (1986) paper. In their study of causality tests, Sims, Stock and Watson (1990) investigate specifically at trivariate systems and conclude that the Wald test has a limiting chi-squared distribution if the time series are cointegrated and if the long run relationship involves the variable that is excluded under the null hypothesis (Toda & Phillips, 1993). The trivariate model of the study is expressed as follows:

$$GDP_t = \alpha_1 + \sum_{j=1}^{p} \alpha_j GDP_{t-j} + \sum_{j=1}^{p} \beta_j INFL_{t-j} + \sum_{j=1}^{p} \chi_j GOVE_{t-j} + \mu_t \quad 3.3$$

$$INFL_t = \alpha_2 + \sum_{j=1}^{p} \delta_j GDP_{t-j} + \sum_{j=1}^{p} \phi_j INFL_{t-j} + \sum_{j=1}^{p} \varphi_j GOVE_{t-j} + \nu_t \quad 3.4$$

$$GOVE_t = \alpha_3 + \sum_{j=1}^{p} \eta_j GDP_{t-j} + \sum_{j=1}^{p} \theta_j INFL_{t-j} + \sum_{j=1}^{p} \psi_j GOVE_{t-j} + \nu_t \quad 3.5$$

3.4.6 Diagnostic test

To ensure that the results of the linear regression model yield true estimates, the researcher performed some diagnostic test such as Jarque Bera normality test, Ljung-Box autocorrelation test. Since the statistical and econometric literature on testing for heteroscedasticity are quite extensive, the study explained few of them which are: ARCH heteroscedasticity test, White heteroscedasticity test, Harvey heteroscedasticity test.

3.4.6.1 Normality test

Jarque-Bera is defined as a goodness-of-fit test which tests whether sample data have the skewness and kurtosis matching a normal distribution. The null hypothesis is a joint hypothesis of the skewness being zero and the excess kurtosis being zero. Samples from a normal distribution have an expected skewness of 0 and an expected excess kurtosis of 0 (which is the same as a kurtosis of 3) (Jarque & Bera, 1987).

The Jarque-Bera test works by comparing the sample versions of the coefficient excess skewness

$$Y1 = \frac{\mu_3}{\left(\sqrt{\mu_2}\right)^3}, \qquad 3.6$$

And the coefficient of excess kurtosis,

$$Y2 = \frac{\mu_4}{\mu_2^2} - 3, \qquad 3.7$$

With their theoretical values of zero under normality. Every symmetric distribution should have $Y1 = 0$

The ideas of skewness and kurtosis sometimes provide confusion over the relationship between these terms and the shape of a distribution. If an asymmetric distribution has its long tail on the right of the distribution, it means there is positive skew, and $Y1 > 0$, a chi-squared is one of the example. Distributions with kurtosis different from that of the normal could have fatter tails (and hence a thinner centre)

or thinner tails (and hence a fatter centre). A platykurtic distribution has $Y2 \leq 0,$ and is fatter in the centre than normal, and thinner in the tails, whilst a leptokurtic distribution, with $Y2 \geq 0$, is thinner in the centre and hence has fatter tails. The problem with using these definitions is that they do not always match visual inspection of the graphs of densities. For example, an N(0,3) distribution appears to have fatter tails than the N(0,1), but has exactly the same kurtosis.

For a given data set, $Y1,...,Y_{n,}$ and estimates of $\mu_{2,}\mu_3$ and μ_4 are obtained from sample moments and hence the jth sample moment is

$$m_j = \frac{1}{n}\sum_{t=1}^{n}(Y_t - \overline{Y})\, j. \qquad 3.8$$

One could use degrees of freedom correction (n-1), when the test is conducted on a large sample, otherwise this can be ignored. Estimates of $Y1$ and $Y2$ are then obtained directly as

$$Y1 = \frac{m_3}{\sqrt{(m_2)3'}} \qquad Y2 = \frac{m_4}{m_2^{2}} - 3. \qquad 3.9$$

For large samples the Jarque-Bera test for normality is based on the statistic

$$BJ = n\left(\frac{Y_1^{\,2}}{6} + \frac{Y_2^{\,2}}{24}\right) \xrightarrow{D} X_2^{\,2} \qquad 3.10$$

This can be derived from the LM test principle by embedding the null hypothesis of a normal distribution for Y_t within a more general distributional form:

$$mj = \frac{1}{n}\sum_{t=1}^{n} e_t^{\,j}\ . \qquad 3.11$$

This test examines only if the third and fourth sample moments of the data are compatible with the third and fourth moments of a normal distribution (Stewart & Gill, 1998).

3.4.6.2 Autocorrelation test

The Ljung-Box Q-Statistic is a test statistic for the null hypothesis of no autocorrelation for a specified order of autocorrelation lags. If there is no serial correlation, the autocorrelations and partial autocorrelations at all lags should be nearly zero, and all Q-Statistics should be insignificant with large probability-values (Ljung & Box, 1979).

3.4.6.3 Heteroscedasticity

Hypothesis testing is a significant component of any econometric analysis and the usual OLS inference is generally faulty in the existence of heteroscedasticity. Econometricians have studied how to adjust standard errors, t, F, and LM statistics so that they are effective in the existence of heteroscedasticity of unknown form (Wooldridge, 2003)

Consider the model (Wooldridge, 2003):

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + ... + \beta_k x_k + u, \quad 3.12$$

Where

$$u^2 = \delta_0 + \delta_1 x_1 + \delta_2 x_2 + ... + \delta_k x_k + error \quad 3.13$$

The null hypothesis of homoscedasticity is that if the p-value is sufficiently small, (meaning if it does not meet the required level of significance) then we reject the null hypothesis.

The existence of an ARCH effect would be explained as the evidence of misspecification, either by omitted variables or through structural change. This test allows for the autocorrelation to occur in the variance of the error terms rather than in

the error terms themselves. The null hypothesis is that there is no ARCH effect present (Engle, 1982).

Consider the regression model (Asteriou & Hall, 2007):

$$Y_t = \beta_1 + \beta_2 x_{2t} + \beta_3 x_{3t} + ... + \beta_k x_{kt} + u_t \quad 3.14$$

And assume that the variance of the error term follows an ARCH (1) process:

$$Var(\mu_t) = \sigma_t{}^2 = \gamma_0 + \gamma_1 \mu^2{}_{t-1} \quad 3.15$$

If there is no existence of autocorrelation in $Var(\mu_t)$, then γ_1 should be zero and therefore $\sigma_t{}^2 = \gamma_0$. So there is a constant (homoscedastic) variance

The model is easily expanded for higher-order ARCH (p) effects having that:

$$Var(\mu_t) = \sigma_t{}^2 = \gamma_0 + \gamma_1 \mu^2{}_{t-1} + \gamma_2 \mu^2{}_{t-2} + ... + \gamma_p \mu^2{}_{t-p} \quad 3.16$$

The null hypothesis is formulated as:

$$H_0 := \gamma_1 = \gamma_2 = ... = \gamma_P = 0$$

The are no existence of ARCH effects

The White Test is also a test for heteroscedasticity in OLS residuals where the null hypothesis shows that there is no heteroscedasticity. The White test statistic is computed by an auxiliary regression of the squared residuals on all possible cross products of the regressors (White, 1980).

Consider the model (Wooldridge, 2003).

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + ... + \beta_k x_k + u,$$

3.17

Where

$$\mu^2 = \delta_0 + \delta_1 y + \delta_2 y^2 + error \quad 3.18$$

The null hypothesis is formulated as:

$$H_0 : b_1 = b_2 = ... = b_m = 0$$

The null hypothesis H_0 highlights the fact that the variance of the residuals is homoscedastic, e.g.,

$$\text{var}(\varepsilon_i) = \text{var}(Y_i) = \sigma^2$$

The alternative hypothesis is formulated as:

$$\text{var}(\varepsilon_i) = \text{var}(Y_i) = \sigma_i^2$$

This aims the fact that the variance of the residuals is heteroscedastic

It is likely to get a test that is simple to implement than the White test and more conserving on degrees of freedom.

Harvey-Godfrey LM test (1976) test for heteroscedasticity is comparable to the Breusch-Pagan-Godfrey test, it checks a null hypothesis of no heteroscedasticity against heteroscedasticity of the form of $\sigma_t^2 = \exp(z_t'\alpha)$ and, again z_t, is a vector of independent variables.

Consider the model (Asteriou & Hall, 2007):

$$Y_i = \beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} + ... + \beta_k X_{ki} + \mu_i \qquad 3.19$$

Where

$$In(\mu_i^2) = \alpha_1 + \alpha_2 Z_{2i} + \alpha_3 Z_{3i} + ...\alpha_P Z_{Pi} + \nu_i \qquad 3.20$$

The null hypothesis of homoscedasticity is formulated as:

$$H_0 : \alpha_1 = \alpha_2 = ... = \alpha_P = 0$$

While the alternative is that at least one of the αs is different from zero

3.4.6.4 Stability tests

The researcher also performed a stability test by using the CUSUM and CUSUM of square and Ramsey RESET test. The key principle of carrying out this test is to determine whether the model is stable. Ploberger, Kramer and Alt (1988) defined CUSUM test as a test that is essentially used to detect instability in the intercept alone. While Ploberger and Krammer (1990) defined CUSUM of squares as a test

that has poor asymptotic power against instability in the regression coefficient, and can be viewed as a test for detecting instability in the variance of the regression error (Hansen, 1992). Ramsey RESET was also applied to determine whether an econometric model is correctly specified. RESET test (Regression Specification Error Test) is a general test for the misspecification/incorrect specified equation which is designed to detect both omitted variables and inappropriate functional form (Shukur & Mantalos, 2004).

3.4.7 Impulse response

In order to see how economic growth as an independent variable reacts overtime to changes in government spending and inflation as dependent variables, this study applied the impulse response methodology. The impulse response function (IRF) traces out how the changes in one variable can affect current and future values of the endogenous variables in the model. The impulse response functions can be used to create the time path of the dependent variables in the VAR, to shocks from all the explanatory variables. If the system of equations is stable, any shock should fall to zero. An unstable system would produce an explosive time path. In that sense, short-run values of the variable will diverge from its equilibrium values (Asmah, 2013).

Impulse responses trace out the responsiveness of the dependent variables in the VAR to shocks of each of the variables. So, for each variable from each equation separately, a unit shock is applied to the error term, and the impact upon the VAR system over time is noticed. Thus, if there are g variables in a system, a total of g^2 impulse responses could be produced (Brooks, 2008). The way that this is accomplished in practice is by expressing the VAR model as a VMA - that is, the vector autoregressive model is written as a vector moving average. On condition that the system is stable, the shock should gradually die away (Brooks, 2008)

3.4.8 Choleski/variance decomposition

This study also applied Choleski/Variance decomposition to understand by how much each variable contributes to other variables in the autoregression. Brooks

(2008) defined variance decomposition methodology as a tool to offer a slightly different method for examining VAR system dynamics. The Choleski/Variance decomposition procedure give the proportion of the movements in the dependent variables that are due to their 'own' shocks, versus shocks to the other variables. A shock to the ith variable will directly affect that variable of course, but it will also be transmitted to all the other variables in the system through the dynamic structure of the VAR. Variance decompositions determine how much of the s-step-ahead forecast error variance of a given variable is explained by innovations to each explanatory variable for s = 1, 2, and so on. In practice, it is usually observed that own series shocks explain most of the (forecast) error variance of the series in a VAR (Brooks, 2008).

3.4.9 Vector Autoregresions (VAR)

A Vector Autoregressions (VAR) is an n-equation, n-variable linear model in which each variable is in turn explained by its own lagged values, plus current and past values of the remaining n-1 variables. This simple framework provides a systematic way to capture rich dynamics in multiple time series, and the statistical toolkit that came with VARs was easy to use and to interpret. VAR held out the promise of providing a coherent and credible approach to data description, forecasting, structural inference and policy analysis (Stock & Watson, 2001).

