THE CONSEQUENTIAL EFFECTS OF BUDGET DEFICIT ON ECONOMIC GROWTH: A VECM ANALYSIS OF SOUTH AFRICA

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DECLARATION AND COPYRIGHT

Student

I hereby declare that this study is my own work and that due acknowledgement has been given in the references to all sources of information used. Furthermore, this study has not been submitted before for any degree or examination in any other University.

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DEDICATION

This study is dedicated to my one and only daughter **Leano** and her lovely mother **Khethiwe.** Thanks for the support, advises, endurance and love that you demonstrated throughout the writing of this dissertation.

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LIST OF ABBREVIATION USED

ADF:	Augmented Dickey-Fuller
AIC:	Akaike Information Criteria
BCA:	Budget Control Act
BDIF:	Budget Deficit
BLUE:	Best Linear Unbiased Estimates
BRICS:	Brazil, Russia, India, China and South Africa
CBA:	Cost Benefit Analysis
GDP:	Gross Domestic Product
CLRM:	Classical Linear Regression
EU:	European Union
FPE:	Final Prediction Errors
GEAR:	Growth Employment and Redistribution
GFECRA:	Gold and Foreign Exchange Contingencies Account
GMM:	General Methods of Moments
HQIC:	Hanna and Quinn Information Criteria
IMF:	International Monetary Fund
IID:	Independently and Identically Distributed
J.B:	Jarque-Bera test
LAB:	Labour force
LR:	Likelihood Ratio

MTEF:	Medium Term Expenditure Framework
MTBPS:	Medium Term Budget Policy Statement
MOU:	Memorandum of Understanding
NDP:	National Development Plan
OLS:	Ordinal Least Square
P.P:	Phillip-Peron
RGDP:	Real Gross Domestic Product
SADC:	Southern African Development Community
SARS:	South African Revenue Service
SARB:	South African Reserve Bank
SBIC:	Schwartz Bayesian Information Criteria
SONA:	State of the Nation Address
UN:	United Nations
USAID:	United States Agency for International Development
UNDP:	United Nation Development Plan
VECM:	Vector Error Correction Model
VAR:	Vector Auto-Regression

IN USE DEFINITION OF TERMS

Budget:	It's a governmental financial plan that outlines how government intend to raise revenue and spend the raised revenue.
Budget deficit:	The instance where the government expenditure exceeds the revenue collected in a specific period in time
Budget balance:	Zero difference between governmental revenue and government expenditure.
Budget surplus:	The instance where the government expenditure is less than the revenue collected in a specific period in time
Budget process:	a set of budget activities which are interrelated to produce a credible budget
Crowding out:	A decline in either private investment and or consumption due to the increased interest rates due to increase in government expenditure.
Government expenditure:	Comprises all government consumption, investment, and transfer payments.
Economic growth:	The aggregate sum of goods and services produced within the borders of the country in a specific period, normally one year.
Unemployment:	Refers to the situation where an individual of working age is unable to get an employment but willing to work.
Gross fixed capital:	Refers to the disposable increase in physical assets within the specific period in time. However it does not account for the depreciation of fixed capital, and also does not take account of land acquisitions.
Interest rate:	The percentage of a loan that is charged as interest to the debtor, typically expressed as an annual percentage of the loan unpaid.

Fiscal policy:	The instrument which the government utilise to adjusts its expenditure levels and tax rates to monitor and influence a nation's economy.
Labour force:	refers to all the participants who are able to work in a particular organization or country.
VECM:	A general framework that is normally employed to define the dynamic interrelationship among stationary variables. The VECM also take into account any cointegrating associations amongst the variables.
MTEF:	A transparent planning and budget formulation procedure within which the Cabinet and central agencies found credible. It is also referred to as a process of allocation public resources to their planned priorities at the same time ensuring overall fiscal discipline.
Time series data:	An arrangement of data points, typically consisting of succeeding measurements made over a time interval.
Transfer payments:	Government funds that are directly reassigned to other institutions or individuals, and are not payments for productive work.

ABSTRACT

This study was undertaken to examine the effects of budget deficit on economic growth of South Africa using the Vector Error Correction Model under the VAR framework. This study is relevant because recently, the rate of budget deficit in South Africa is high and it continues to pose risks to the economic outlook of the country. This study contributes to the debate of budget deficit reduction through measures such as fiscal consolidation and Austerity measures. To this end, the time series data set from the period from 1985 to 2015 was collected and analysed. The results of this study revealed that budget deficit is inversely related with economic progress in South Africa. The policy implication of this negative relationship is that an increase in budget deficit is detrimental to economic growth of a country. Furthermore, the study discovered that labour force participation and gross domestic investment remains the core elements that improve the economy in South Africa. Therefore, the government of South Africa should work together with private sectors, labourers and other stakeholders and should also reinforce austerity measures such as cost containment and fiscal consolidation without curtailing its priorities to ensure the effective promotion of economic growth in the country.

KEYWORSD: (Budget Deficit, Economic Growth, Vector Error Correction Model, South Africa).

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

How economic growth responds to increasing budget deficits remains a policy matter in numerous countries. Furthermore, it is still one of the argued issues between economists and policy makers since it is an ideal depiction of every country, both emerging and advanced, to realise equilibrium between revenue collected and government expenditure. However, ordinarily, government expenditure on both goods and services and transfers are likely to exceed the revenue collected or the available resource envelope. This transpires predominantly due to excessive reliance by the general public on government expenditure as a source of social security, improved standard of living conditions and expanded physical infrastructure. As a result, the realisation of budget stabilities remains a challenge, more particularly in developing economies where government expenditure is regarded as an indispensable component of economic growth and development.

Budget instabilities has necessitated the need for fiscal cautiousness and effective budget formulation, implementation and monitoring process in all public sectors around the globe. According to Black, Calitz and Steenkamp (2012), the budgeting process is a useful tool that determines the triumph of the country's developmental plans. Therefore, it is very essential that every government sets aside its priorities as outlined in the National Development Plans (NDP) and size them against the available revenue in order to avoid tabling a deficit budget. Nonetheless, this is not always the case in emerging economies since the collected revenue is insufficient to address all the priorities brought forward by its government. According to Mashakada (2013), high deficits in most African countries and other emerging countries have always been at the centre of macroeconomic adjustment due to the developing nature of their economies.

South African is one of the developing countries that have experienced budget deficits over the several decades. These very same budget deficits have led to most economic challenges such as high inflation, low investments, high interest rates, low economic performance, worsened credit ratings and unmanageable debt in South Africa (**refer to table 1.1 below**).

Table 1.1: Macroeconomic developments in South Africa

	2009	***2010***	***2011***	***2012***	***2013***	***2014***	***2015***
GDP Growth rate	*-1.5*	*3.0*	*3.2*	*2.2*	*2.2*	*1.5*	*1.3*
GDP per capita growth	*-2.9*	*1.5*	*1.7*	*0.7*	*0.6*	*-0.1*	*-0.2*
CPI inflation	*7.1*	*4.3*	*5.0*	*5.7*	*5.4*	*6.4*	*6.5*
Budget balances % of GDP	*-4.6*	*-4.6*	*-4.0*	*-5.2*	*-4.8*	*-4.7*	*-4.5*
Current account deficit % of GDP	-2.7	-1.5	-2.2	-5.0	-5.8	-5.4	-4.4

Source: author's own computation using data from SARB & World Bank.

It is evident from table 1.1 that GDP growth rate has been unstable throughout the years in South Africa due to challenges conveyed by budget deficits and other macroeconomic challenges. The growth rate fluctuated from -1.5% in 2009 to 1.3% in 2015 which is way below the South African potential growth. The instabilities in the GDP growth rate transpired as a result of fluctuations in the above highlighted macroeconomic variables. Notwithstanding that, less than a decade into the 21st century, numerous countries, as well as South Africa experienced the world economic predicament which actually affected their economic advancement. South Africa experienced an average growth rate of roughly 5% in real terms between 2004 and 2007. Nonetheless, from 2008 to 2012, it only recorded the average growth of just above 2% mainly due to the effects of the 2009 world economic crisis.

Between 2006 and 2007, South Africa recorded the highest growth rate of 5.6% and 5.4% respectively. That was the same period the country experienced its first budget surpluses of 0.3% and 0.7% respectively. This was a clear indication that the growth rates of the country are better off when the levels of budget deficits are low. During that point in time, South African performance was precisely commendable as compared to other African countries such as Botswana, Angola and Lesotho which have recorded budget surpluses several times. Nevertheless, during mid-2008 towards the beginning on 2009, the economic conditions became hostile and led to increased budget deficits. The degree in which the global economic predicament stalled South African economy was extensive

with budget deficit shifting from -0.4% in 2008 to -4.6% in 2009. The GDP growth also declined drastically from 3.2% to -1.5% in 2009.

This is a clear picture that South Africa might have done well since 1994 particularly in economic terms, but it is still not sufficient enough to address structural problems of the country. As compared to its peers such as Brazil, India, and Turkey, the South African economic growth is still not satisfactory, mainly due to forever escalating government spending, insufficient revenue generation capacity and increasing levels of government debt to finance budget shortfalls. According to National Treasury (2015), the government of South Africa should promote fiscal discipline and budget growth rate must be controlled in order to preserve the sustainable public financial management. Consequently, the South Africa government is committed to fiscal consolidation and expenditure ceiling that would strengthen sustainable expenditure levels.

Empirically, the relationship between budget deficits and economic growth has been an essential question for some time now. However, the results obtained have been vague, with others perceiving the relationship to be positive and others negative. Quite number of studies recommended that government should not be strained to table a balanced budget every financial year since this would weaken the role of taxation and transfers as stabilizers. According to the authors, governments should table a deficit budget only on depraved years which can be offset by surpluses in virtuous years. Given the reason that there exists no coherent finding regarding the relationship between budget deficit and economic growth, it then seems sensible to examine it based on a specific country, which in this study is South Africa.

1.2 Problem statement

The argument regarding the relationship between budget deficit and economic growth has been an on-going debate between economists and policy makers for a century with agreement occasionally emerging but not persisting. In the case of South Africa, the level of budget deficit has been on an escalating drift accompanied by a mute economic growth. The escalation in budget deficit transpires as a result of vast government expenditure and strained revenue generation capacities. For instance, in 2015/16 financial year the government consolidated expenditure was estimated at R1.4 billion whilst the revenue collected was only R1.2 billion translating to a negative budget balance of -3.9% as affirmed by National Treasury (2015).