VARs come in three varieties: reduced form, recursive and structural. A reduced from VAR expresses each variable as linear function of its own past values, the past values of all other variables being considered and a serially uncorrelated error term. Thus, in our example, the VAR involves three equations: current unemployment as a function of past values of unemployment, inflation and the interest rate; and similarly for the interest rate equation. Each equation is estimated by ordinary least squares regression. The number of lagged values to include in each equation can be determined by a number of different methods. A recursive VAR constructs the error terms in each regression to be uncorrelated with the error in the preceding equation. This is done judiciously including some contemporaneous values as regressors. A structural VARs require identifying assumptions that allow correlations to be interpreted causally. These identifying assumptions can involve the entire VAR, so that all of the causal links in the model are spelled out, or just a single equation, so that only a specific causal link is identified. This produces instrumental variables

regression. The number of structural VARs is limited only by the inventiveness of the researcher (Sims, 1980).

3.5 SUMMARY

This chapter presented a clear explanation of the Unit root tests, the Johansen cointegration test, VECM, VEC Granger causality/Block exogeneity Wald test, Diagnostic tests, Stability tests, Impulse Response and variance decomposition techniques. The VECM method is chosen as the preferred method of estimation for the several advantages it offers when compared to other alternative approaches. In the following chapter, all the techniques outlined in this chapter will then be applied to annually South African data to determine the results of the relationship and achieve the objectives already set out in chapter 1.

CHAPTER 4

DATA INTERPRETATION AND RESULTS DISCUSSION

4. INTRODUCTION

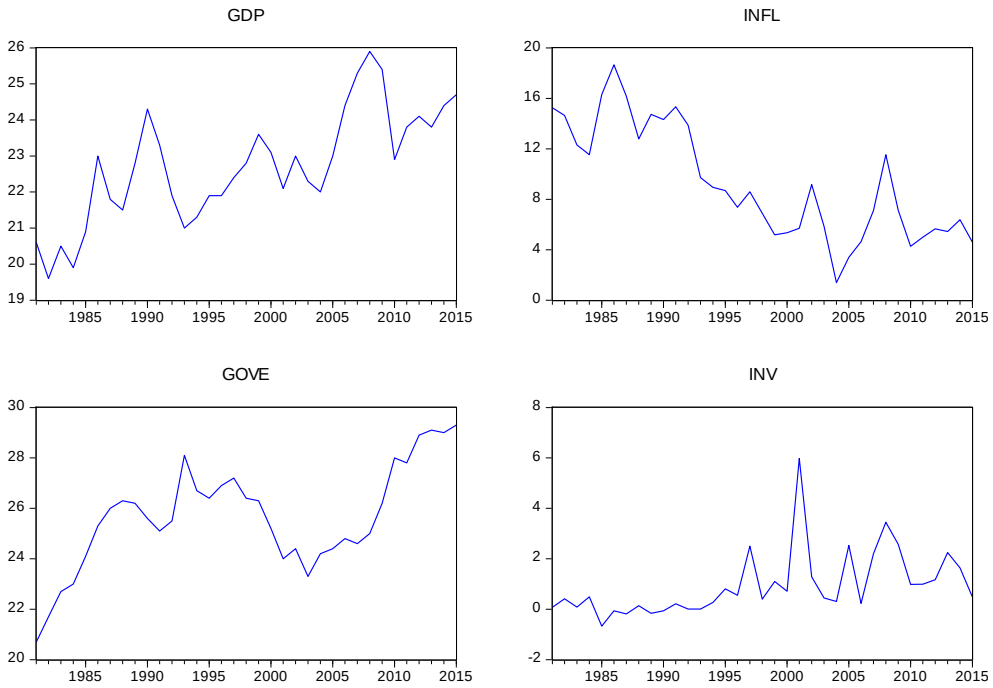
Chapter 4 shows empirical results obtained by using econometric procedures such as the Augmented Dickey Fuller test (ADF) and Phillip Perron (PP) unit root tests, Johansen cointegration test, Vector Error Correction Model (VECM), Granger Causality test, Diagnostic tests, Stability tests, Impulse response and Choleski/Variance decomposition. All the empirical test results were obtained by using the Eviews 9 econometrics statistical package. This study makes use of the 1%, 5% and 10% level of significance.

4.1 Unit root tests

To determine whether a time series variable is non-stationary and also to check for the presence of stationarity the unit root test was performed.

4.1.1 Informal unit root tests in level form

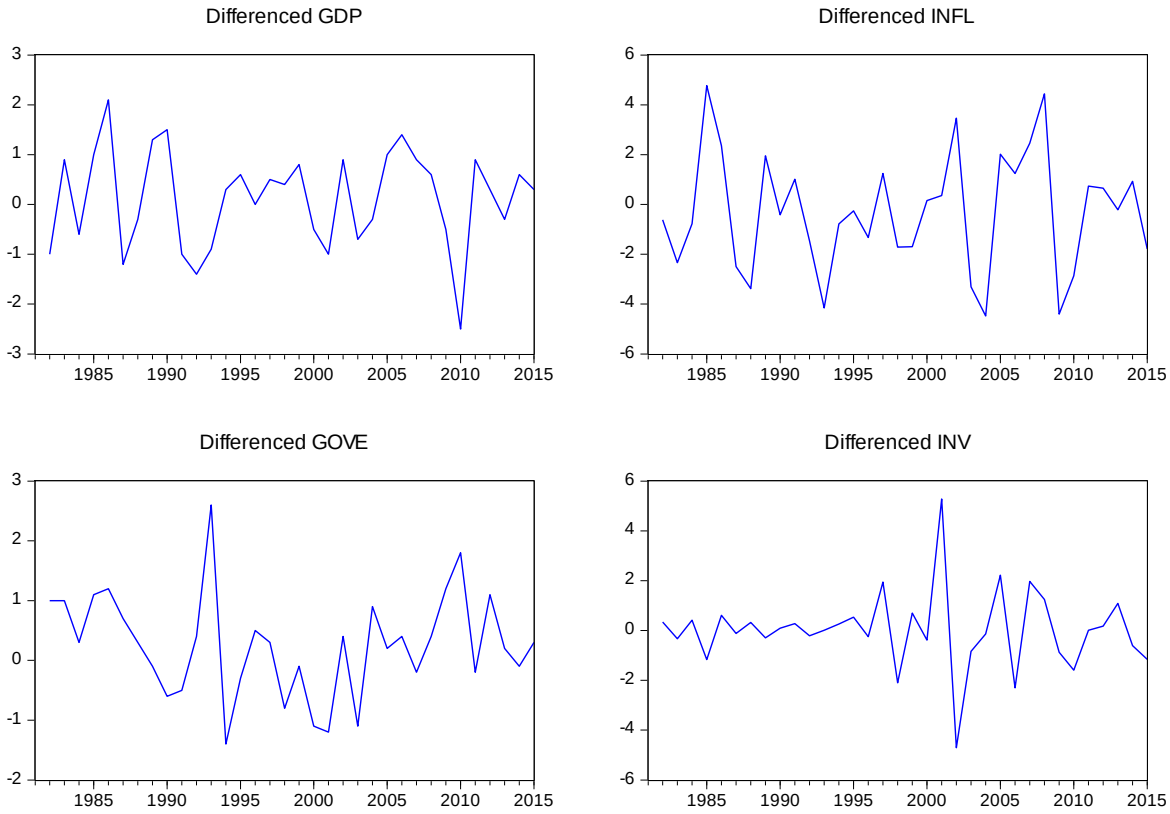
Figure 4.1: All variables in level form



Source: Author

Figure 4.1 illustrates the level form trend for GDP, inflation, government spending and foreign direct investment from 1981 to 2015. All variables appear to be non-stationary in its level form. Figure 4.1 shows that GDP, inflation, government spending and foreign direct investment are not fluctuating around the mean, and this implies that the data has trending characteristics. This is shown by how the time series is influenced by time and hence such time series must be differenced at least once for it to be stationary.

Figure 4.2: All variables in first differenced



Source: Author

Figure 4.2 illustrates the first difference form for GDP, inflation, government spending and foreign direct investment from 1981 to 2015. All variables (GDP, inflation, government spending and foreign direct investment) appear to be stationary after 1st difference as it fluctuates around the mean of zero, these results will also be confirmed by the Augmented Dickey Fuller (ADP) and Phillip Perron (PP) unit root tests.

Table 4.1 Results of ADF and PP tests at level and differenced form

Series	Model	ADF lags	ADF statistics	PP Band width	PP Statistics	Conclusion & order of integration
GDP	Trend & intercept	8	-3.946418	7	-2.842299	Do not reject H_0: Series contains unit root, implying series not stationary, I(1
	Intercept	8	-1.959851	13	-1.704551	
	None	8	0.579160	33	1.531176	
DGDP	Trend & intercept	8	-5.432787***	11	-6.650625***	Reject H_0 :series contains unit root, hence its stationary
	Intercept	8	-5.503122***	10	-6.630418***	
	None	8	-5.462976***	7	-5.860081***	
INFL	Trend & intercept	8	-0.984719	7	-2.741680	Do not reject H_0: Series contains unit root, implying series not stationary, I(1)
	Intercept	8	-0.974935	13	-1.461173	
	None	8	-2.157441	33	-1.900168	
DINFL	Trend and intercept	8	-5.382611***	28	-8.871068***	Reject H_0 :series contains unit root, hence its stationary
	Intercept	8	-5.438716***	28	-8.811472***	
	None	8	-2.524917***	32	-5.486769***	
GOVE	Trend & intercept	8	-1.796099	2	-1.879617	Do not reject H_0: Series contains unit root, implying series not stationary, I(1)
	Intercept	8	-1.525348	2	-1.563035	
	None	8	-1.429591	1	-1.558281	
DGOV	Trend &	8	-6.342769***	2	-6.308259***	Reject H_0

E	intercept					:series contains unit root, hence its stationary
	Intercept	8	-6.457035***	2	-6.412673***	
	None	8	-6.137946***	2	-6.122935***	
INV	Trend & intercept	8	-5.444545	8	-5.414457	Do not reject H_0 : Series contains unit root, implying series not stationary, I(1)
	Intercept	8	-4.348902	0	-4.348902	
	None	8	-0.585705	1	-3.064070	
DINV	Trend & intercept	8	-7.181201***	13	-16.31334***	Reject H_0 :series contains unit root, hence its stationary
	Intercept	8	-7.307073***	13	-16.01287***	
	None	8	-7.411120***	13	-15.91829***	

Note*** indicates level of significance at 1%

Source: Author

Table 4.1 shows the results of the ADF and PP unit root tests for both level form and first differenced at 1%, 5% and 10%. The unit root test results obtained in this study were derived by applying the ADF test and PP unit root testing techniques evaluated at 1%, 5% and 10% level of significance based on the none, intercept, trend and intercepts. The dependent variable together with independent variables were found to be non-stationary in their level forms but stationary in first difference.

4.2 The choice of the lag length

An important preliminary step in model building, cointegration analysis and impulse response analysis is the selection of the VAR lag order. In this thesis the research study used some commonly used lag-order selection criteria to choose the lag order, such as LR, FPE AIC, SC and HQ.

Table 4.2: Lag length selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-265.8421	NA	148.8043	16.35407	16.53546	16.41510
1	-194.1991	121.5760*	5.153425*	12.98176*	13.88874*	13.28693*
2	-179.6571	21.15198	5.901848	13.07013	14.70268	13.61943

* indicates lag order selected by the criterion

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

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Source: Author

Table 4.2 shows the results of the lags length, where lag length 1 is suggested by all the criteria's (SC, LR, FPE, AIC, and HQ). To select the optimal lag order for the VAR from the above Table 4.2 it is important to select high enough lags to ensure that the optimal order is not exceeded. This study has chosen lag length 1 chosen by all criteria's and because the choice of lag length can drastically affect the results of the cointegration analysis (Brooks, 2008).

4.3 Johansen cointegration test

Table 4.3: Johansen cointegration test

Test	Hypothesized No. CE(s)	Eigen value	Trace statistic	0.05 critical values	Probability**
Trace	None*	0.627117	56.92381	47.85613	0.0256
	At most 1	0.428864	24.36963	29.79707	0.1853
	At most 2	0.096555	5.885393	15.49471	0.7090
	At most 3	0.073929	2.534562	3.841466	0.1114
Maximum	None*	0.627117	32.55418	27.58434	0.0105

Eigen value	At most 1	0.428864	18.48424	21.13162	0.1128
	At most 2	0.096555	3.350831	14.26460	0.9207
	At most 3	0.073929	2.534562	3.841466	0.1114

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

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

*denotes rejection of the hypothesis at the 0.05 level

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

Source: own calculation eviews 9

Table 4.3. present the Johansen cointegration tests results of both the trace and the maximum eigenvalue tests. Both tests indicate that there is one cointegrating equation at 5% level. This is shown by the critical values of both the trace and the maximum eigenvalue tests which are greater than the critical values at 5%, and the implication is that the variables in the model have a long run relationship.

4.4 Normalised Cointegration test

The long run relationship between inflation, economic growth and government spending for one cointegrating vector for the South African economy in the period 1981-2015 is displayed below (standard errors are displayed in parenthesis).

Table: 4.4 Normalised cointegration test

VARIABLES	GDP	INFL	GOVE	INV
COEFFICIENT	1.000000	27.96937	9.878156	141.4231
STANDARD ERROR		(5.35601)	(9.90451)	(21.6924)

$$GDP_t + \beta_0 + \beta_1 INFL_t + \beta_2 GOVE_t + \beta_3 INV_t = 0 \quad \text{.....4.1}$$

$$GDP_t = -27.96937\ INFL_t - 9.878156\ GOVE_t - 141.4231 INV_t \text{.....4.2}$$

Table 4.4 presents the results of the long-run relationship between the dependent variable and independent variables. According to the equation 4.2, there is a

negative relationship between government expenditure (GOVE), inflation (INFL) and investment (INV) with country's economic growth (GDP). In case of GDP and inflation the results indicate that there is a negative relationship between the variables. A unit increase in inflation (INFL) will lead to 27.96937 unit decrease in GDP which is in line with other studies such as Mamo (2012) and Kasidi & Mwakanemela (2013). Mamo (2012) holds that the negative relationship between inflation and GDP is caused by failure to enhance economic growth due to the high rate of rent seeking in the country as well as higher rate of unemployment. While Kasidi and Mwakamela (2013) holds that the negative relationship is caused by all factors which cause an increase in the general price levels such as energy crisis, exchange rates volatility, and increase in money supply, poor agricultural production. The long run equation also reveals that economic growth (GDP) and government expenditure (GOVE) are negatively related. A unit increase in government expenditure (GOVE) will lead to 9.878156 unit decrease in GDP. The outcome is in line with empirical results of studies such as Hasnul (2016) who also found that there is a negative correlation between government expenditure and economic growth in Malaysia for the last 45 years from 1970 to 2014. Hasnul (2016) found out that education, defense, healthcare, and operating expenditure do not show significant effect on the economic growth. Also in support of the negative relationship between government expenditure and GDP, Olabisi and Funlayo (2012) found that the government expenditure on education failed to enhance economic growth due to the high rate of rent seeking in the country as well as the increase in unemployment rate.

4.5 VECM

Table 4.5: VECM estimates

Variables	Coefficient	Standard errors	T-statistics
GDP (-1)	1.000000	-	-
INFL (-1)	27.96937	(5.35601)	[5.22206]
GOVE (-1)	9.878156	(9.90451)	[0.99734]
INV (-1)	141.4231	(21.6924)	[6.51949]
CointEq1	-0.003912	(0.00142)	[-2.75949]
Constant	-673.8301	-	-

R-squared 0.258376
Adjusted R-squared 0.121038
S.E of regression 0.926357
F-statistic 1.881318

Source: Author

The presence of cointegration between variables suggests a long-term relationship among the variables under consideration which calls for the use of VECM to determine short run relationship. Table 4.5 show the results of the Vector Error Correction Model (VECM), and the coefficient of error correction term (ECT) indicates the speed of adjustment to be 0.003912. However, the speed of adjustment is negative therefore it meets a priori expectation. This indicates that divergence from the long run equilibrium within the system is corrected at speeds 0.39% percent. In this case empirical results indicate a very slow convergence process to equilibrium.

4.6 VEC Granger causality/Block exogeneity Wald test

Table 4.6: VEC Granger causality/Block exogeneity Wald test

	GDP	INFL	GOVE	INV
Dependent variable				
GDP	-	11.55902 (0.0031) ***	1.175737 (0.5555)	1.730755 (0.4209)
INFL	0.480924	-	0.586930	5.911138

	(0.7863)		(0.7457)	(0.0520) **
GOVE	2.310832 (0.3149)	1.226729 (0.5415)	-	0.563101 (0.7546)
INV	5.309144 (0.0703) **	9.863299 (0.0072) ***	1.468974 (0.4798)	-

*,**,***,represents statistical significance at 10%,5%,1% and figures in parentheses are p-values

Source: Author

In an effort to determine the short run causality between the four variables Granger causality/Block exogeneity Wald tests based upon VECM model is performed. Table 4.6 show the results of causality. Therefore, from Table 4.6, the direction of causality is based on the probability values. This study makes use of the 1%, 5% and 10% level of significance in deciding the direction of causality which is in line with other studies such as Lean and Smyth (2010). Eviews output reported in Appendix F shows that Granger causality runs jointly from all three variable inflation (INFL) government expenditure (GOVE) and investment (INV) to the dependent variable economic growth (GDP). Inflation (INFL-lag 1) Granger causes economic growth (GDP), implying a one-way or unidirectional causality from inflation to economic growth. Investment (INV lag 1) Granger causes economic growth (GDP) but economic growth (GDP lag 1) do not Granger cause investment this is in line with other studies such as Afsar (2008).

4.7 Diagnostic Tests

Table 4.7: Diagnostic tests

Test	**H**o	**t-stat**	**P-value**	**Conclusion**
Jarque-Bera	Residuals are normally distributed	0.975022	0.614	Do not reject H0 since PV= 0.614, is in line with the acceptance of H0 Hence, residuals are normally distributed
Ljung-Box Q	No autocorrelation	18.543	0.293	Do not reject H0 since PV > L.O.S. Hence there is no serial autocorrelation in the model
Arch	No Arch Heteroscedasticity	2.915618	0.0877	Do not reject H0 since PV > L.O.S. Hence, there no is heteroscedasticity
Harvey	No Heteroscedasticity	3.971102	0.2646	Do not reject H0 since PV > L.O.S. Hence, there no is heteroscedasticity
Glejser	No Heteroscedasticity	7.037901	0.0707	Do not reject H0 since PV > L.O.S. Hence, there is no heteroscedasticity in the model
White (NCT)	No Heteroscedasticity	7.084140	0.0693	Do not reject H0 since PV > L.O.S.

				Hence, there is no heteroscedasticity in the model
White (CT)	No heteroscedasticity	16.72639	0.0532	Do not reject H0 since PV > L.O.S. Hence, there is no heteroscedasticity in the model

Note : L.O.S means “level of significance”

: PV means “Probability Value”

: NCT means “no cross terms”; CT means with “cross terms”

Source: Author

To determine the strength of the model, diagnostic tests were conducted using E-views 9 and are shown in Table 4.7. The study investigated whether there is autocorrelation and heteroscedasticity in the model. Moreover, normality of the model was also investigated. It can be concluded that the model is robust enough since it satisfies diagnostic testing criteria. These results are tested based on the level of significance (L.O.S) of 5% and which is in line with other studies such as Mokgola (2016). According to Jarque-Bera test results, the residuals are normally distributed in the model since the p-value of 61% is greater than 5% level of significance. The Ljung-Box Q test of order (6)’s, results showed that the model does not contain an autocorrelation problem, given that the p-value of 29% is greater than the 5% level of significance.

Several other tests were performed to test for the existence of the heteroscedasticity problem in the model. The Arch test and the Harvey test results revealed that there is no problem of heteroscedasticity in the model since their p-values of 8.7% and 26% respectively are greater than 5%. This outcome of the nonexistence of heteroscedasticity in the model was also confirmed by the White tests, with no cross terms (NCT) and with cross terms (CT) since their respective p-values of 6.9% and 5.32% outweigh the 5% level of significance.

4.8 Stability Tests

Figure 4.3: CUSUM

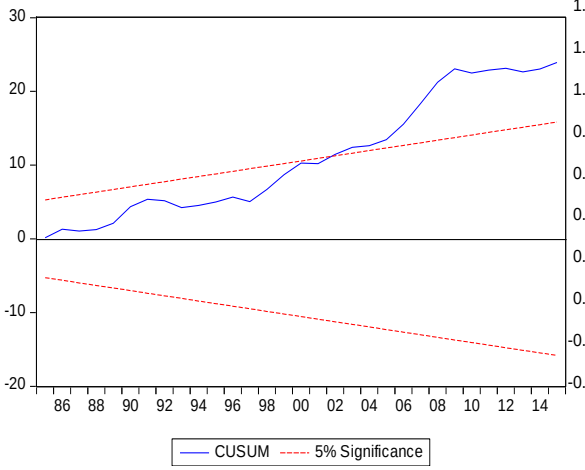
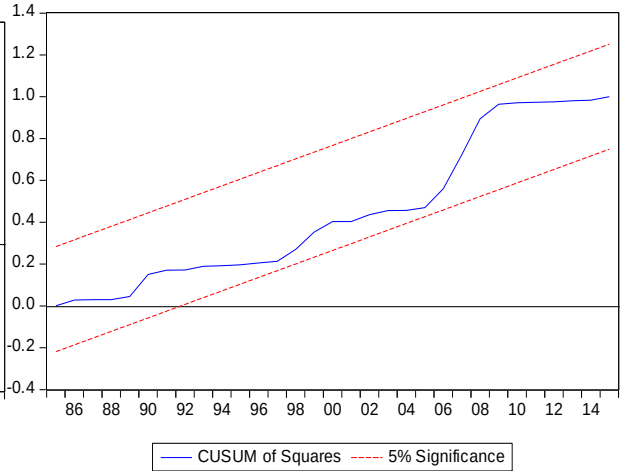


Figure 4.4: CUSUM of squares



The stability tests have also been used to investigate the stability of long and short run parameters. In doing so, CUSUM and CUSUM of squares tests have been conducted. The graphs of both CUSUM and CUSUM of squares are presented in Figure 4.3 and Figure 4.4, Figure 4.3 specify that plots for CUSUM is not between critical boundaries at 5% level of significance. The CUSUM series in Figure 4.3 crosses the upper critical line after the 04-recursive regression, which indicates model instability. Figure 4.4 specify that plots for CUSUM of squares is between critical boundaries at 5% level of significance, which then indicate that the model is stable. This confirms the accuracy of long and short run parameters which have effect on economic growth in South Africa.