Despite the negative budget balance acquired by the government on an annual basis, the South African economy is still not sufficient to address major economic challenges such as increasing unemployment, unstable price levels and current account deficit. The Gross Domestic Product (GDP) is also quandary since it is not growing as expected. According to Statistics South Africa (2015), South African real GDP growth rate was at 0.7% in the 3rd quarter of 2015 as compared to a drastically decline of 1.3% during the second quarter. The growth was mainly contributed to by sectors such as manufacturing, finance, and real estate and business services, while major sectors such as mining and quarrying, agriculture, forestry and fishing were recording a negative growth rate.

Budget deficits are observable facts that affect the economic and political significance of the country and South Africa is not excluded from such implications. As the government is committed at balancing the revenue and expenditure through the application of austerity measures (cost containment measures), factors such as weaker than expected economic growth and public sector wage settlement above the inflation rate continue to pose risk to the fiscal outlook. According to the National Treasury Budget Review (2015), sustained public finance cannot be achieved through expenditure cuts or faster economic growth since the budget deficit is structural in nature. This has necessitated the need for an empirical analysis of the above phenomenon in South Africa. This study is the aimed at recommending possible ways in which budget deficit can be moderated to policy makers who are aimed at improving the economy of South Africa.

Sub-problems consistent to the main problem stated above include high unemployment rate of 25.2% with youth unemployment being among the highest in the world. As reported by Statistics South Africa, poorly positioned and insufficient infrastructure that limit economic growth and social enclosure, poor and uneven service delivery that discourage improved health and education standards are some of the factors negatively affecting economic growth.

1.3 Objectives of the study

The primary objective of this study is to investigate the nature of the relationship between South Africa's budget deficit and economic growth for the period 1985 to 2015. The sub-objectives are to:

- Assess the trends between budget deficits and economic growth indicators in South Africa.

- Employ the Vector Error Correction methodology to analyse both short-run and long-run association between budget deficit and its determinants.
- Determine how real economic growth reacts to shocks in budget deficit and its fundamental determinants.
- Determine the direction of the causal association between budget deficit and economic growth.
- Articulate relevant policies grounded on the findings of the study.

1.4 Research questions and hypothesis

1.4.1 Research questions

- What are the main determining factors of budget deficit in South Africa?
- What is the relationship between budget deficit and economic growth in South Africa?
- What is the direction of causality between budget deficit and economic growth?
- What measures can ensure a sustained budget deficit in South Africa?

1.4.2 Research hypothesis

The study will test the following null hypotheses:

- There is no significant relationship between budget deficit and its fundamental determinants.
- Budget deficit has no significant impact on real GDP growth in South Africa.
- There is no causal relationship between budget deficit and economic growth

1.5 Significance of the study

This study is undertaken to examine the response of economic growth to changes in budget deficits in South Africa from the period of 1985 to 2015. The results obtained from this study will help the South African government to understand how economic growth increases or decreases as a result of fiscal stimulus, as well as how economic growth can deteriorate or intensify as a result of reduction fiscal policy. Furthermore, this study contributes to the fiscal policy literature more particularly in South Africa where the effects of fiscal policy is less studied as compared to monetary policy. Most of the fiscal policy studies are undertaken in the U.S. economy and increasing in the European Union as affirmed by De Castro and Garrote (2012).

During the tabling of 2011 Medium Term Expenditure Framework, the government of South Africa suggested to employ a numeric target fiscal rule. However, it is worth noting that a fiscal rule implies that discretionary fiscal policy is unproductive in stimulating demand and that only automatic stabilisers should be relied upon to smooth out business cycle. Therefore, this study will also assist in establishing the effectiveness of fiscal deficits in stimulating economic growth and hopefully the results obtained will contribute to the debate of whether to abandon the discretionary fiscal policy and pursue a fiscal rule.

1.6 Structure of the study

This chapter mainly introduces the research topic, problem statement, research question, objective and also the significance of the study. The following chapter which is chapter two will present the overview of budget deficit and economic growth in South Africa. Chapter three will scrutinize theoretical aspects to budget deficit and economic growth and will also examines empirical studies undertaken in South Africa and elsewhere in the domain. Chapter four will present the methodology employed in the study. Chapter five will report the overall findings of the study by using E-views 9. The last chapter which is chapter 6 will present the conclusion, policy recommendation and limitation of the study.

CHAPTER TWO

OVERVIEW OF THE STUDY

2.1 Introduction

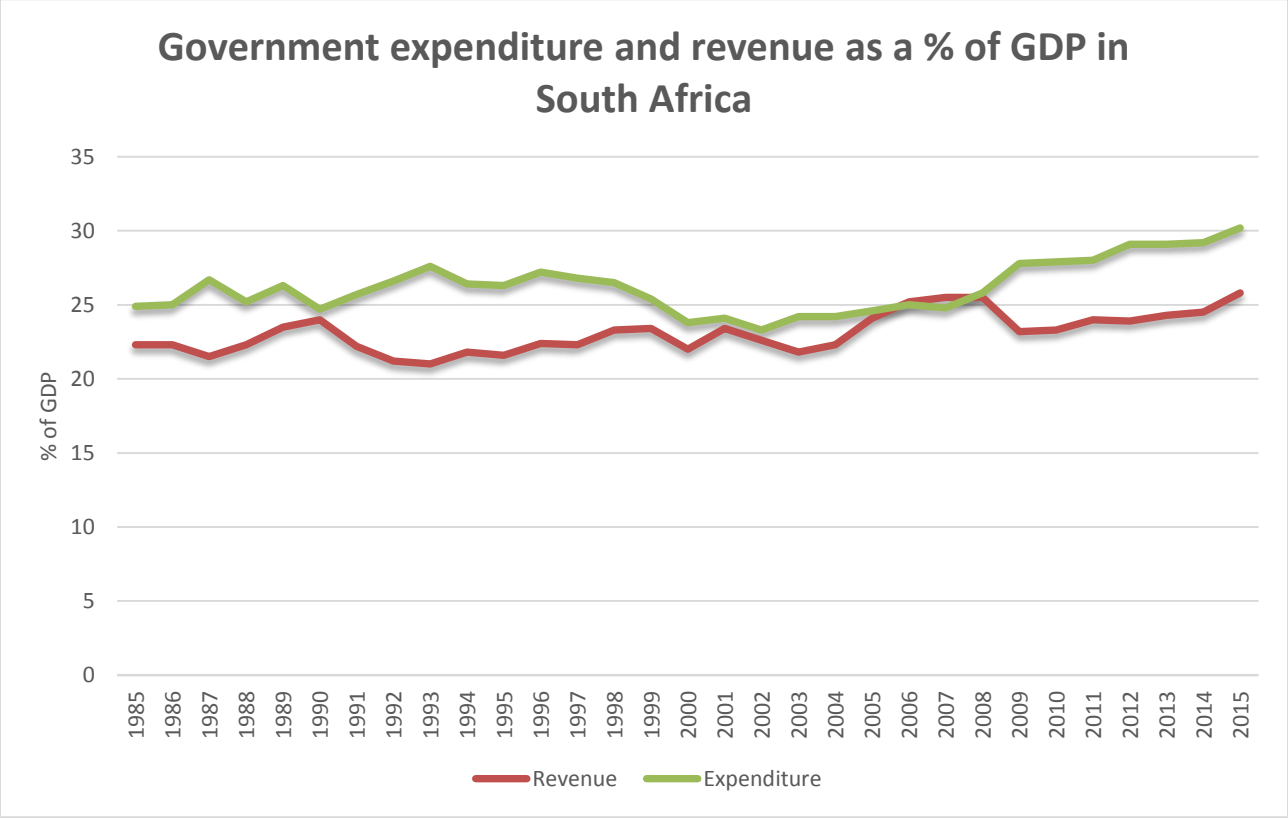
This chapter presents an overview of budget deficits and economic growth in South Africa covering the period 1985 to 2015. This chapter will start by reflecting on government expenditure and government revenue in South Africa as main determinants of budget deficits or surpluses. Moreover, this chapter will examine the behaviour of budget deficits and economic growth in South Africa. Lastly, this chapter will compare and contrast South Africa with the rest of Southern African Development Community (SADC) members in terms of budget deficits and economic performance in order to establish the position of South Africa in the region.

2.2 Government expenditure and government revenue collection in South Africa

The fiscal policy of South Africa is characterised by two interrelated policy instruments namely, government expenditure and taxation. These two policy instruments are both endorsed by National Treasury of South Africa which is mandated by chapter 13 of the Constitution of the Republic of South Africa (1996) to support well-organized and maintainable public financial management with the aim of promoting economic progression, good governance, social progress and a rising standard of living for all South Africans. Fiscal policy plays an essential role in driving the economy of the country to a path of growth and development. The expenditure instrument is concerned with how the government intends to fund its priorities whereas the taxation instruments address strategies in which the government intends to raise revenue. The very same policy instruments play a fundamental role in determining whether the budget of the country is a deficit or a surplus. According to the National Treasury (2015), the government ensures long-term vigorous public finance by appropriating the principle of counter cyclicality, debt sustainability and intergenerational fairness, and by so doing, it can act within its available resources.

Figure 2.1 below clearly demonstrates the trends between government expenditure and government revenue in South Africa.