Table 4.8: Ramsey RESET Test

Test	**H0**	**t-statistic**	**P-value**	**Conclusion**
Ramsey RESET	Equation is correctly specified	2.791206	0.0948	Do not reject H0 since PV>L.O.S. Hence, equation is correctly specified

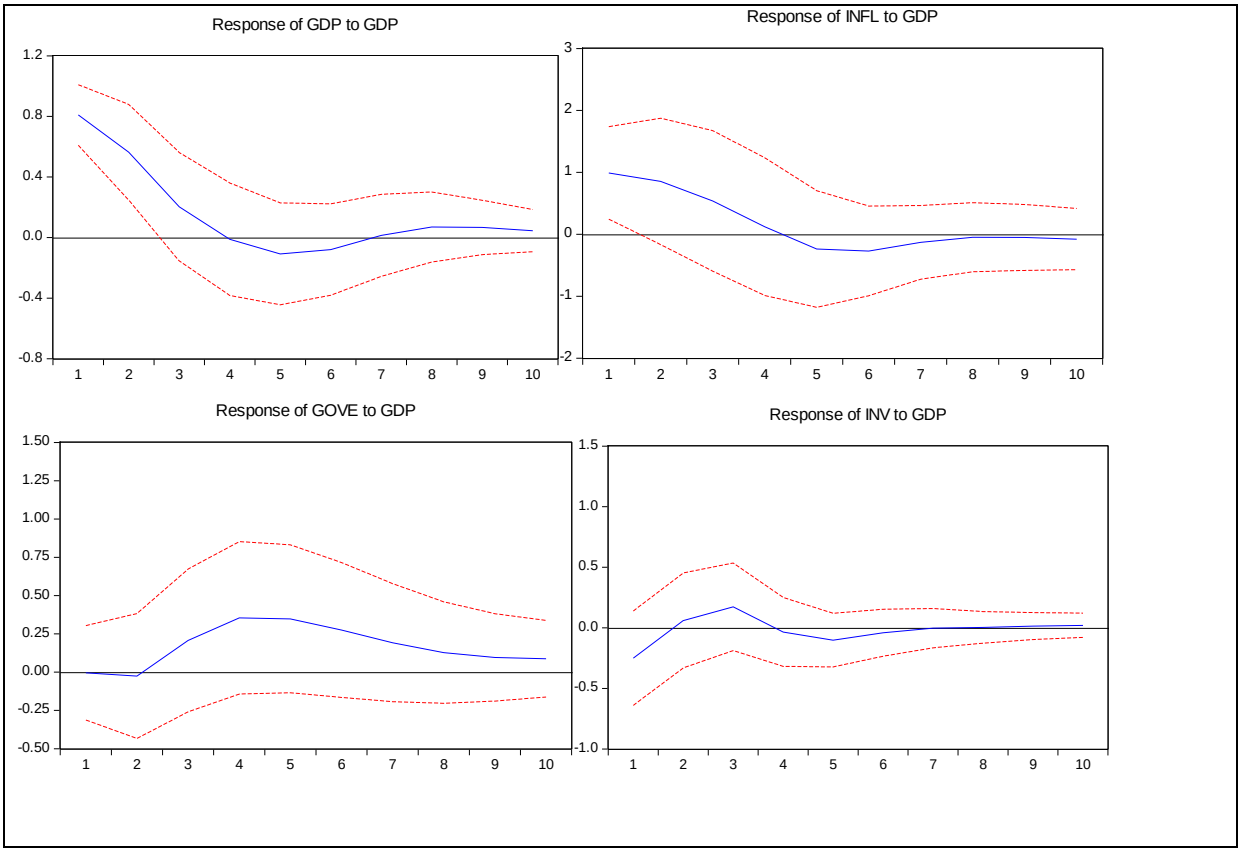
Source: Author

The stability test using Ramsey Reset was performed to test for stability of the model used. Table 4.8 presents the results of the Ramsey Reset performed. According to the results of this test, the model is correctly specified because the P-value of 9.48% is greater than 5% level of significance. Therefore, there is insufficient evidence to reject the null hypothesis (H0) and this shows that the model is correctly specified.

4.9 Impulse Response

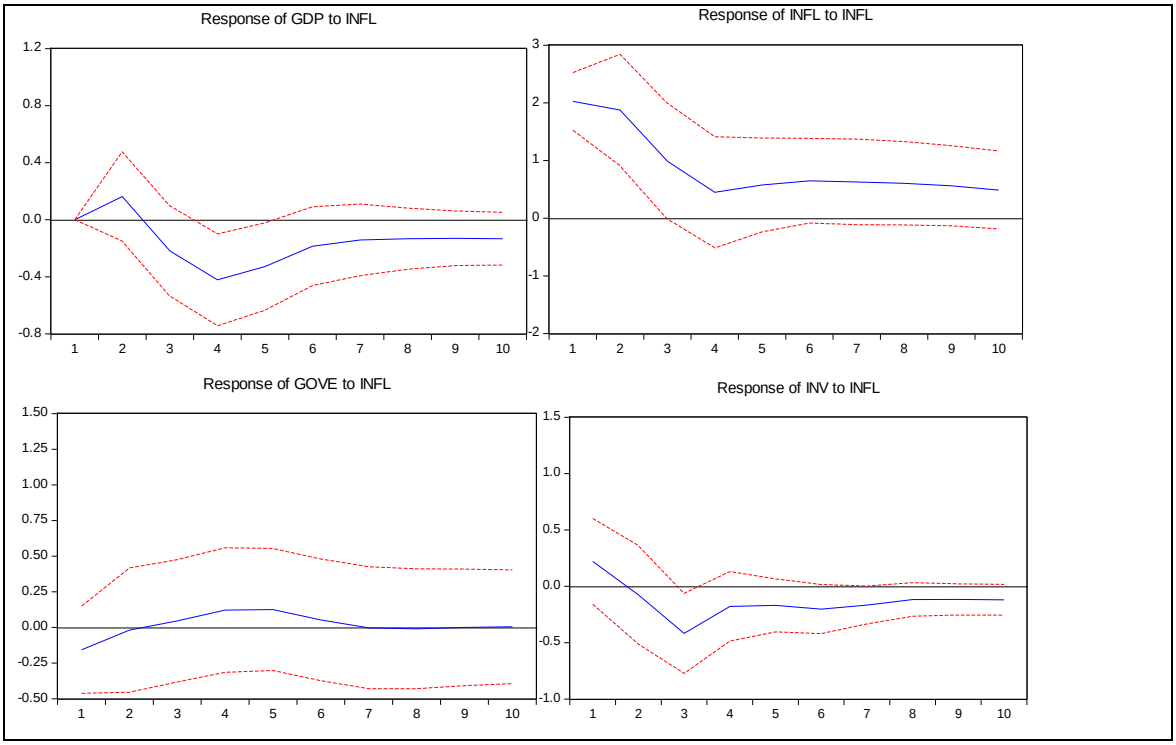
Impulse response show how these variables react to different shocks in the model. From the graphical presentation of the impulse response function (IRF) below, it is observed that the variables response to shocks either in the short-run or long run is positive and negative. This is evident by the graphs representing each of the variable, falling within the positive and negative region.

Figure 4.5



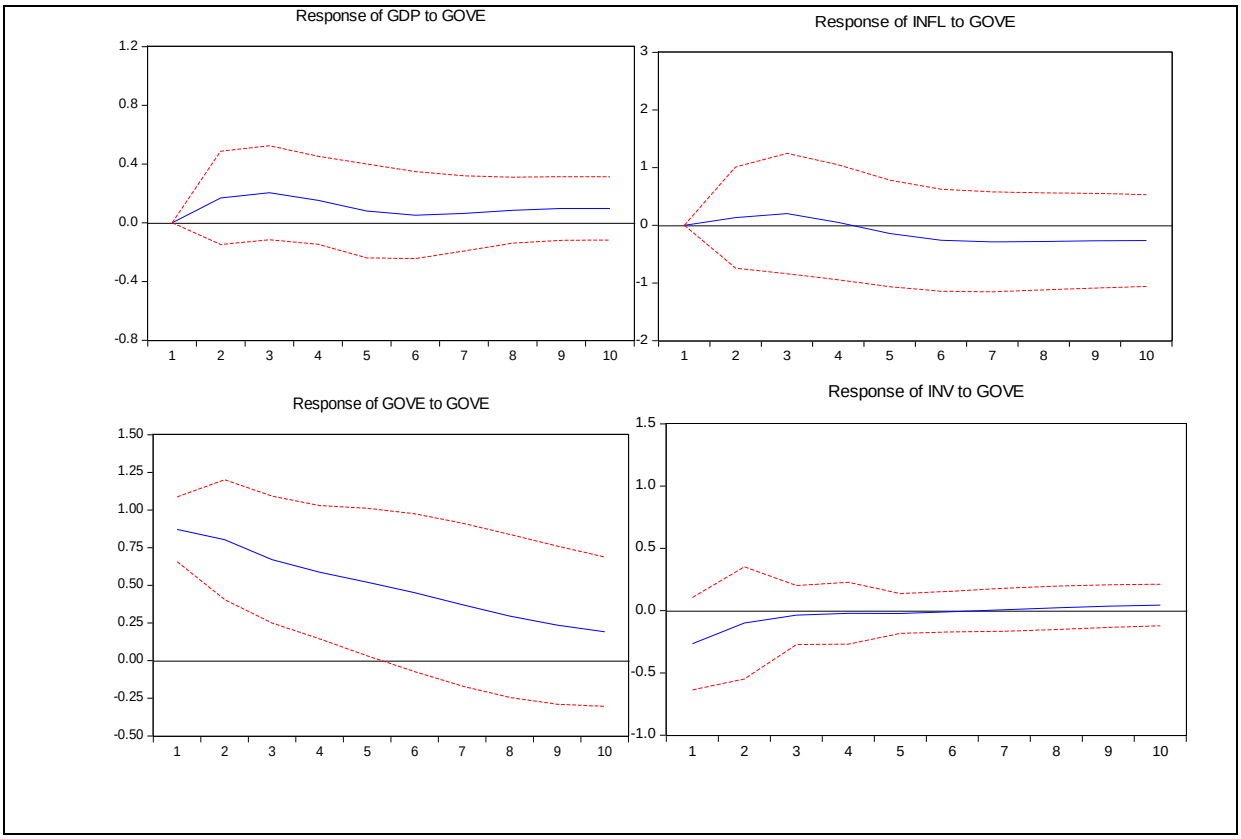
Figures 4.5 show the responses of GDP, inflation (INFL), government spending (GOVE) and investment (INV) to GDP shock. The positive effect is indicated by all three lines above (0.0), and the negative effect is indicated by all lines below 0.0. In the first year, GDP shock to GDP is significant, this is indicated by 0.1 on the vertical axis, and also to inflation it significant in the first year, this is indicated by 1.8 in the vertical axis, GDP shock to government spending is significant in the fourth year, this is indicated by 0.76 in the vertical axis, and to investment it shows an positive response in the third year, this is indicated by 0.5 in the vertical axis.

Figure 4.6



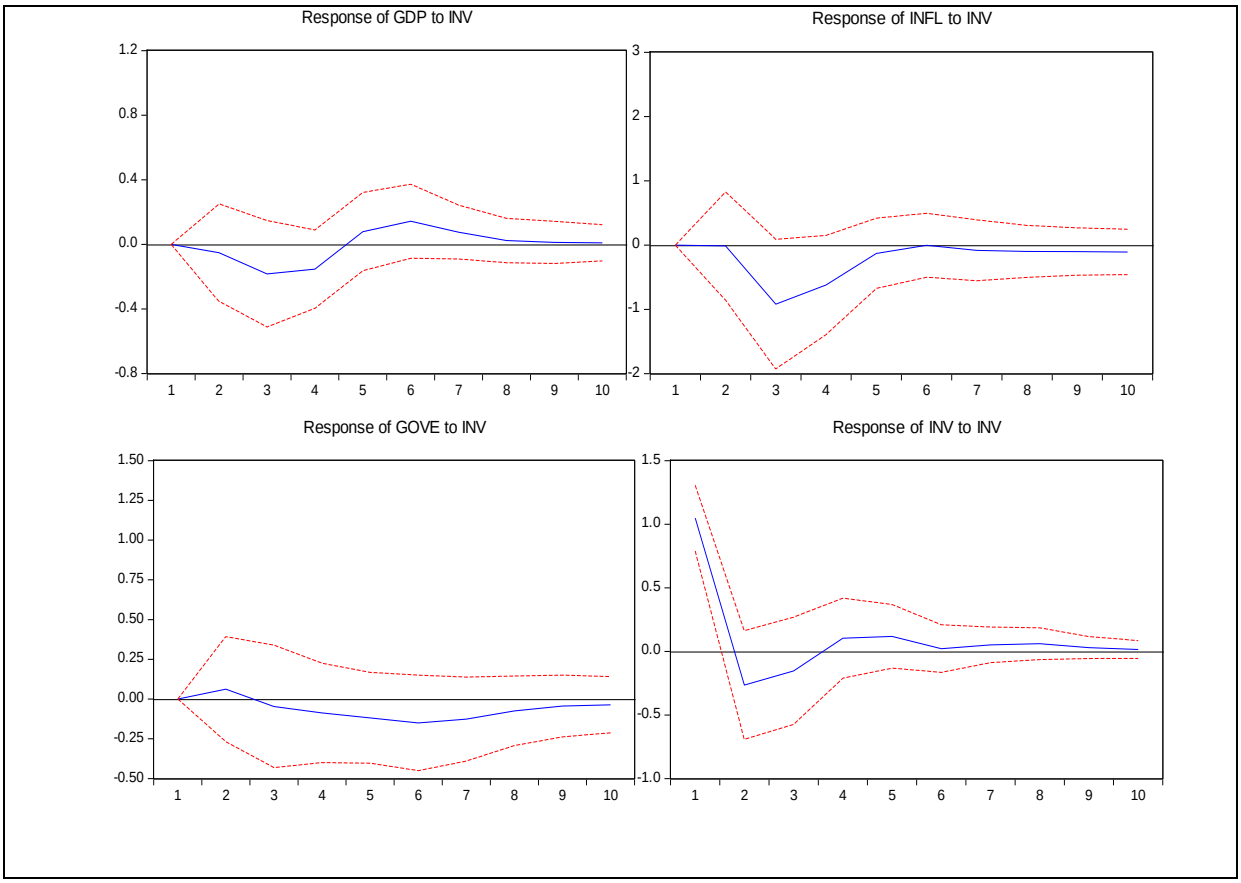
Figures 4.6 show the responses of GDP, inflation (INFL), government spending (GOVE) and investment (INV) to inflation (INFL) shock. In the fourth year, GDP shock to inflation was negative, this is indicated by -0.7 in the vertical axis (below 0.0). In the first year, inflation shock to inflation was significant, this is indicated by 2.8 in the vertical axis, then started decreasing from the second year. Thereafter, the impact of inflation shock on government spending show a positive response in the second year, this is indicated by 0.5 in the vertical axis, for other years, the impact of inflation shock on government spending is not statistically significant. The impact of inflation on investment show a decrease in the third year.

Figure 4.7



Figures 4.7 show the responses of GDP, inflation (INFL), government spending (GOVE) and investment (INV) to government spending (GOVE) shock. Looking at Figure 4.7, a shock of government spending to GDP is positive in the second and third period, this is indicated by 0.5 in the vertical axis. A shock of government spending to GDP is significant in the second and third period, this is indicated by a line above 1.0 in the vertical axis. Impact of government spending on government spending show a significant effect in the first four years, this is indicated by all lines above 1.0. The impact of government spending on investment show a positive effect in the second year, this is indicated by 0.4 in the vertical axis.

Figure 4.8



Figures 4.8 show the responses of GDP, inflation (INFL), government spending (GOVE) and investment (INV) to investment (INV) shock. Impact of investment on GDP shows a negative response in the third year, this is indicated by -0.3 in the vertical axis. Impact of investment on inflation also shows a response in the third year, this is indicated by -2 in the vertical axis. Looking at Figures 4.8, a shock to investment has positive effects on government spending, Impact of investment on investment show a significant effect in the first year, this is shown by 1.3 in the vertical axis, and a negative effect in the second year, this is indicated by -0.7 in the vertical axis.

4.10 Variance Decomposition

Table 4.9: Variance decomposition of GDP

Period	S.E	GDP	INFL	GOVE	INV
1	0.809393	100.0000	0.000000	0.000000	0.000000
2	1.015223	94.38174	2.572780	2.785892	0.259589
3	1.093312	84.84015	6.223531	5.908287	3.028029
4	1.191798	71.40731	17.76087	6.617761	4.214054
5	1.246081	66.07128	23.20501	6.472335	4.251376
6	1.271390	63.85800	24.41622	6.384174	5.341603
7	1.283117	62.70834	25.18582	6.514317	5.591527
8	1.294934	61.85597	25.79000	6.832127	5.521901
9	1.306853	60.99175	26.31781	7.260826	5.429612
10	1.318009	60.08142	26.89352	7.682599	5.342464

Looking at Table 4.9, the fluctuations of GDP are explained mainly by GDP and inflation shocks. GDP shock accounts for 100% at the first year. GDP proportion in the variance of GDP decreases over time and reaches 60.08% in the tenth year. Inflation (INFL) shock accounts for 0% in the first year. Its proportion increases over time and reaches 26.89% in the tenth year. Government spending (GOVE) shock accounts for 0% in the first year, its proportion increases over time and reaches 7.68% in the tenth year. Investment (INV) shock accounts for 0% in the first year. Its proportion increases over time from period 2 (0.25%) to period 7 (5.59%), then period 8 it started to decrease and reaches 5.34% in the tenth year.

Table 4.10: Variance decomposition of INFL

Period	S.E	GDP	INFL	GOVE	INV
1	2.255918	19.27705	80.72295	0.000000	0.000000
2	3.058373	18.26974	81.53953	0.188732	0.002001
3	3.392345	17.36283	74.78224	0.511340	7.343596
4	3.480517	16.61903	72.70470	0.507407	10.16887
5	3.541317	16.50578	72.88651	0.649567	9.958148
6	3.619712	16.35707	72.97732	1.134025	9.531587
7	3.688475	15.87828	73.19497	1.697633	9.229112
8	3.749787	15.37984	73.42341	2.196532	9.000214
9	3.802957	14.97113	73.57419	2.632072	8.822613
10	3.845725	14.68192	73.56338	3.047646	8.707051

Looking at Table 4.10, the variation in inflation (INFL) are explained mainly by inflation (INFL) and GDP shocks, in the long run.

GDP shock accounts for 19.28% in the first year. Its proportion in the variance of GDP decreases over time and reaches 14.68% in the tenth year. Inflation (INFL) shock accounts for 80.72% in the first year. Its proportion decreases over time and reaches 73.56% in the tenth year. Government spending (GOVE) shock accounts for 0% in the first year, its proportion increases over time, but fall in the 4th year and the starts to increase over time again and reaches 3.05% in the tenth year. Investment (INV) shock accounts for 0% in the first year. Its proportion increase from second year to forth year, and went down for over time, and reaches 8.71% in the tenth year. In addition, the fluctuation of inflation (INF) is also explained by its own shock.

Table 4.11: Variance decomposition of GOVE

Period	S.E	GDP	INFL	GOVE	INV
1	0.885773	0.002705	3.116847	96.88045	0.000000
2	1.197699	0.046763	1.730648	97.95529	0.267302
3	1.389730	2.255409	1.395437	96.03865	0.310499
4	1.556820	6.983789	1.724200	90.72955	0.562464
5	1.687131	10.19886	2.020293	86.81079	0.970055
6	1.775094	11.61771	1.914104	84.87573	1.592462
7	1.828162	12.05817	1.804748	84.15709	1.979993
8	1.857884	12.14630	1.749863	84.02641	2.077420
9	1.875721	12.17932	1.716742	84.01158	2.092360
10	1.887855	12.23793	1.695369	83.96496	2.101741

Looking at Table 4.11, the fluctuations of government spending (GOVE) are explained mainly by government spending (GOVE) and GDP shocks. GDP shock accounts for 0.00% at the first year. Its proportion in the variance of GDP increases over time and reaches 12.24% in the tenth year. Inflation shock accounts for 3.12% in the first year, falls to 1.73% in the second year, its proportion in the variance of INFL went up and down over time and reaches 1.70% in the tenth year. Government spending accounts for 96.88% at the first year. Its proportion decreases over time but still accounts for 83.96% in the tenth year. Investment shock accounts for 0% in the first year. Its proportion in the variance of INV increases over time and reaches 2.10% in the tenth year.

Table 4.12: Variance decomposition of INV

Period	S.E	GDP	INFL	GOVE	INV
1	1.132275	4.898395	3.812633	5.526124	85.76285
2	1.171172	4.841440	3.985019	5.880701	85.29284
3	1.265419	6.025574	14.33024	5.118168	74.52602
4	1.282717	5.935509	15.87662	5.008411	73.17946
5	1.303335	6.356940	17.06194	4.883187	71.69793
6	1.319764	6.294547	18.98958	4.765973	69.94990
7	1.331179	6.187456	20.22330	4.687070	68.90218
8	1.337833	6.126812	20.78714	4.667721	68.41833
9	1.343795	6.084391	21.35682	4.697685	67.86111
10	1.350128	6.051117	21.94839	4.762916	67.23758

Looking at Table 4.12, the fluctuations of investment (INV) are explained mainly by investment (INV) and inflation (INFL) shocks. GDP shock accounts for 4.90% at the first year. Its proportion in the variance of GDP went up and down over time and reaches 6.05% in the tenth year. Inflation shock accounts for 3.81% in the first year. Its proportion increases over time and reaches 21.95% in the tenth year. Government spending shock accounts for 5.53% in the first year but falls to 5.12% in the third year. Its proportion decreases over time and reaches 4.67% in the 8th year, then it increases from 9th period (4.70%) to tenth period (4.76%). Investment accounts for 85.76% at the first year. Its proportion decreases over time but still accounts for 67.24% in the tenth year.

4.11 SUMMARY

This chapter presented the results of the study based on the methodology discussed in chapter 4. The time series characteristics of the data were discussed first to visually check if the variables are stationary before proceeding with the ADF and Phillips - Perron unit root tests. Choice of the lag length was also adopted before proceeding with the Johansen Cointegration analysis to select the lag length , this study has selected lag length 1 chosen by all criteria's and because the choice of lag

length can drastically affect the results of the cointegration analysis. Therefore, the research study applied the Johansen cointegration test to determine whether there is a long run relationship between the variable, and the results obtained are reported in Table 4.3. Indeed, the results indicated that a long run relationship exist between the variable (Variables are cointegrated in the long run).

The research study also applied the Vector Error Correlation Model (VECM) to determine whether there is a short run relationship between the variable and the results obtained are reported in Table 4.5. Indeed, the results indicated that a short run relationship exist between the variable. VEC Granger causality/Block exogeneity Wald test, Diagnostic, Stability tests and Impulse Response were also employed. Variance decomposition round up the chapter. The study did not use the Autoregressive Distributed Lag Model (ARDL) Bounds test for Co-integration, because the data does no support the model. therefore, this study calls for future researchers to look at this model when comparing the results of this variables.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

After a long debate/history about the role, relationship and impact of government expenditure on economic growth. This research study's intention is to add value to such debate. Therefore, the main purpose of this study was to determine relationship between inflation, economic growth and government expenditure in South Africa. To achieve this purpose a comprehensive literature review was carried out to review what other studies has previously found when making similar studies, using similar/different econometric techniques as this study has used. A Vector Error Correction Model was used to achieve the following research objectives:

- Determining whether the long run relationship between inflation, economic growth and government expenditure exists in South African economy
- Examine the causal relationship between inflation, government expenditure and economic growth
- Does government expenditure spur economic growth?
- To suggest policies to moderate government spending reduce inflation rate and promote economic growth

These objectives have been achieved as discussed in the last three chapters.

- **Determining whether the long run relationship between inflation, economic growth and government expenditure exists in South African economy**

The objective was to determine whether a long relationship between inflation, economic growth (GDP) and government spending exist in South Africa. Therefore, the research study applied the Johansen cointegration test to determine whether there is a long run relationship between the variable and the results obtained are reported in Table 4.3. Indeed, the results indicated that a long run relationship exist between the variable (Variables are cointegrated in the long run).

- **Examine the causal relationship between inflation, government expenditure and economic growth**

The objective was to examine the direction of causality between inflation, economic growth (GDP) and government spending, after the existence of the long run between the variables, The VEC Granger causality/Block Exogeneity Wald test was applied to examine the causal relationship that exists between the variables and the results are reported in Table 4.6. The results indicated that Granger causality runs jointly from all three variable inflation (INFL) government expenditure (GOVE) and investment (INV) to the dependent variable economic growth (GDP). Inflation Granger causes economic growth (GDP), implying a one-way or unidirectional causality from inflation to economic growth. Investment Granger causes economic growth (GDP) but economic growth does not Granger cause investment.