Figure 2.1: South Africa fiscal framework from 1985-2015



Source: author's own computation using data from South African Reserve Bank

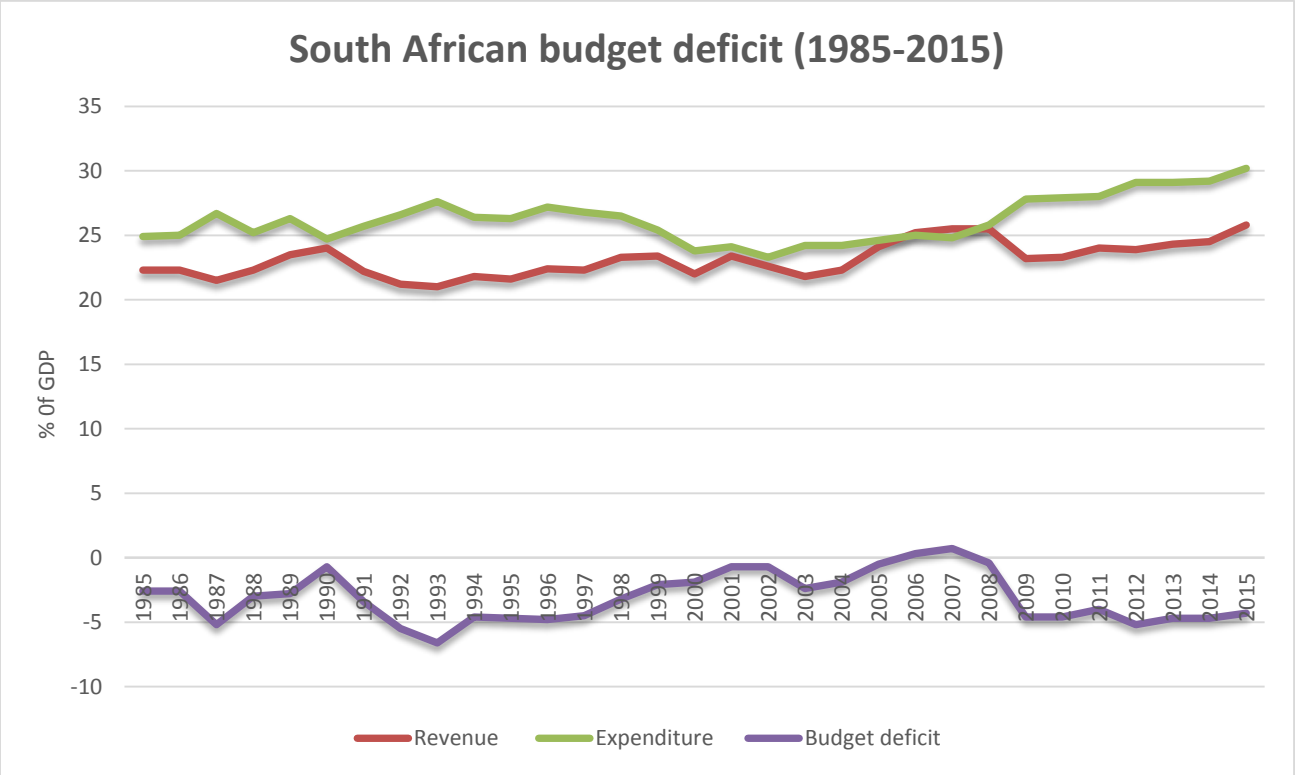
Since the beginning of the year 1985, the government expenditure has been surpassing the revenue collected in South Africa with government expenditure recording 24.9% of GDP while revenue was standing at 22.3%. The expenditure further increased to 26.7% of GDP whilst the revenue was decreasing to 21.5%. However, starting form 1988, the revenue was on an escalating trend until 1990 where it was almost equivalent to government expenditure. This was predominantly due to an augmentation in income and profit taxes, property tax, and taxes on goods and services as reported by South African reserve Bank (2013).

Simultaneously as the revenue was escalating, the expenditure was also increasing significantly mainly due to special transfers which were made for shortfalls on government pension fund and the Gold and Foreign Exchange Contingencies Account (GFECRA) held with the central bank of South Africa. Following the implementation of the Growth, Employment and Redistribution (GEAR) policies in 1997, the government revenue increased significantly by 12.3% and this was qualified by a drastic increase in the number of registered taxpayers and new registrations, coupled with improvements in the revenue-collection efficiency of the South African Revenue Service (SARS).

Then again, government expenditure continued escalating due to activities by the government to fight poverty and develop an efficient environment through the improvement in the quality of education, enhanced efficiency in the public service, access to health care and support for impecunious people through social grants.

As a result of government's commitment to economic improvement, the level of expenditure surpassed the revenue collected and resulted in huge negative budget balances. The only measure which assisted South Africa in remaining efficient in providing for its citizen was borrowing from institutions such as the International Monetary Fund (IMF). However, the government had to begin consolidating the expenditure ceiling in order to stabilise the debt. The enthusiasm to reinforce expenditure ceiling and increasing taxation assisted the government during 2006 and 2007, where the level of revenue surpassed the level of spending and that was the first time South Africa tabled a surplus budget **(refer to figure 2.2)** below.

Figure 2.2: South African budget deficit (1985-2015)



Source: author's own computation using data from South African Reserve Bank and World Bank

In 2009 during the world economic crisis, the government revenue started declining drastically with government expenditure increasing way above the expected rate. The world economic crisis of 2009

stalled the South African economy extensively and the country is struggling to fully recover. From 2012 until 2015, South Africa has been experiencing high expenditure and constrained revenue collection. The budget deficit was increasing to -5.2% in 2012 and -4.5% in 2015 due to structural challenges which the government is addressing such as high unemployment rate and weaker growth output. At the current moment, the country implemented the fiscal consolidation policy which is referred to by National Treasury as fiscal discipline "spending within the available resources" in order to combat the negative bank balances.

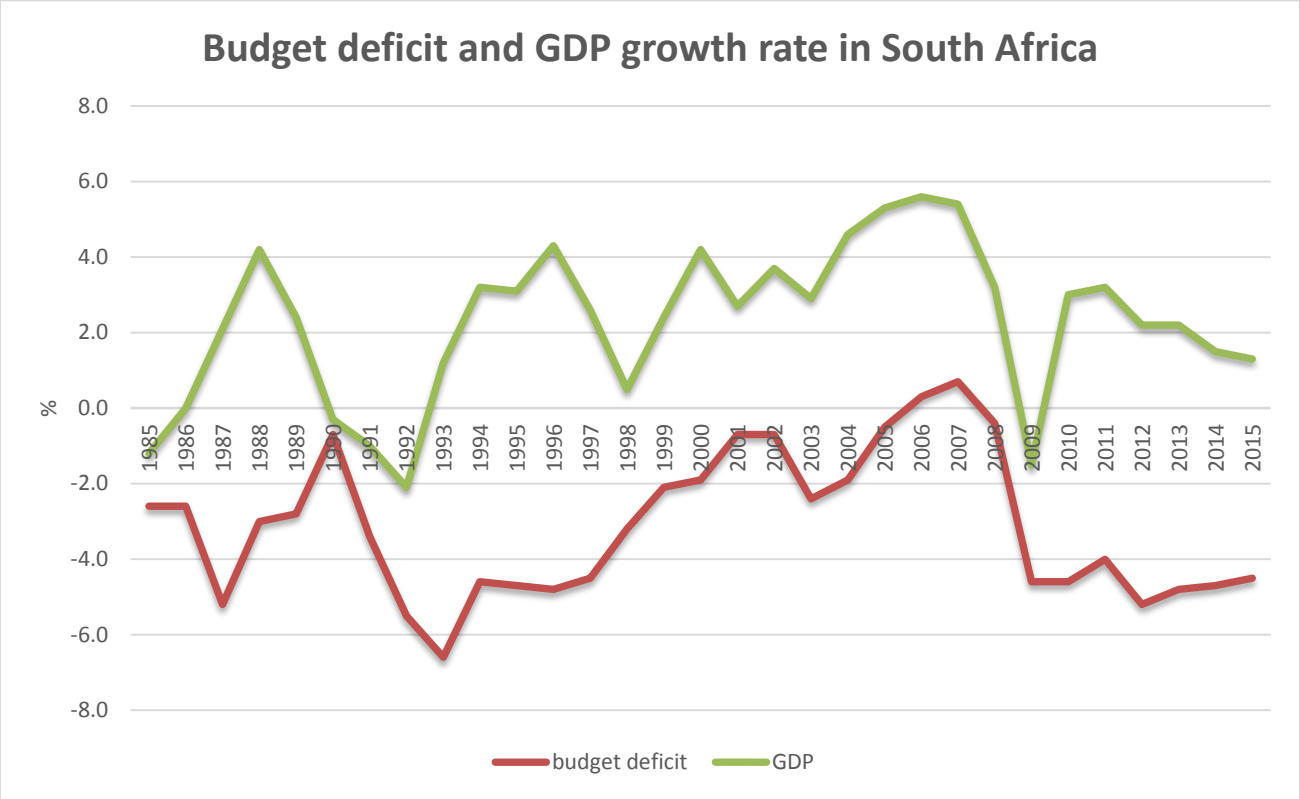
2.3 Overview of budget deficit and economic growth in South Africa

Since the period of 1985, South African fiscal trends recorded massive budget deficits accompanied by mute economic growth. According to National Treasury (2011) high budget deficits in South Africa emerged mainly due to high levels of unemployment and stumpy growth performance. South Africa recorded its first highest budget deficit of -6.6% in 1993 while the GDP growth rate was 1.2%. This was a result of government spending towards the first democratic elections, among other reasons. Just a year in democracy, the budget deficit was slumped down to -4.6% at the same time as GDP growth rate was augmenting by 3.4%. This was a good indication that the new government of South Africa was taking a correct path in addressing the errors of past apartheid regime. The government continued being fiscal enthusiast and dedicated to cautious fiscal reforms through the implementation of a policy known as Growth, Employment and Redistribution (GEAR) in 1996. The policy was aimed at among others:

- Reducing overall budget deficit to 3%,
- Encouraging the government level of saving, and
- Decreasing government consumption relative to gross domestic product.

The policy assisted the government of South Africa in reducing budget deficit to -3.2% in 1998 as reported by South Africa Reserve Bank (2013). However, this rate of budget deficit was still above the anticipated 3% as stipulated in the GEAR policy. During the same year of 2008, the GDP growth rate only grew by 0.5% (**refer to figure 2.3 below**):

Figure 2.3: budget deficit and GDP growth trends in South Africa (1985 – 2015)



Source: author's own computation using data from World Bank

According to the World Bank (2015) South Africa recorded its highest GDP growth rate of 5.6% and 5.4% in 2006 and 2007. This was the same period South Africa experienced their first budget surpluses of 0.3% and 0.7%. The budget surpluses were mainly due to large savings on debt servicing cost and under-spending by governmental departments. Reasonable monetary easing implemented by the South Africa Reserve Bank also assisted the fiscal authorities in realising budget surpluses. The favourable economic conditions of that time assisted the government of South Africa in reducing the debt and also allowed expenditure redeployment.

In the later stage of 2008 towards the beginning of 2009, the South African economy was stalled by the global economic crisis. The magnitude of the global economic crisis on South African economy was enormous. The country regressed from budget surplus of 0.7% to deficit of -4.6% and GDP growth rate of -1.5%. Subsequent to the global economic crisis, the South African economy has been struggling to recover and this has positioned the country under fiscal constraint environment. According to the National Treasury (2015), the fiscal constraints facing the country will affect the

swiftness and extent of government's contribution to the National Developmental Plan (NDP). However, the government remains resilient in promoting the core social and economic programmes.