- **Does government expenditure spur economic growth?**

The objective was to determine whether government spending can spur economic growth, Therefore, the research study applied the VECM, The VEC Granger causality/Block Exogeneity Wald test and the impulse response to determine whether government spending can spur economic growth and the results obtained are reported in Table 4.5, Table 4.6, Figure 4.5, 4.6, 4.7 and 4.8 Indeed, the results indicated that government expenditure do not spur economic growth.

- **To suggest government spending policies that can be implemented to spur economic growth**

The recommendation of policies that could be implemented to spur economic growth and reduce inflation rate in South African economy, were derived from VECM results, VEC Granger causality/Block Exogeneity Wald test, impulse response and variance decomposition results obtained in this research study, and the results are reported in Table 4.5, 4.6, 4.9,10,11,12 and Figure 4.5, 4.6, 4.7 and .4.8

5.2 RECOMMENDATION

Based on findings from the empirical analysis, the study offers the following recommendations, among others:

- The South African government needs to restructure its spending to make it in line with its economic growth macroeconomic objectives.

- Government should increase spending in these sectors which are important pillars of the economy. Government should direct its expenditure towards the productive sectors like education as it would reduce the cost of doing business as well as raise the standard living of poor ones in the country and find ways of attracting investments as this will lead to enhancing the economic growth.
- Government should ensure expenditures are properly managed in a manner that it will raise the nation's production capacity.
- This study recommends that government should implement policies that would moderate government spending to reduce inflation rate. To compliment for the loss in economic growth through the reduction in government spending, lending rate should be moderated to encourage private investors in investing in the South African economy. The reduction in inflation rate is important because price stability is an incentive for investment and motivation for inflow of foreign/international capital, which can help South Africa to never go back to recession and promote economic growth.

- The study recommends that the South African government spending patterns should be designed in a way that it fit the economy's needs so that it could significantly influence the economy in a positive way.
- South Africa should find a way of attracting foreign direct investment or they can start by encouraging improved domestic investment (companies should be competitive in the domestic market before they venture in the international arena) to accelerate growth rather than relying on FDI as a prime mover of the economy.

5.3 FURTHER RESEARCH

- The results found here were based on annual time series data from 1981 to 2015. This means that the relationship between inflation, economic growth and government expenditure in South Africa should be monitored and compared with the findings in this study and beyond the year 2015.
- This study used the Vector Error Correlation Model (VECM) to estimate the relationship between inflation, economic growth and government expenditures in South African economy. Therefore, it invites the future researchers to criticize this model and prove its relevancy.
- The study also did not use other models such as the Autoregressive Distributed Lag Model (ARDL) Bounds test for Co-integration, therefore, this study calls for future researchers to look at this model when comparing the results of this variables. There is a need to make comparison analysis with methodologies such as the one mentioned above. Additionally, it would be useful for this relationship researchers if the forecasting performance of the different lags order could be also compared.

5.4 LIMITATIONS OF THE STUDY

This study primarily focuses on the relationship between inflation, economic growth and government expenditure in South Africa without checking for distortions and misuse of funds within the components, Thus, it is not ascertained which expenditure impact more on the economic growth and therefore it is not limited to South African context; it is applicable to any other region outside South Africa as the study was comparing what other studies previously found in other countries outside South Africa. The study used annual time series data from 1981 to 2015.

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APPENDICES

Appendix A: DATA

Years	GDP	INFL	GOVE	INV
1981	20.6	15.25424	20.7	0.074855
1982	19.6	14.63904	21.7	0.411695
1983	20.5	12.30321	22.7	0.082427
1984	19.9	11.52648	23.0	0.492548
1985	20.9	16.29423	24.1	-0.674932
1986	23.0	18.65492	25.3	-0.063503
1987	21.8	16.16059	26.0	-0.184252
1988	21.5	12.77955	26.3	0.138216
1989	22.8	14.73088	26.2	-0.161086
1990	24.3	14.32099	25.6	-0.067600
1991	23.3	15.33477	25.1	0.211380
1992	21.9	13.87470	25.5	0.002573
1993	21.0	9.717447	28.1	0.008406
1994	21.3	8.938547	26.7	0.267910
1995	21.9	8.680425	26.4	0.803051
1996	21.9	7.354126	26.9	0.553079
1997	22.4	8.597770	27.2	2.497308
1998	22.8	6.880553	26.4	0.399448
1999	23.6	5.181491	26.3	1.100279
2000	23.1	5.338953	25.2	0.710486
2001	22.1	5.701901	24.0	5.983041
2002	23.0	9.164038	24.4	1.281412
2003	22.3	5.858980	23.3	0.446850
2004	22.0	1.385382	24.2	0.306842
2005	23.0	3.399300	24.4	2.530173
2006	24.4	4.641625	24.8	0.229456
2007	25.3	7.098420	24.6	2.199885
2008	25.9	11.53645	25.0	3.447016
2009	25.4	7.130000	26.2	2.576394
2010	22.9	4.262344	28.0	0.983956
2011	23.8	4.995510	27.8	0.993596
2012	24.1	5.653583	28.9	1.164114
2013	23.8	5.445279	29.1	2.247825
2014	24.4	6.375259	29.0	1.639526
2015	24.7	4.588271	29.3	0.481503

Appendix B: Unit root tests

Null Hypothesis: GDP has a unit root

Exogenous: None

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

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.579160	0.8365
Test critical values:	1% level	-2.634731	
	5% level	-1.951000	
	10% level	-1.610907	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(GDP)

Method: Least Squares

Date: 02/16/18 Time: 08:37

Sample (adjusted): 1982 2015

Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP(-1)	0.004353	0.007516	0.579160	0.5664

R-squared	-0.004981	Mean dependent var	0.120588
Adjusted R-squared	-0.004981	S.D. dependent var	0.992939
S.E. of regression	0.995408	Akaike info criterion	2.857643
Sum squared resid	32.69765	Schwarz criterion	2.902536
Log likelihood	-47.57993	Hannan-Quinn criter.	2.872953
Durbin-Watson stat	1.896876		

Null Hypothesis: D(GDP) has a unit root

Exogenous: None

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

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.462976	0.0000
Test critical values:	1% level	-2.636901	
	5% level	-1.951332	

	10% level	-1.610747

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDP,2)
Method: Least Squares
Date: 02/16/18 Time: 08:37
Sample (adjusted): 1983 2015
Included observations: 33 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDP(-1))	-0.951123	0.174104	-5.462976	0.0000

R-squared	0.482140	Mean dependent var	0.039394
Adjusted R-squared	0.482140	S.D. dependent var	1.388556
S.E. of regression	0.999239	Akaike info criterion	2.866189
Sum squared resid	31.95131	Schwarz criterion	2.911537
Log likelihood	-46.29211	Hannan-Quinn criter.	2.881447
Durbin-Watson stat	1.879049		

Null Hypothesis: INFL has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.974935	0.7492
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INFL)
Method: Least Squares
Date: 02/16/18 Time: 08:39
Sample (adjusted): 1986 2015
Included observations: 30 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFL(-1)	-0.091404	0.093754	-0.974935	0.3393
D(INFL(-1))	0.024902	0.179469	0.138752	0.8908
D(INFL(-2))	-0.527114	0.178757	-2.948776	0.0070
D(INFL(-3))	-0.104526	0.167974	-0.622276	0.5396
D(INFL(-4))	-0.398868	0.170636	-2.337539	0.0281
C	0.134765	0.952128	0.141541	0.8886

R-squared	0.398588	Mean dependent var	-0.390199
Adjusted R-squared	0.273294	S.D. dependent var	2.348984
S.E. of regression	2.002441	Akaike info criterion	4.403467
Sum squared resid	96.23444	Schwarz criterion	4.683706
Log likelihood	-60.05201	Hannan-Quinn criter.	4.493118
F-statistic	3.181214	Durbin-Watson stat	1.930450
Prob(F-statistic)	0.024174		

Null Hypothesis: D(INFL) has a unit root

Exogenous: None

Lag Length: 4 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.524917	0.0135
Test critical values:	1% level	-2.647120	
	5% level	-1.952910	
	10% level	-1.610011	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(INFL,2)

Method: Least Squares

Date: 02/16/18 Time: 08:40

Sample (adjusted): 1987 2015

Included observations: 29 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INFL(-1))	-1.378965	0.546143	-2.524917	0.0186
D(INFL(-1),2)	0.470109	0.436345	1.077378	0.2920

D(INFL(-2),2)	-0.027821	0.365866	-0.076042	0.9400
D(INFL(-3),2)	0.065065	0.244506	0.266110	0.7924
D(INFL(-4),2)	-0.301911	0.181889	-1.659862	0.1100

R-squared	0.679248	Mean dependent var	-0.143024
Adjusted R-squared	0.625790	S.D. dependent var	3.341956
S.E. of regression	2.044366	Akaike info criterion	4.423638
Sum squared resid	100.3064	Schwarz criterion	4.659379
Log likelihood	-59.14275	Hannan-Quinn criter.	4.497469
Durbin-Watson stat	2.126678		

Null Hypothesis: GOVE has a unit root

Exogenous: None

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

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		1.536074	0.9667
Test critical values:	1% level	-2.634731	
	5% level	-1.951000	
	10% level	-1.610907	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(GOVE)

Method: Least Squares

Date: 02/16/18 Time: 08:41

Sample (adjusted): 1982 2015

Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GOVE(-1)	0.009012	0.005867	1.536074	0.1341

R-squared	-0.014396	Mean dependent var	0.252941
Adjusted R-squared	-0.014396	S.D. dependent var	0.870818
S.E. of regression	0.877064	Akaike info criterion	2.604497
Sum squared resid	25.38496	Schwarz criterion	2.649390
Log likelihood	-43.27645	Hannan-Quinn criter.	2.619807
Durbin-Watson stat	1.830030		

Null Hypothesis: D(GOVE) has a unit root

Exogenous: None

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

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.028768	0.0000
Test critical values:	1% level	-2.636901	
	5% level	-1.951332	
	10% level	-1.610747	

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

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(GOVE,2)

Method: Least Squares

Date: 02/16/18 Time: 08:41

Sample (adjusted): 1983 2015

Included observations: 33 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GOVE(-1))	-0.865732	0.172156	-5.028768	0.0000

R-squared	0.441243	Mean dependent var	-0.021212
Adjusted R-squared	0.441243	S.D. dependent var	1.199155
S.E. of regression	0.896369	Akaike info criterion	2.648905
Sum squared resid	25.71127	Schwarz criterion	2.694254
Log likelihood	-42.70693	Hannan-Quinn criter.	2.664163
Durbin-Watson stat	2.062856		

Null Hypothesis: INV has a unit root

Exogenous: None

Lag Length: 3 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.585705	0.4554
Test critical values:	1% level	-2.641672	
	5% level	-1.952066	

	10% level	-1.610400

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INV)
Method: Least Squares
Date: 02/16/18 Time: 08:42
Sample (adjusted): 1985 2015
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INV(-1)	-0.102186	0.174467	-0.585705	0.5629
D(INV(-1))	-0.630265	0.208335	-3.025245	0.0054
D(INV(-2))	-0.526225	0.205124	-2.565398	0.0162
D(INV(-3))	-0.546747	0.169270	-3.230025	0.0032

R-squared	0.501090	Mean dependent var	-0.000356
Adjusted R-squared	0.445656	S.D. dependent var	1.671523
S.E. of regression	1.244521	Akaike info criterion	3.395292
Sum squared resid	41.81846	Schwarz criterion	3.580323
Log likelihood	-48.62703	Hannan-Quinn criter.	3.455608
Durbin-Watson stat	1.828494		

Null Hypothesis: D(INV) has a unit root
Exogenous: None
Lag Length: 2 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.411120	0.0000
Test critical values:	1% level	-2.641672	
	5% level	-1.952066	
	10% level	-1.610400	

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

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(INV,2)
Method: Least Squares
Date: 02/16/18 Time: 08:43
Sample (adjusted): 1985 2015

Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INV(-1))	-2.871868	0.387508	-7.411120	0.0000
D(INV(-1),2)	1.162885	0.291776	3.985545	0.0004
D(INV(-2),2)	0.578767	0.158309	3.655942	0.0010

R-squared	0.824636	Mean dependent var	-0.050585
Adjusted R-squared	0.812110	S.D. dependent var	2.837232
S.E. of regression	1.229834	Akaike info criterion	3.343402
Sum squared resid	42.34979	Schwarz criterion	3.482175
Log likelihood	-48.82273	Hannan-Quinn criter.	3.388638
Durbin-Watson stat	1.844953		

Appendix C: Choice of lag length

VAR Lag Order Selection Criteria
Endogenous variables: GDP INFL GOVE INV
Exogenous variables: C
Date: 03/01/18 Time: 20:02
Sample: 1981 2015
Included observations: 33

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-265.8421	NA	148.8043	16.35407	16.53546	16.41510
1	-194.1991	121.5760*	5.153425*	12.98176*	13.88874*	13.28693*
2	-179.6571	21.15198	5.901848	13.07013	14.70268	13.61943

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

Appendix D: Johansen Cointegration test

Date: 02/13/18 Time: 20:05
Sample (adjusted): 1983 2015
Included observations: 33 after adjustments
Trend assumption: Linear deterministic trend

Series: GDP INFL GOVE INV

Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.627117	56.92381	47.85613	0.0056
At most 1	0.428864	24.36963	29.79707	0.1853
At most 2	0.096555	5.885393	15.49471	0.7090
At most 3	0.073929	2.534562	3.841466	0.1114

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

* denotes rejection of the hypothesis at the 0.05 level

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

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.627117	32.55418	27.58434	0.0105
At most 1	0.428864	18.48424	21.13162	0.1128
At most 2	0.096555	3.350831	14.26460	0.9207
At most 3	0.073929	2.534562	3.841466	0.1114

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

* denotes rejection of the hypothesis at the 0.05 level

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

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

GDP	INFL	GOVE	INV
0.008791	0.245879	0.086839	1.243250
0.904569	0.057085	-0.318702	-0.688938
-0.049334	-0.061884	-0.562101	0.183339
0.293821	-0.182037	-0.053396	0.051153

Unrestricted Adjustment Coefficients (alpha):

D(GDP)	-0.444989	-0.467675	0.078520	-0.027889
D(INFL)	-0.996897	-0.391766	0.296398	0.407873
D(GOVE)	0.091583	0.248736	0.187201	-0.111357
D(INV)	-0.904577	0.441282	-0.133067	0.040801

1 Cointegrating Equation(s): Log likelihood -191.8419

Normalized cointegrating coefficients (standard error in parentheses)

GDP	INFL	GOVE	INV
1.000000	27.96937	9.878156	141.4231
	(5.35601)	(9.90451)	(21.6924)

Adjustment coefficients (standard error in parentheses)

D(GDP)	-0.003912
	(0.00142)
D(INFL)	-0.008764
	(0.00343)
D(GOVE)	0.000805
	(0.00140)
D(INV)	-0.007952
	(0.00181)

2 Cointegrating Equation(s): Log likelihood -182.5998

Normalized cointegrating coefficients (standard error in parentheses)

GDP	INFL	GOVE	INV
1.000000	0.000000	-0.375461	-1.083158
		(0.14102)	(0.25402)
0.000000	1.000000	0.366602	5.095082
		(0.34260)	(0.61713)

Adjustment coefficients (standard error in parentheses)

D(GDP)	-0.426956	-0.136110
	(0.12104)	(0.03377)
D(INFL)	-0.363143	-0.267480
	(0.34624)	(0.09661)
D(GOVE)	0.225804	0.036717
	(0.13687)	(0.03819)
D(INV)	0.391217	-0.197226
	(0.16984)	(0.04739)

3 Cointegrating Equation(s): Log likelihood -180.9244

Normalized cointegrating coefficients (standard error in parentheses)

GDP	INFL	GOVE	INV
1.000000	0.000000	0.000000	-1.382756
			(0.47096)
0.000000	1.000000	0.000000	5.387612

			(0.74494)
0.000000	0.000000	1.000000	-0.797950
			(1.06748)

Adjustment coefficients (standard error in parentheses)

D(GDP)	-0.430830	-0.140970	0.066271
	(0.12044)	(0.03455)	(0.08668)
D(INFL)	-0.377766	-0.285822	-0.128318
	(0.34288)	(0.09836)	(0.24676)
D(GOVE)	0.216568	0.025133	-0.176546
	(0.13313)	(0.03819)	(0.09580)
D(INV)	0.397782	-0.188991	-0.144393
	(0.16851)	(0.04834)	(0.12127)

Appendix E: VECM

Vector Error Correction Estimates
Date: 02/13/18 Time: 20:07
Sample (adjusted): 1983 2015
Included observations: 33 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
GDP(-1)	1.000000
INFL(-1)	27.96937
	(5.35601)
	[5.22206]
GOVE(-1)	9.878156
	(9.90451)
	[0.99734]
INV(-1)	141.4231
	(21.6924)
	[6.51949]
C	-673.8301

Error Correction:	D(GDP)	D(INFL)	D(GOVE)	D(INV)
CointEq1	-0.003912	-0.008764	0.000805	-0.007952
	(0.00142)	(0.00343)	(0.00140)	(0.00181)

	[-2.75949]	[-2.55546]	[0.57712]	[-4.38976]
D(GDP(-1))	-0.221116	-0.012086	-0.180330	-0.169017
	(0.20919)	(0.50607)	(0.20586)	(0.26732)
	[-1.05699]	[-0.02388]	[-0.87597]	[-0.63226]
D(INFL(-1))	0.218416	0.270620	0.035360	0.184870
	(0.09767)	(0.23628)	(0.09612)	(0.12481)
	[2.23622]	[1.14533]	[0.36789]	[1.48120]
D(GOVE(-1))	0.141095	0.161921	0.079619	-0.063730
	(0.19494)	(0.47158)	(0.19183)	(0.24910)
	[0.72380]	[0.34336]	[0.41504]	[-0.25584]
D(INV(-1))	0.332818	1.050122	0.018392	0.038086
	(0.13812)	(0.33414)	(0.13592)	(0.17650)
	[2.40957]	[3.14276]	[0.13531]	[0.21578]
C	0.187506	-0.320880	0.239685	0.085542
	(0.17422)	(0.42146)	(0.17144)	(0.22263)
	[1.07627]	[-0.76136]	[1.39803]	[0.38424]
R-squared	0.258376	0.287516	0.082294	0.550105
Adj. R-squared	0.121038	0.155575	-0.087651	0.466791
Sum sq. resids	23.16968	135.5938	22.43763	37.83444
S.E. equation	0.926357	2.240981	0.911605	1.183755
F-statistic	1.881318	2.179118	0.484239	6.602805
Log likelihood	-40.98953	-70.14205	-40.45980	-49.08072
Akaike AIC	2.847850	4.614670	2.815745	3.338226
Schwarz SC	3.119943	4.886762	3.087837	3.610318
Mean dependent	0.154545	-0.304569	0.230303	0.002115
S.D. dependent	0.988082	2.438695	0.874101	1.621113

Determinant resid covariance (dof adj.)	2.938675
Determinant resid covariance	1.316894
Log likelihood	-191.8419
Akaike information criterion	13.32375
Schwarz criterion	14.59352

Appendix F: VEC Granger Causality/Block Exogeineity Wald Test

VAR Granger Causality/Block Exogeneity Wald Tests
Date: 02/18/18 Time: 15:45
Sample: 1981 2015
Included observations: 33

Dependent variable: GDP

Excluded	Chi-sq	df	Prob.
INFL	11.55902	2	0.0031
GOVE	1.175737	2	0.5555
INV	1.730755	2	0.4209
All	15.00796	6	0.0202

Dependent variable: INFL

Excluded	Chi-sq	df	Prob.
GDP	0.480924	2	0.7863
GOVE	0.586930	2	0.7457
INV	5.911138	2	0.0520
All	9.576939	6	0.1436

Dependent variable: GOVE

Excluded	Chi-sq	df	Prob.
GDP	2.310832	2	0.3149
INFL	1.226729	2	0.5415
INV	0.563101	2	0.7546
All	4.254873	6	0.6422

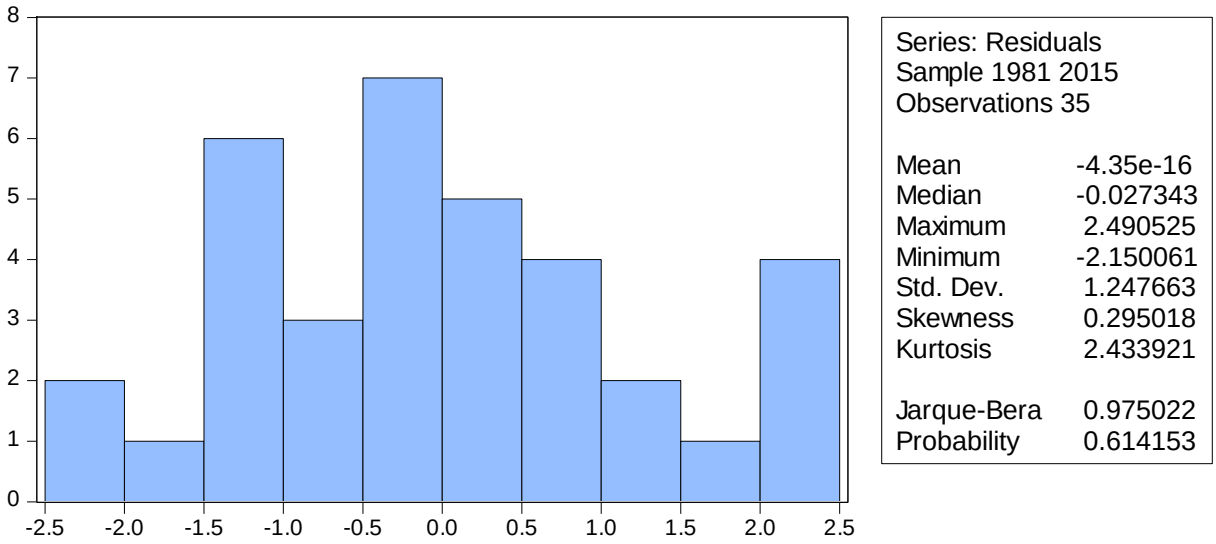
Dependent variable: INV

Excluded	Chi-sq	df	Prob.
GDP	5.309144	2	0.0703
INFL	9.863299	2	0.0072

GOVE	1.468974	2	0.4798
All	16.43701	6	0.0116

DIAGNOSTIC TESTS

Appendix G: Normality tests on residuals



Autocorrelation

Appendix H: Ljung-Box Q

Date: 02/13/18 Time: 20:29

Sample: 1981 2015

Included observations: 35

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
. |**** |	. |**** |	1	0.486	0.486	9.0058	0.003
. |*. |	.*| . |	2	0.097	-0.183	9.3716	0.009
. | . |	. |*. |	3	0.023	0.076	9.3924	0.025
. | . |	. | . |	4	0.042	0.018	9.4646	0.050
.*| . |	.*| . |	5	-0.075	-0.150	9.7101	0.084
.*| . |	. | . |	6	-0.140	-0.034	10.584	0.102
.*| . |	.*| . |	7	-0.162	-0.098	11.791	0.108
. | . |	. |*. |	8	0.027	0.194	11.826	0.159
. |*. |	. | . |	9	0.135	0.043	12.734	0.175