However, the government remain resilient to promote the core social and economic programmes. To restrain costs and sustain service delivery in order to promote growth of the country, the government of South Africa is planning to promote fiscal consolidation as reflected in table 2.1 below.

Table 2.1: Consolidated fiscal framework, 2012/13 – 2018/19

Consolidated fiscal framework, 2012/13 – 2018/19

R billion/percentage of GDP	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19
	Outcome			Revised estimate	Medium-term estimates		
Revenue	**907.6**	**1 008.1**	**1 100.0**	**1 223.1**	**1 324.3**	**1 436.7**	**1 571.6**
	27.3%	*27.9%*	*28.6%*	*30.0%*	*30.2%*	*30.2%*	*30.4%*
Non-interest expenditure	950.1	1 034.5	1 116.5	1 245.6	1 308.9	1 403.4	1 509.6
	28.6%	*28.7%*	*29.0%*	*30.6%*	*29.8%*	*29.5%*	*29.2%*
Interest payments	93.3	109.6	121.2	135.3	154.3	168.7	185.6
	2.8%	*3.0%*	*3.2%*	*3.3%*	*3.5%*	*3.6%*	*3.6%*
Expenditure	**1 043.4**	**1 144.1**	**1 237.7**	**1 380.9**	**1 463.3**	**1 572.1**	**1 695.2**
	31.4%	*31.7%*	*32.2%*	*33.9%*	*33.3%*	*33.1%*	*32.8%*
Budget balance	**-135.9**	**-136.0**	**-137.8**	**-157.9**	**-139.0**	**-135.3**	**-123.6**
	-4.1%	*-3.8%*	*-3.6%*	*-3.9%*	*-3.2%*	*-2.8%*	*-2.4%*
Primary balance	**-42.6**	**-26.4**	**-16.6**	**-22.6**	**15.4**	**33.4**	**62.0**
	-1.3%	*-0.7%*	*-0.4%*	*-0.6%*	*0.4%*	*0.7%*	*1.2%*

Source: National Treasury (2016)

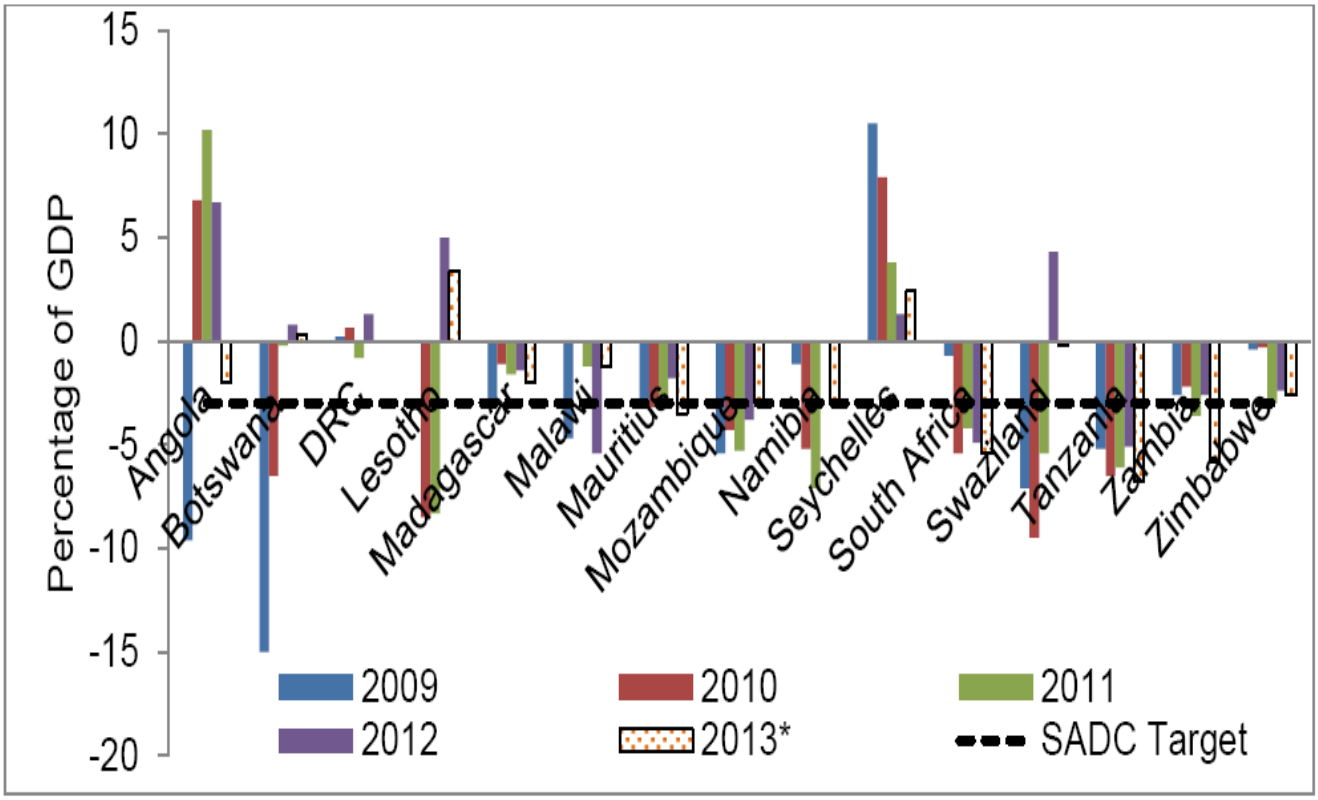
The above table 2.1 reflects how the government of South Africa is committed to promoting fiscal consolidations. During the 2015/16 financial year, the revenue target was R1 223 trillion or 30%, whereas the anticipated spending was R1 381 trillion or 33.9 per cent. This represented about R157.9 million deficit or -3.9% which was still above the 3% set aside by the GEAR policy. In 2016/17 the revenue is expected to increase on both Non-interest expenditure and interest to 30.2% year on year to 30.4% over the 2016 MTEF, whilst expenditure is reflecting significant declines of 33.3% year on year and 32.8% over the MTEF. This will assist the government in narrowing the budget deficit from -3.2% year on year to -2.4% over the 2016 MTEF.

2.4 Southern African Development Community (SADC) countries budget deficit and economic growth comparison

The Southern African Development Community (SADC) has developed a regional economic integration as a strategic path to realise economic growth and development and level of affluence enhancement in support of the socially deprived people within the Southern Africa region. During the workshop that took place in 2001 between Macroeconomic subcommittee of Finance and Investment, Trade and Industry, Finance and Investment Directorate of the SADC Secretariat of the committee of Central Bank Governors and funding from USAID, a Memorandum Of Agreement (MOA) on Macroeconomic Stability and Convergence was drafted and endorsed by the Minister of Finance and Investment. According to the SADC technical report (2003), the SADC countries approved the MOU to accomplish macroeconomic stability in a regional unit. However, the SADC countries had to implement policies that will position macroeconomic stability and among others those policies encompassed: enforcing low levels and steady inflation rate, upholding a cautious fiscal attitude that gives a wide berth to excessive fiscal deficits, high public debt and unwanted financial imbalances in the economy and minimizing internal and international market falsifications.

Variables such as inflation rate, budget deficit as ratio of GDP, net value of public debt and the balance of the external account were preferred as measures to monitor macroeconomic convergence within all countries of SADC. According to the SADC report (2013), several regional countries have issues of arrears. For instance Zambia, Tanzania, Malawi and Zimbabwe carry as much as 15% of projected government expenditure year on year and now the complexity of taking amount outstanding into account makes the budget deficit figures less accurate. The following figures below were derived from the SADC publications just to highlight the countries performance from 2009 to 2013.

Figure 2.4: Budget Deficit comparison between SADC countries (2009-2013)



Source: SADC Central Bank

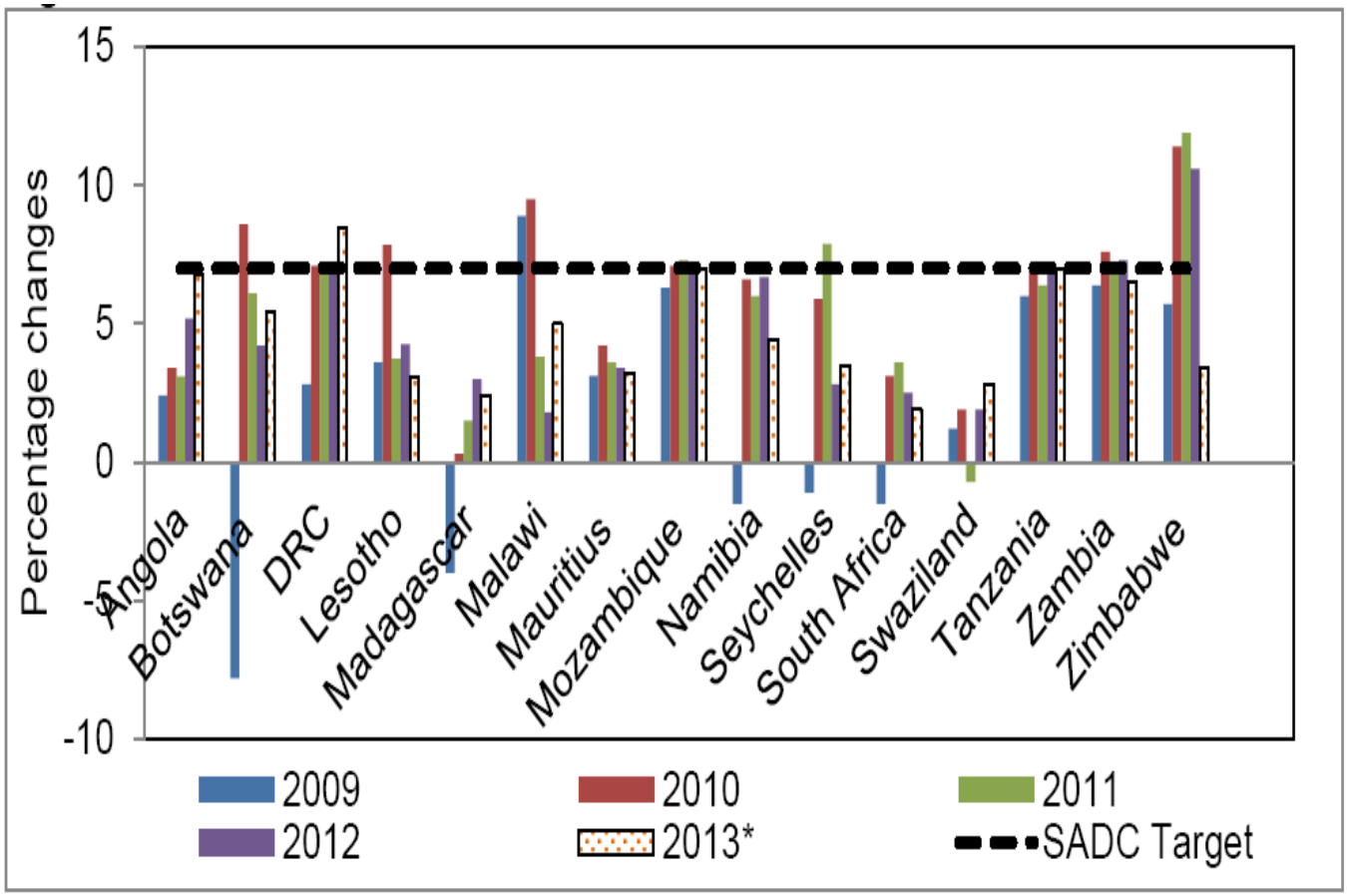
Based on figure 2.4, it is clear that most of the SADC countries experienced budget deficit from 2009 to 2013, in exception of Seychelles and Angola which have recorded surpluses over the year. During the year 2009, Botswana and Angola recorded significant rates of budget deficit representing – 15% and –10% of the GDP respectively. South Africa, Zimbabwe and Namibia recorded minimal rates of deficit below the SADC target, whereas the DRC and Seychelles realised some savings. Most of the SADC countries recorded budget deficit mainly due to poor revenue collection or utilisation, overspending by governmental departments and low rate of economic growth. The best recommendation that could be made that time was that countries should implement revenue enhancement strategies and ensure that policies against excessive expenditure are in place to combat negative budget balances.