. | . |	**| . |	10	-0.064	-0.237	12.944	0.227
.*| . |	. | . |	11	-0.147	0.020	14.109	0.227
. | . |	. | . |	12	-0.054	-0.016	14.272	0.284
. | . |	.*| . |	13	-0.065	-0.105	14.519	0.338
.*| . |	.*| . |	14	-0.183	-0.103	16.578	0.279
.*| . |	. | . |	15	-0.141	0.052	17.863	0.270
. |*. |	. |** |	16	0.100	0.235	18.543	0.293

HETEROSKEDASTICITY TESTS

Appendix I: ARCH

Heteroskedasticity Test: ARCH

F-statistic	3.001500	Prob. F(1,32)	0.0928
Obs*R-squared	2.915618	Prob. Chi-Square(1)	0.0877

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 02/13/18 Time: 20:17
Sample (adjusted): 1982 2015
Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.110784	0.400861	2.770995	0.0092
RESID^2(-1)	0.290568	0.167717	1.732484	0.0928

R-squared	0.085753	Mean dependent var	1.556641
Adjusted R-squared	0.057183	S.D. dependent var	1.845650
S.E. of regression	1.792103	Akaike info criterion	4.061679
Sum squared resid	102.7723	Schwarz criterion	4.151465
Log likelihood	-67.04855	Hannan-Quinn criter.	4.092299
F-statistic	3.001500	Durbin-Watson stat	1.931038
Prob(F-statistic)	0.092817		

Appendix J: Harvey test

Heteroskedasticity Test: Harvey

F-statistic	1.322468	Prob. F(3,31)	0.2848
Obs*R-squared	3.971102	Prob. Chi-Square(3)	0.2646

Scaled explained SS	4.670123	Prob. Chi-Square(3)	0.1976

Test Equation:
Dependent Variable: LRESID2
Method: Least Squares
Date: 02/13/18 Time: 20:19
Sample: 1981 2015
Included observations: 35

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-7.253723	6.102076	-1.188730	0.2436
INFL	0.168692	0.109883	1.535194	0.1349
GOVE	0.161968	0.216663	0.747558	0.4604
INV	0.631179	0.353548	1.785272	0.0840

R-squared	0.113460	Mean dependent var	-0.938427
Adjusted R-squared	0.027666	S.D. dependent var	2.444208
S.E. of regression	2.410160	Akaike info criterion	4.704474
Sum squared resid	180.0750	Schwarz criterion	4.882228
Log likelihood	-78.32829	Hannan-Quinn criter.	4.765835
F-statistic	1.322468	Durbin-Watson stat	1.855015
Prob(F-statistic)	0.284804		

Appendix K: White (NCT)

Heteroskedasticity Test: White

F-statistic	2.622265	Prob. F(3,31)	0.0682
Obs*R-squared	7.084140	Prob. Chi-Square(3)	0.0693
Scaled explained SS	3.984463	Prob. Chi-Square(3)	0.2631

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 02/13/18 Time: 20:20
Sample: 1981 2015
Included observations: 35

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.971175	2.286968	0.861917	0.3954

INFL^2	0.001236	0.003612	0.342238	0.7345
GOVE^2	-0.001376	0.003092	-0.445153	0.6593
INV^2	0.127209	0.048384	2.629149	0.0132

R-squared	0.202404	Mean dependent var	1.512187
Adjusted R-squared	0.125217	S.D. dependent var	1.837226
S.E. of regression	1.718355	Akaike info criterion	4.027822
Sum squared resid	91.53502	Schwarz criterion	4.205576
Log likelihood	-66.48689	Hannan-Quinn criter.	4.089183
F-statistic	2.622265	Durbin-Watson stat	1.342715
Prob(F-statistic)	0.068164		

Appendix L: White (CT)

Heteroskedasticity Test: White

F-statistic	2.542585	Prob. F(9,25)	0.0316
Obs*R-squared	16.72639	Prob. Chi-Square(9)	0.0532
Scaled explained SS	9.407732	Prob. Chi-Square(9)	0.4005

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 02/13/18 Time: 20:22
Sample: 1981 2015
Included observations: 35

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4.743205	77.31763	-0.061347	0.9516
INFL^2	-0.012388	0.017148	-0.722448	0.4767
INFL*GOVE	0.013879	0.068404	0.202891	0.8409
INFL*INV	0.195108	0.091965	2.121537	0.0440
INFL	-0.084429	1.742994	-0.048439	0.9618
GOVE^2	-0.007802	0.100037	-0.077994	0.9385
GOVE*INV	-0.209501	0.213850	-0.979662	0.3366
GOVE	0.394728	5.586421	0.070658	0.9442
INV^2	0.085757	0.164985	0.519790	0.6078
INV	4.030709	5.991702	0.672715	0.5073

R-squared	0.477897	Mean dependent var	1.512187
Adjusted R-squared	0.289940	S.D. dependent var	1.837226

S.E. of regression	1.548140	Akaike info criterion	3.946942
Sum squared resid	59.91845	Schwarz criterion	4.391327
Log likelihood	-59.07149	Hannan-Quinn criter.	4.100344
F-statistic	2.542585	Durbin-Watson stat	1.677154
Prob(F-statistic)	0.031576		

Appendix M: Stability test

Ramsey RESET Test

Equation: UNTITLED

Specification: GDP INFL GOVE INV C

Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	1.578115	30	0.1250
F-statistic	2.490448	(1, 30)	0.1250
Likelihood ratio	2.791206	1	0.0948

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	4.056908	1	4.056908
Restricted SSR	52.92654	31	1.707308
Unrestricted SSR	48.86963	30	1.628988

LR test summary:

	Value	df
Restricted LogL	-56.90009	31
Unrestricted LogL	-55.50449	30

Unrestricted Test Equation:

Dependent Variable: GDP

Method: Least Squares

Date: 02/13/18 Time: 20:23

Sample: 1981 2015

Included observations: 35

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFL	-0.506955	0.307858	-1.646715	0.1101
GOVE	5.523422	3.301078	1.673218	0.1047
INV	6.880485	4.118487	1.670634	0.1052
C	67.26893	33.59983	2.002062	0.0544

FITTED^2	-0.363886	0.230582	-1.578115	0.1250

R-squared	0.409188	Mean dependent var	22.72000
Adjusted R-squared	0.330413	S.D. dependent var	1.559751
S.E. of regression	1.276318	Akaike info criterion	3.457399
Sum squared resid	48.86963	Schwarz criterion	3.679592
Log likelihood	-55.50449	Hannan-Quinn criter.	3.534100
F-statistic	5.194387	Durbin-Watson stat	0.993198
Prob(F-statistic)	0.002663		

Appendix N: Impulse Response

Response of GDP:

Period	GDP	INFL	GOVE	INV
1	0.809393	0.000000	0.000000	0.000000
	(0.09963)	(0.00000)	(0.00000)	(0.00000)
2	0.563609	0.162841	0.169451	-0.051726
	(0.15756)	(0.15672)	(0.15904)	(0.15099)
3	0.203344	-0.218803	0.204719	-0.183083
	(0.17877)	(0.15807)	(0.16013)	(0.16489)
4	-0.011713	-0.421759	0.152886	-0.153821
	(0.18583)	(0.16117)	(0.14982)	(0.12119)
5	-0.107904	-0.328688	0.080620	0.078461
	(0.16844)	(0.15317)	(0.15985)	(0.12116)
6	-0.079497	-0.185373	0.051949	0.142588
	(0.15069)	(0.13801)	(0.14817)	(0.11446)
7	0.014239	-0.141369	0.063681	0.075597
	(0.13562)	(0.12575)	(0.12808)	(0.08362)
8	0.069356	-0.133431	0.085520	0.023149
	(0.11576)	(0.10718)	(0.11227)	(0.06866)
9	0.066505	-0.130431	0.097162	0.011673
	(0.08969)	(0.09563)	(0.10851)	(0.06529)
10	0.045227	-0.133068	0.097226	0.008718
	(0.06963)	(0.09233)	(0.10772)	(0.05593)

Response of INFL:

Period	GDP	INFL	GOVE	INV

1	0.990475	2.026851	0.000000	0.000000
	(0.37330)	(0.24949)	(0.00000)	(0.00000)
2	0.853139	1.875845	0.132866	-0.013681
	(0.50993)	(0.48390)	(0.43903)	(0.42047)
3	0.537799	0.989457	0.202958	-0.919192
	(0.56746)	(0.50252)	(0.52172)	(0.50340)
4	0.122937	0.448890	0.051207	-0.621897
	(0.55556)	(0.48135)	(0.49866)	(0.38617)
5	-0.238220	0.577233	-0.141402	-0.130335
	(0.47045)	(0.40689)	(0.46179)	(0.27333)
6	-0.270514	0.648902	-0.259079	-0.003796
	(0.36211)	(0.36696)	(0.44209)	(0.24877)
7	-0.130618	0.629561	-0.287014	-0.082147
	(0.29713)	(0.37081)	(0.43301)	(0.23678)
8	-0.048249	0.604920	-0.279091	-0.099521
	(0.27926)	(0.36134)	(0.42082)	(0.20213)
9	-0.051499	0.562726	-0.267975	-0.102263
	(0.26657)	(0.34736)	(0.41069)	(0.18433)
10	-0.078749	0.488957	-0.264711	-0.108488
	(0.24692)	(0.33766)	(0.39813)	(0.17661)

Response of GOVE:

Period	GDP	INFL	GOVE	INV
1	-0.004607	-0.156380	0.871848	0.000000
	(0.15419)	(0.15299)	(0.10732)	(0.00000)
2	-0.025487	-0.019267	0.803139	0.061923
	(0.20384)	(0.21786)	(0.19891)	(0.16527)
3	0.207097	0.046097	0.670591	-0.046502
	(0.23312)	(0.21460)	(0.21074)	(0.19242)
4	0.354550	0.121813	0.586650	-0.087382
	(0.24876)	(0.21821)	(0.22137)	(0.15624)
5	0.347903	0.125366	0.521528	-0.118235
	(0.24154)	(0.21393)	(0.24466)	(0.14273)
6	0.275259	0.052979	0.451006	-0.150220
	(0.22011)	(0.21340)	(0.26202)	(0.15016)
7	0.192188	-0.002293	0.371861	-0.126480
	(0.19255)	(0.21389)	(0.27053)	(0.13217)
8	0.127486	-0.009096	0.296123	-0.074378
	(0.16563)	(0.21011)	(0.27072)	(0.10930)
9	0.096179	1.53E-06	0.235448	-0.043693
	(0.14261)	(0.20436)	(0.26272)	(0.09706)

10	0.087468	0.004716	0.191580	-0.035915
	(0.12481)	(0.19934)	(0.24803)	(0.08815)

Response of INV:

Period	GDP	INFL	GOVE	INV
1	-0.250599	0.221088	-0.266172	1.048580
	(0.19468)	(0.19028)	(0.18545)	(0.12907)
2	0.060063	-0.076030	-0.099069	-0.265318
	(0.19593)	(0.21895)	(0.22532)	(0.21355)
3	0.173434	-0.418100	-0.035975	-0.153168
	(0.18089)	(0.17783)	(0.11849)	(0.21096)
4	-0.034265	-0.178214	-0.021216	0.103413
	(0.14190)	(0.15398)	(0.12416)	(0.15713)
5	-0.101605	-0.169116	-0.023309	0.117696
	(0.11082)	(0.11746)	(0.07975)	(0.12481)
6	-0.040655	-0.202307	-0.007925	0.021250
	(0.09696)	(0.10883)	(0.08193)	(0.09373)
7	-0.002652	-0.166157	0.006633	0.050997
	(0.08109)	(0.08397)	(0.08642)	(0.06988)
8	0.003677	-0.116976	0.022048	0.059811
	(0.06534)	(0.07468)	(0.08728)	(0.06245)
9	0.014611	-0.116664	0.035879	0.029600
	(0.05569)	(0.06917)	(0.08540)	(0.04297)
10	0.020772	-0.120112	0.044615	0.014532
	(0.05003)	(0.06819)	(0.08348)	(0.03509)

Cholesky Ordering: GDP INFL GOVE INV

Standard Errors: Analytic

Appendix O: Variance Decomposition