During the year 2010, Angola started realising budget balances, whereas South African deficit was increasing mainly due to the requirement for a country to invest more on safety and security for the 2010 FIFA tournament that was taking place. Botswana, Namibia, Lesotho, Swaziland and Zambia also recorded significant deficit above the target. Seychelles continued recording the highest budget

surpluses which dropped significantly in 2011 and 2012. In 2013, there was a huge improvement in the level of budget deficit among the SADC countries following the reinforcement of Macroeconomic Stability and convergence policy. As a result of the enforcement of the stability policy, Botswana and Lesotho experienced the budget steadiness for two conservative years of 2012 and 2013. Throughout the above stipulated years, South African deficit was minimal mainly due to government commitment to fiscal consolidation and the increase of tax baselines.

According to the Central Bank of Lesotho report (2014), South African, Tanzanian and Zambian deficit were expected to worsen in years to come due to excessive investment in social and economic infrastructures as affirmed by Rakotonjatovo and Ramilison (2007). As for other member states, it is anticipated that Lesotho will record a highest budget deficit subsequent to a three trend of positive budget balances. Mauritius will continue to experience deficit mainly due to low public investment and continued reliance on food import from the European countries (Kalumiya and Kannan, 2015).

Figure 2.5: Real GDP comparison between SADC countries



Source: SADC Central Bank

According to the SADC Central Bank (2014), the economic performance of SADC was hostile following the global economic crisis. Due to the sluggish recovery of the global economy, the regional economic growth deteriorated from 5%to 4.8% which is still below the target of 7% as stipulated in the macroeconomic convergence stability policy signed by the member states. However, the overall economic performance in the SADC countries improved quite strongly over the years. Countries such as Zimbabwe, Malawi, Tanzania, Zambia Mozambique and DRC have recorded the real GDP growth rate above 5 per cent throughout the above stipulated years.

In 2009, Botswana, Madagascar, Namibia Seychelles and South Africa were stalled by the global economic crisis which led to countries recording a negative GDP growth. During 2010 Malawi, Zimbabwe and Botswana recorded a significant increases in the GDP growth rate. South African real GDP also increased significantly in 2010 mainly due to the FIFA tournament that was taking place. The tournament assisted in improving the growth rate of the country in the form of foreign direct investment, domestic investments and employment opportunities. Regardless of the development occurring in the country, South Africa has never recorded a real GDP growth rate closer or above the SADC target of 7%.

2.5 Conclusion

This chapter presented an overview of budget deficit and economic growth in South Africa. The chapter began by highlighting the association between government expenditure and revenue. The analysis clearly indicated that throughout the years, the government expenditure has been surpassing revenue generated in exception of 2006 and 2007, where South Africa recorded the first budget surpluses. Furthermore, the chapter analysed the behaviour of budget deficit in South Africa. Based on the analyses, it was clear that the economic growth of South Africa is better off when the budget deficits are low. Lastly, the study compared and contrasted South African budget deficit and economic growth with those of the rest of the SADC countries to check the position of the country on the region.

CHAPTER THREE

LITERATURE REVIEW

3.1 Introduction

Numerous empirics propose that budget deficits are associated with a slow economic growth and the crowding out of private investment through their effect on interest rate, investor's sensitivities and inflation rate. According to Abedian and Biggs (1999), crowding-out effects are believed to be very much dominant than the crowding-in effects, and are known to enhance the capacity-utilization effects on deficit spending. As a result, policies have been developed to assist governments in combating budget deficits. However, the very same policies have been debated since others argue that the reductions in budget deficits are essential for sustained economic growth, whereas others emphasize that a strong growth necessitates a deficit-financed government. This chapter deliberates on the theoretical vagueness of the correlation between budget deficit and economic growth, and also reviews the relevant empirical inputs to the debate.

The theoretical analysis of this study gives consideration to both theories behind budget deficit and economic growth. Theories such as Keynesian theorem, neoclassical hypothesis and the Ricardian equivalence are discussed. The study also acknowledges the theoretical contributions made by Solow growth model, the new growth model and the Augmented Solow model in explaining the determinants of economic growth. Once the theoretical analysis is covered, then the empirical contribution regarding the relationship between budget deficit and economic growth will follow. The empirical literature is divided into three subsections which are empirical evidence undertaken in developed economies, developing economies and then South African economy as the country in question.

3.2 Budget deficits in theory

Commonly, there are particularly three schools of thought regarding the relationship between budget deficit and economic growth. Such school of thought includes the Keynesian theory, the neoclassical theory and the Ricardian equivalence. While, the Keynesians were promoting budget deficit as a measure of boosting economic growth, the neoclassical were proposing the contradictory assumptions and the Ricardian equivalence suggested the neutral association between the budget deficit and economic growth. The debate between these three schools of thought concerning the

budget deficit and economic growth persisted throughout and necessitated an empirical analysis; hence this topic engrossed much attention of scholars in the field of public finance and macroeconomics. In this section of the study, the above outlined schools of thought are discussed in details, and the attention is given to their advantages, assumptions, arguments raised and critics.

3.2.1 Keynesian Theorem

The argument concerning the relationship between budget deficit and economic growth embanked with the significant works of Keynes (1936), following the publication of an influential book titled "*The General theory of Employment, Interest and Money".* Keynes brought to life what is known today as the Keynesian theory which emerged as a result of the Great turn down which was occurring in the United States and European economies in the 1930's. The theory dominated subsequent to the World War II until the 1970's, when many economies of the world were suffering from both inflation and slow economic growth. According to Barro (1997), Keynes affirmed that government should apply the expansionary fiscal policy during the economic uncertainty to stimulate demand. Keynes was more concerned with the increasing level of unemployment which occurred as a result of the low demand in the economy. Low consumer demand of goods and services due to low utilization of resources led to depressed firms or business and result in reduced investment.

According to Binh and Hai (2013), the Keynesian theory suggests that spending by the households, businesses and government are the most important elements that drive the economy to the correct path. The argument that Keynes was presenting was that free markets have no self-balancing instruments that will pilot to full employment. According to the theory, government should fully intervene in the economy through policies that are aimed at full employment and price stability. Increasing budget expenditures or budget deficit improves comprehensive demand and investors' assurance on the economic prospective. Therefore foster investments and comprehensive savings will result in long-lasting economic growth.

The Keynesian theorem was grounded on two main assumptions that government should increase its expenditure and run a budget deficit in order to correct the economy during a recession or depression period, and also to decrease the level of taxation in order to boost the comprehensive demand in the economy. By so doing, this will allow more disposable income for consumers to enhance demand. The Keynesian viewpoint was that when the aggregate demand is insufficient, the firms would not be able to perform at their potential level and run profit forfeiture. In such a situation, the firms will

have no choice but to cut back production and lay off workers. According to Mujuta (2013), the increasing level of unemployment and declining profit by firms in the economy will depress demand and result in never-ending cycles of absent aggregate demand.

Keynesian model was a demand side economic model which was made up of four major economic elements and it can be written as:

$$Y = C + I + G + (NX) \quad (1)$$

Where: (Y) represents the total production of the economy, (C) is total consumption by households, (I) is total investment, (G) is an aggregate government spending and (NX) represents the net export. Keynes believed that the increase in demand should come from those four elements outlined above, otherwise during recession consumers will lose confidence and reduce their spending followed by the businesses reducing their investment as firms respond negatively to destabilized demand. Once the consumers and firms have lost confidence due to economic uncertainties, the government remains the only role player that can drive the economy to the desirable path of growth. According to the Keynesians, the government intervention in the economy is essential to moderate the booms in the business cycle.

Based on the above discussion, the main aim of Keynesian theory was to smooth the current and future economies through government intervention, rather than signifying budget deficit as wrong. However, according to Binh *et al.* (2013), Keynesian economist supported budget deficit on the grounds that it contributes towards labour concentrated infrastructure developments to enhance employment and stabilize remunerations during recession. This could solve the economic dilemma in the short-run than waiting for the market forces to correct things in the long-run, since the author always emphasized that "in the long-run we all dead".

The Keynesian theory had its own limitations and it was empirically challenged by many scholars. For instance, Binh and Hai (2013) debated that the theorem failed to account for the world economic recession that occurred in the 1970's and the boom during the 1980's. Saleh (2003) also followed by highlighting that increased government expenditure would not only improve the aggregate demand as suggested by Keynes, but that it will likewise initiate a chain response of increased demand from labourers and suppliers whose income had been increased by the government expenditure.

Despite the fact that Keynes died more than 50 years back, the Keynesian theory about recession and depression remains a strong foundation of modern macroeconomics. During the 2007-08 global economic crises, the theory was resurrected since it was the hypothetical underpinning of economic policies in response to the predicament by numerous governments as well as the United States and the United Kingdom.

3.2.2 The Neoclassical Hypothesis

The Neoclassical Hypothesis had a different point of view concerning budget deficit as opposed to the Keynesian model. According to Eigbiremolen, Ezema and Orji (2015) the neoclassical hypothesis suggested a negative relationship between budget deficit and economic growth. The argument was that budget deficit leads to higher interest rates and further disheartens private bonds, private investments and private spending. Instead, budget deficit increases the inflation rate and current account deficit of a country which finally results in the slow economic growth due to resources crowding out.

According to Bernheim (1989), the standard neoclassical model was based on three main attributes which are documented as follows:

- Firstly, the expenditure of each individual is determined as an explanation to an intertemporal optimization challenge where borrowing is endorsed at the market interest rate.
- Secondly, individuals have limited life span, and every purchaser belongs to a certain age group.
- Lastly, market equilibrium is generally assumed in all periods.

Based on those three attributes outlined above, the neoclassical paradigm rejected the Keynesian point of view concerning budget deficits. The Keynesian view was rejected on grounds that the current budget deficit imposes heavier taxation on the future generation. Heavy future taxes will encourage consumers to increase their present consumption and weaken the household and government savings. Once the national savings is depressed the government is forced to borrow either globally or domestically which is not also desirable. According to Saleh (2003), funding the deficit by domestic borrowing is not desirable, mainly due to that the amount of loanable funds available for private sectors diminishes and interest rate increase at the same time as private investments are depressed.

Diamond (1965) who was the first to study the effect of budget deficit in the framework of a model, also disputed that an increase in the ratio of nationally held debt to the national income discourages the steady state capital-labour ratio. According to the author, continual government deficit is a main root of crowed out private capital accumulation. According to the UNDP (2011), as cited by Binh *et al*. (2013), interest rates must drive up to bring capital markets into equilibrium. Due to this investment shrinks due to the decrease in capital accumulation. Diamond also argued that budget deficit increases interest rate and as a result increase savings and diminish investment up until the capital market equilibrium is re-established. The author further expressed that at the initial rate of interest, consumers are not willing to hold the inventive capacity of physical capital and bonds.

In agreement, Hubbard and Judd (1986) also demonstrated that an increase of the national debt to national income discourages capital growth. However, both Diamond and Hubbard and Judd's analysis were focused on the permanent changes in deficit instead of the temporary changes. Analysing the temporary changes in deficit, Auerbach and Kotlikoff (1986) undertook a study in a more complex neoclassical model. The examination was focused on the instantaneous effects of temporary deficit. The results obtained indicated that in the short-run the temporary budget deficits may stimulate the level of savings. The author's argument was that by holding government expenditure constant the temporary deficit will reduce the level of taxation and stimulate savings directly due to increase after tax income. Therefore the temporary deficit have a diminutive effects in the short-run on the economy of the country.

According to Bernheim (1989), if consumers are realistic and have right of entry to perfect capital market, then permanent deficits will weaken capital considerably, as temporary deficit have an insignificant effect on variables such as consumption, savings and interest rates. If consumers are liquidity constrained, the effect of long-lasting deficits remains unaffected. Nevertheless, impermanent deficits should weaken savings and increase the level of interest in the short-run. The focus of the neoclassical framework was mainly based on the analysis of permanent deficit and it was believed to be appropriate for policy analysis.

Though the neoclassical theory laid a solid argument as opposed to the Keynesians, it had its own short comings which were highlighted by Binh and Hai (2013). The authors criticized the neoclassical hypothesis, mainly due to the fact that it only accounts for the long run influence of budget deficit on macroeconomic variables. The hypothesis did not incorporate much of the short-run influence of the budget deficit on economic growth. Therefore, this shifted the focus of most

countries to the Ricardian equivalence which account for both short-run and long-run (Binh and Hai: 2013).

3.2.3 The Ricardian equivalence

In the Ricardian perspective, budget deficit both temporary and permanent budget deficit has no real impact on economic growth. Ricardo did not hold as true that budget deficit has an effect on macroeconomic variables in both the long-run and the short-run. The central Ricardian observation was that financing of budgets by deficits simply postpones taxations. According to Eigbiremolen *et al.* (2015) the Ricardian paradigm simply propose that government can fund their expenditure by increasing current tax or either borrow money and in the long run settle this borrowing by increasing taxation way above what they could have been in the past.

According to Mohanty (2013), the deficit in any present period is precisely equivalent to the current worth of forthcoming taxation that is compulsory to settle off the increment to debt resulting from deficit. According to the author, budget deficits are valuable devices that are utilised to smooth the revenue shock. Based on the Ricardian paradigm, budget deficit has no influence on aggregate demand if household expenditure choices are grounded on their current level of income and take into consideration the taxation outlook.

Ricardo articulated that although tax payers would currently have additional money, they would become conscious that they would have to pay higher tax in the prospect. The extra savings by consumers would offset the extra spending by government; as a result, the overall demand would remain unaffected. In a nutshell, government intensions to influence demand by means of fiscal policy will be fruitless.

According to Bernheim (1989) the Ricardian equivalence is based on multiplicity of assumptions outlined below:

- consecutive age groups are connected by unselfishly motivated transfers;
- capital markets are either perfect or will fail in particular methods;
- consumers are realistic and predictive;
- the tax postponement does not redistribute resources crossways families with efficient dissimilar marginal propensity to consume;
- taxation collected are non-distortionary;

- budget deficits do not create value; and
- The accessibility of deficit financing as a fiscal mechanism does not amend the political procedure.

Barro (1989) also argued that consumers will save an essential amount of money to utilise in a future based on their predictions of future income and payments. Therefore, when taxes are reduced, consumer's income will increase and unable them to save more whilst budget deficit decrease savings by government. Following the above mentioned logic, it was argued that budget deficit has no effect on investment, savings and economic performance of the country as articulated by Saleh (2003). The author further argued that an increase in budget deficit as a result of the upsurge in government expenditure must settled currently or later with total current worth of receipts fixed by the total current value of expenditure.

However, the equivalence approach was criticized. According to Bernheim (1989) there were five foremost theoretical oppositions that were raised contrary to Ricardian equivalence and are documented as follows:

1. The first objection was based on **Finite Prospects** that people do not live forever; hence they don't care about the taxes that will be imposed once they have passed. Once the consumer's wealth is increased it will be followed by increased consumption demand and this serves as evidence that individuals capitalise only on taxes expect before dying.
2. The secondly argued element was that the Ricardian equivalence missed the mark due to **Imperfect Loan Markets**. The author highlighted the issue that government indirectly assurances the reimbursement of loans through its tax collections and debt payments. Therefore, loans between people with good access and people with poor access take place even such loans were not feasible on the imperfect loan market.
3. The third opposition was based on the issue of **ambiguity about forthcoming tax levies and income**. The ambiguity concerning an individual's taxes or the difficulty of approximating them implies high rate of discount in take advantage of these forthcoming liabilities, therefore the replacement of budget deficit for current taxes enhance net wealth. As a result, budget deficit increases the aggregate consumption demand and diminishes the desired nationwide savings. This implies that national savings have a tendency to increase with budget deficit increase if the uncertainty increases.

4. Fourthly, **the timing of taxes** was also debated. For instance if levies are lump sum with an income tax, budget deficit modify the timing of income taxations and in so doing distress people's encouragements to work and produce in different periods.
5. Lastly it was debated that the Ricardian equivalence relies strongly in the **full employment** which does not even hold in the Keynesian theorem.

Based on the above outlined objections, the Ricardian equivalence was criticised mainly because its assumptions are too extreme and invalid. The post-Keynesian economists also pointed out that the Ricardian equivalence does not account for any potential multiplier effects from public spending.

3.3 Economic growth in theory

The theories of economic growth became significant with the works of Harrod and Domar (1939) subsequent to the AK model. The AK model used fixed proportion production function with no substitution between capital and labour. The Harrod-Domar theory laid a firm foundation in macroeconomic context and continued being celebrated until the post-war. Solow and Swan (1956) augmented the model with the full employment of all factors of production (labour and capital). Subsequent to the Solow growth model, Romer (1986) developed the new growth model with the suggestion of endogenous technological change. In the boundary of this study, the focus is given to the post-war theories starting from the Solow growth model.

3.3.1 Solow growth model

Solow (1956) was the first to present a long-run economic growth model in neoclassical economics, and he was referred to as the forefather of long-run growth. The Solow growth model was an extension of the Harrod-Domar, the difference was that Solow included labour as one of the significant factors of production and did not treat the capital-labour ratio as fixed as the Harrod-Domar model. The Solow model explained the long-run economic growth by taking into consideration the population growth, savings, technological advancement and capital accumulation.

According to Solow (1956), a single unit of output is produced by two factors of production which are labour (L) and capital (K) and by so doing in aggregate production the Inada condition is fulfilled. Inada condition requires the model to be in the Cobb-Douglas form as follows:

$$Y_t\,(\mathrm{t}) = \mathrm{K}\,(t)^{\alpha}\,(\mathrm{A}\,(\mathrm{t})\,\mathrm{L}\,(t))^{1-\alpha} \qquad (2)$$

Where: **t** is time period

$\boldsymbol{Y}_{(t)}$Denotes total output produced in the economy in a specific period

A refers to knowledge which is sometimes called labour-augmenting technology

AL denotes effective labour force.

The Solow growth model was based on the assumption that both factors of production should be completely employed in production. The factors of production are completely employed as soon as values of **A** (0), **K** (0) and **L** (0) are given. This statement implies that labour and technology or productivity increase exogenously at the rate of inhabitants (n) and growth rate (g). Since the production function in the Solow growth model has constant return to scale, and as output per effective unit of labour it can be expressed as:

$$Y(t) = \frac{Y(t)}{A(t)L(t)} = K(t)^{\alpha} \quad (3)$$

The attention of Solow was more on the economy that is capital intensity (K) and how it behaves at the end of the day. Now the model can be transformed as follows:

$$K(t) = sK(t)^{\alpha} - (n+g+\delta)\, k(t) \quad (4)$$

$sK(t)^{\alpha} = sY(k(t))$ is the real investment per unit of effective labour and $(n + g + \delta)\, k(t)$ is the break-even investment that must be capitalised to prevent the declining of capital (K). The above equation suggests that k (t) will converge to steady-state valuek^*, where there is neither an increase nor a decrease in capital concentration. According to this neoclassical model, capital per worker is determined by three important variables such as investment (savings) per worker, increase in population and depreciation of capital stock as it decline.

According to the Solow prediction, the steady-state capita-labour ratio and savings are positively related. In a nutshell, the savings rate is a major contributor to the steady-state capital stock. If the savings rate of the country is in elevation, the economy will have a enormous capital stock and elevated level of output in the steady state. However, according to McQuinn and Whelan (2007), the level of savings can lead to high growth output until the steady state is reached, but once the country's economy is in the steady state, the level of growth will mainly be contingent on technological advancement. Technology advancement will be an only variable that can explain

continuous growth and increased living standards in the country. The authors then suggest that Solow could have treated technology as an endogenous factor in the model since it is one of the central elements that drives the growth rate of the country to the desirable rate. When the technology of a country such as South Africa increases, the economy will subsequently converge with richer nations such as the USA.

Nevertheless the Solow long-run model was later rejected based on the following grounds:

- According to Sorensen and Whita-Jacobsen (2010), the Solow growth model was not based on true assumptions. The first limitation of the Solow growth model is that all factors that determine the steady-state or long-run economic growth for instance, level of savings, productivity and population growth are exogenous, meaning that they are not explained in the model. The other challenge was that the level of convergence is actual low based on the Solow model.
- The second drawback of the Solow model is that the contained share of income that come from capital is not equivalent to national accounting information. Many authors, such as Lucas (1988) who is one of the endogenous theorists, have tried to solve this problem by expanding the concept of capital in order to include human and capital stock which is can be done by providing education and health to the people to improve the standard of living.

3.3.2 New growth model

The new growth model received consideration through the works of Paul Romer (1986). Contrary to the Solow growth model, Romer (1986) developed a theory called endogenous growth theory highlighting the fact that the main contributors of economic growth are human capital, innovation and knowledge. The Romer model like others entails four variables which are labour (L), capital (K), output (Y) and technology (A) which is set on the continuous time. The Romer model presented two imperative mechanisms which are learning-by-doing and the analysis that learning will take place in all the firms. The author added Learning-by-doing mainly due to the assumption that knowledge obtained from the process of production and investment cannot be internalised.

The new growth models were based on assumptions of constant or increasing returns $\propto + \beta = 1$ to production. In the endogenous growth theory, the long-run rate of the growth of GDP per person is endogenous or explained. The theory of endogenous growth model explains how the long-run growth rate of productivity depends on basic model parameters such as physical capital, human capital and

savings rate. The long-run economic growth rate of output per person remains subject to total factor productivity or technological progress.

The model was divided into two sectors which are goods production sector where output is manufactured and Research and development where ideas are developed. The production of new ideas is dependent of factors such as capital absorbed in research and the level of technological progress. In the famous Cobb-Douglas production function it can be expressed as follows:

$$A(t) = B\,[\alpha_k K(t)^{\beta}[\alpha_L L(t)]^{\gamma} A(t)^{\theta} \quad B > 0,\ \beta \geq 0,\ \gamma \geq 0 \qquad (5)$$

B in the above equation represents the shift parameter. According to Romer (1990), the production function of knowledge is not supposed to have a constant return to scale towards capital and labour and the author further allowed possibilities of accumulative returns. The parameter θ is the consequence of the existing knowledge on the accomplishment of research and development. The propositions were that whether the parameter θ is less than, greater than or equal to 1decides whether the factors of production are decreasing, increasing or constant.

The endogenous hypothesis also focuses on optimistic externalities and spill-overs of knowledge based that will direct to economic development of a country. The theory challenges the theory of Solow (1956) that states that long-run economic growth is given exogenously meaning outside the model. Not like the Solow model, the endogenous growth model explains the long-run growth rate of output per worker within the model rather than by an exogenous rate of technological progress.

Romer predicted that higher savings or investment rate should result in higher growth rate ($sA - \delta$). This simply implies that growth rate and investment or savings are positively related. The other factor that contributes to the growth rate is research and development (R&D) which is normally referred to by other authors as ideas. According to Romer (1992), Research & Development sectors contain ideas associated with microeconomics. This implies that ideas should be treated as public goods, in other words, ideas should be categorised as non-rival and non-excludable in nature.

Like the Solow model, the new growth model had its own shortcomings. According to Sorensen and Whita-Jacobsen (2010), the new growth model fails to explain conditional convergence which was referred to by authors as an idea that both economy converge to its own steady state and the inferior starting value of per capita income generate a higher per capita growth rate. Another shortcoming was that the endogenous growth model is based on the assumption of diminishing return on capital.

3.3.3 Augmented Solow Model

Mankiw, Romer and Weil (1992) were not satisfied with the Solow model of long-run growth. The argument by the authors was based on Solow's idea of treating savings rate and population growth as exogenous meaning that they are not explained in the model. According to Mankiw et al. (1992), the predictions of the Solow about savings and population growth rate does not correctly predict the magnitude. One more thing is that the Solow model does not describe the determinants of population growth, savings rate and technological change because it is an exogenous model.

The authors dismissed the Solow model in favour of the endogenous growth model that is based on the assumption that the production function has constant or increasing returns to scale. The author's interests were to investigate the Solow's model predictions regarding the standard of living. In particular, the aim was to examine whether real income is high in countries with greater savings rate and low in countries with high value of (n+ g + δ). The authors anticipated that g and δ are constant crossways the countries and that g reveals the knowledge advancement which is not country specific. Mankiw *et al* treated technological progress A (0) not just as technology but resource endowments.

The model was grounded on the hypothesis that the rate of savings and the rate of population are sovereign of country-specific influences that contribute to the production function. This implies that S and n are independent of ε in the log profits per capita at a given time it can be written as follows:

$$\text{In } (\frac{Y}{L}) = \alpha + \frac{\propto}{1-\propto} \text{ in (S) - } \frac{\propto}{1-\propto} \text{ in (n+ g+ δ) + ε} \quad (6)$$

The authors increased the Solow's growth model by incorporating human capital to the model, stressing the significance of human capital or education to the progress of growth. According to the authors, ignoring the importance of human capital could lead to incorrect conclusion. Just like the Solow growth model, the model is a Cobb-Douglas production function and can be written as:

$$\text{Y (t)} = K(t) \propto H(t)^{\beta}(\text{A (t) } L(t))^{1-\propto-\beta} \quad (7)$$

Where: H is human capital stock and K and L is main factors of production which is capital and labour. The argument of the authors is that the Solow model does not foresee convergence. It only envisages that income per capita in a given country converge to that country's steady-state value. The authors concluded by recommending that countries should use the augmented Solow model when testing the income per capita. According to the augmented Solow model, output is produced from

capital stock, physical stock and labour. The result obtained from the author's analysis was that human capital, labour and capital contributes one third $\frac{1}{3}$ to the economy, and can be written as follows:

$$Y= K_3^1 H_3^1 L_3^1 \quad (8)$$

Nevertheless, Dinopoulos and Thompson (1999) criticized the results obtained by Mankiw et al. for lack of robustness. The results were rejected based on the proxy used for human capital formation as a variable. According to the authors, Mankiw et al. should have used Input-based that relies heavily on the rate of school enrolment or Output-based index proposed by Hanushek and Kimko (2000) as a proxy of human capital. One other thing that Dinopoulos and Thompson were concerned about was the assumption that technology is the same in all countries as outlined by Mankiw et al. Nevertheless, evidence indicated a robust association amongst human capital and technological advancement, so the assumption of common technology in all countries is not supported by the data.

3.4 Empirical literature review

Economists have not yet reached an agreement concerning the nature of the relationship between budget deficits and economic growth in both emerging and industrialized economies. The inconsistent outcome of the empirical analysis overrules the conclusion on whether the link between budget deficit and economic growth is positive or inverse, or whether budget deficit stimulate the economic performance or not. This section presents the empirical literature and it has been divided in three subheadings which are empirical literature in developed countries, developing countries and country in question which is South Africa.

3.4.1 Empirical literature in developed countries

The debate about the relationship between budget deficits on output growth sustained across developed countries over the years. For instance, Bernheim (1988) performed a study to review the historical relationship between fiscal policy and trade deficit in United State of America and its five main trading associates which are Canada, the United Kingdom, West Germany, Japan and Mexico. Subsequent to analysing time series data of six countries, Bernheim discovered a robust significant link between fiscal policy and trade deficit. However, the link between fiscal deficit and trade deficit was found to be negative since a $1 increase in budget deficit was associated with roughly $0.30

decline in the current account surplus for United States, Canada, United Kingdom and West Germany. For Mexico, the fiscal effects were extensive at $0.85 decline in trade deficit.

Following Bernheim (1988), Erdoğan and Yildirim (2014) also conducted a study in Turkey employing quarterly data for the period of 2001Q1 to 2012Q2. The purpose of the study was also to analyse the link between twin deficit (budget deficit and trade deficit) using the border test approach. The results obtained from the study indicated a negative and statistical significant link between budget imbalances and trade deficit. The results were consistent with the result of Bernheim who also discovered a negative relationship between fiscal deficit and trade deficit in the U.S and its major trading partners. The study concluded by affirming that trade deficit is an indicator in terms of macroeconomic performance and prospects, therefore expanding trade deficits in a negative way increases the financial crisis risk.

Barro (1989) followed examining the Ricardian approach to budget deficit in the United State of American economy. The study was more concerned with examining the harmfulness of the deficits which the United States of America was facing at that moment. Among others, those detrimental impacts were high real interest rates, lower rate of savings, weaker economic growth and huge current account deficits in the United States of America as well as its trading partners. The author debated that empirical discoveries on interest rates, consumption and savings and the current account equilibrium have a tendency to support the Ricardian point of view. The study concluded that the Ricardian equivalence theorem will remain significant throughout and further predicted that the theorem will come to be the standard model for evaluating fiscal policy.

Applying the Autoregressive Distributed Lag approach, Eminer (2015) conducted a study to investigate link between budget deficit and economic growth in North Cyprus. The study employed time series data covering the period of 1983 to 2010 to examine the correlation between budget deficit and economic growth. The model estimated used variables such as GDP growth, budget deficit, productive spending and non-productive spending. Subsequent to the model estimation, the author discovered that government of North Cyprus has a habit of incurring unproductive expenditures. Therefore, since the economy of Cyprus is contingent on government expenditure, then this would imply that budget deficit will forever remain a fundamental element of economic growth. Furthermore, the study discover that discovered that budget deficit and all kinds of government spending expenditure are positively related with economic growth and supported the Keynesian macroeconomic framework.

Chen (2011) argued that there is no way fiscal deficit can be economic enhancing, subsequent to conducting a study in Japan. The author used a quarterly data dated 1972Q1 to 2010Q3 to examine the effects of budget deficit on long-term interest rates. The study applied the augmented open economy loanable funds model and discovered that budget deficit results in low rate of interest. The Japan's long-term rate of interest is mainly influenced by the real money market, GDP growth rate, anticipated rate of inflation, world long-term interest rate and the anticipated devaluation of the currency (yen).

Nimani (2013) also conducted a study in European Union countries such as Albania, Bulgaria, Rumania, Hungari and Italy. The study observed that all stimulating methods of the central fiscal deficit have increased considerably over the past eight presidential terms and are expected to increase further in the near future. The study was more interested in investigating the relationship between budget deficit, inflation, economic growth and variations in the level and composition of economic activity. The conclusion which was reached was that monetary policy, inflation rate and cumulative economic activities are sovereign of fiscal deficit, however fiscal deficit have main effects on the separation of output between consumption and investment.

Çinar, Eloğlu and Demirel (2014) also conducted a study with the aim of analysing the European Debt Crisis curtailing from 2008 Global Economic Crisis in the context of Keynesian budget deficit policies. The study examined 10 countries and dividing them into 5 worst and 5 best countries according to their debt ratios. The author's focus was more on the growth levels, budget deficit and debt ratio for those 10 countries. The study employed a panel data covering data from the period from 2000Q1 to 2011Q4. The results obtained indicated that budget deficit has a progressive impact on economic growth only in the short run but not in the long run. This implies that in the short run, budget deficits are growth enhancing in all 10 countries and detrimental in the long-run.

Finally, Cashell (2005) conducted a study analysing the economics of the federal budget deficit. According to the author, budgets do have effect on the economy on both the short-run and long-run. Shifting from a budget surplus to a deficit results in national savings reduction and an increase in the consumption by government, and excessive consumption will therefore result in less investment by government and firms. Therefore budget deficit is not desirable in the economy of any country whether developed or developing.

3.4.2 Empirical literature in developing countries

Numerous empirical studies such as Rahman (2012), Nayab (2015) and Odhiambo, Momayi, Lucas and Aila (2013) followed examining the consequence of budget deficits on economic growth in emerging countries. The purpose of their studies was to assess if the theory outlined above in this study holds for their prospective countries and also to recommend to the policy-maker on how to treat budget deficits. For instance, Fatima, Ahmed and Rehman (2012) conducted a study in Pakistan using time series data to investigate the substantial effect of budget deficit on economic growth. The study used annual data from 1978 to 2009 and the result obtained discovered negative effects of budget deficit on economic growth. The results obtained proved that the Keynesian theory does not hold in Pakistan.

However, applying a different methodology, Nayab (2015) also conducted a study in Pakistan employing a VAR method and covering data covering the period of 1976 to 2007. The study discovered that budget deficits enhance economic growth in Pakistan. According to the author, reducing budget deficit is not robust in the Pakistan economy since it will result in diminishing the rate economic growth. The author supported the Keynesian theory regarding the view that budget deficit stimulate aggregate demand which in turn result in economic growth and development. In support of Nayab (2015), Adam and Bevan (2005) confirmed that those budget deficits are growth enhancing mainly in developing countries subsequent to undertaking a panel study in 45 emerging countries. The author employed the Over Lapping Generations (OLG) model of savings performance. The results obtained indicated that there is a positive interaction effects between fiscal deficits and growth rate between the countries under review.

Odhiambo, Momayi, Lucas and Aila (2013) also discovered a positive association between budget deficit and economic growth in Kenya. Odhiambo *et al*. employed both exploratory and causal research design to analyse time series data for the period of 1970 to 2000. The study further recommended that government must find ways to enhance revenue generation capacity especially by enlarging their taxation base in order to fund the expenditure adequately. The government must also assist in augmenting the multiplier that will further generate output and lead to economic growth. Contrary to Odhiambo *et al*., Ezeabasili, Tsegbo and Ezi-herbert (2012) examined the controversial relationship between budget deficit and economic growth within the Nigerian context. The study used data from the period of 1970 to 2006 and a method that combined both cointegration and structural examination. The results obtained indicated that budget deficit and economic growth are

negatively related, and as a result of that, government should spend with regard to the resource envelope of the country.

There was no coherent agreement between economists either on investigative grounds or on the basis of empirical results whether a relationship between fiscal deficit and economic growth is positive or negative. Mohanty (2011) examined both long-run and short-run relationship between variables understudy in India covering data from 1970-71 to 2011-12. The Johansen methodology confirmed that the existence of a long-run correlation between economic growth and budget deficit. The findings of the study indicated that there was a significant negative relationship between fiscal deficit and economic growth in the long run. Nevertheless, the Vector Error correction and Granger Causality results rejected the short-run relationship between fiscal deficit and economic growth of India. The results obtained from the study discarded the Keynesian theory in favour of the Neo-classical theory. Mohanty concluded by expressing that government should reduce subsidies and focus on investing on items such as health, education and infrastructure and by so doing the productivity of human capital and physical capital will grow.

Zonuzi, Pourvaladi and Faraji (2011) were more interested in investigating the deficit-inflation relationship in Iranian economy using quarterly from the period of 1990Q1 to 2007Q4. The author's interest was engrossed by the fact that the economy of Iran was steadily recording budget deficit and high inflation. The study employed test approach to cointegration as suggested by Pesaran *et al.* (2001) to examine the long-run association between budget deficit and inflation. The results obtained indicated that there was a substantial and positive relationship between budget deficit and inflation in Iran. Similar to that, Lozano (2008) conducted a causal long-run correlation between budget deficit, money growth and inflation in Colombia. The study applied the Vector Error Correction (VEC) model and established a close correlation between inflation, Money growth and fiscal deficit. This implied that inflation, money growth and fiscal deficit in Colombia increased simultaneously.

3.4.3 Empirical evidence in South Africa

Reviewing South African literature concerning the relationship of budget deficits and economic growth remains a vast challenge. Studies are undertaken across countries investigative the effects of budget deficit on economic growth, but as for South Africa, there is no sufficient empirical studies conducted on the topic. Hence the rationale of this study is to examine the effects of budget deficit on

economic growth with the aim of minimising the empirical gap and contribute to the existing literature.

The starting point of understanding and examining the effect of fiscal deficit on GDP is by investigating the root causes of fiscal deficits. Murwirapachena, Maredza and Choga (2013) conducted a study to discover the determining factor of budget deficit in South Africa. The study employed the annual time series data for the period of 1980 to 2010. With the assistance of the VECM, authors were able to determine the influence of unemployment, economic growth, foreign reserves, foreign debt, and government investment on fiscal deficit in South Africa. The results obtained from the VECM discovered that all the above mentioned variables, in exception of foreign debt, have a positive influence on fiscal deficit in South Africa. The study concluded by articulating that macroeconomic challenges facing South Africa such as low employment, low levels of economic growth and high government investment expenditure emanate mainly due to budget deficits.

Biza, Kapingura and Tsegaye (2013) also conducted a study in South Africa. The authors were concerned with analysing if budget deficit does crowd out private investment in South Africa. The study utilised quarterly data derived from secondary sources covering the period of 1994Q1 to 2009Q4. An empirical model linking private investment to its theoretical variables was specified and used to assess the quantitative effects of budget deficit on private investment. The study augmented the cointegration and the Vector Auto-Regression (VAR) analysis with impulse response and variance decomposition analyses to make available a robust long run relationship between private investment and its determinants. This implied that budget deficit significantly crowds out private investment in the long run. These results were consistent with the theory and were supported by other empirical studies. Applying the same method of analysis (VAR), Bonga-Bonga (2011) followed investigating the relationship between budget deficit and long-term interest rates in South Africa. The author also discovered an existence of positive relationship between long-term interest rates and budget deficit under different assumption of price expectations by economic agents.

On the other hand, Mujuta (2013) tested how effectiveness of fiscal deficit in stimulating economic performance of South Africa. The study employed quarterly data covering the period of 1991Q2 to 2012Q4 derived from South African Reserve Bank. The results presented by the study revealed an inconsequential response of economic growth to budget deficit in both short-run and long-run. The result obtained implies that fiscal deficits are not effective in stimulating economic performance of

South Africa. Therefore the conclusion that can be drawn from the literature on South Africa is that budget deficits are not desirable for South Africa as a result, government must apply expenditure ceiling and improve the taxation system to find balance between government expenditure and revenue collected through taxation.

According to the National Treasury (2015), South African fiscal outlook is confronted with two main challenges which were outlined as weaker economic growth and wage settlement which is growing at the rate above CPI year on year. However, the government of South Africa is still committed to contract fiscal deficits regardless of the weak economic circumstances that the country find itself under. The government of South African has developed a plan to reduce government debt as percentage of GDP and to create an environment that will allow fiscal freedom in a country. The expenditure ceiling will be lowered and taxation will be raised annual to reach the goal of decreasing fiscal deficit to 2.5% of GDP by 2017/18 financial year.

3.5 Conclusion

It can be noted that various factors of budget deficit affect countries differently depending on the individual country's characteristics, policies and scope. Whilst numerals of studies on budget deficit have been undertaken on both industrialized and unindustrialized countries, there is no coherence as to particular factors that affect individual countries. Some researchers believe that budget deficits do enhance the economic performance, whereas others are having a contrary viewing. In a nutshell, the analysis from the above studies both in developing and developed countries produces mixed results.

CHAPTER FOUR

METHODOLOGY

4.1 Introduction

It has become a tradition in economics to utilise econometric tools to prove or disprove a particular economic propositions and models. According to Asteriou and Hall (2011), the first task in applying econometrics is by developing a model which can be verified empirically. Therefore, this study will develop a regression model to examine both the short-run and long-run effects of budget deficits on economic growth in South Africa. To explore both short-run and long-run relationship between budget deficit and economic growth, the study employs the Vector Error Cointegration Model (VECM). Other approaches such as Ordinary Least Square (OLS) technique could also be used, but then again they are not precisely appropriate for this kind of study since macroeconomic data narrate itself to time series which is either stochastic or deterministic in nature leading to errors being correlated overtime and result in biased estimates of standard errors and coefficient. As a result, the dynamic structure of time series models makes the OLS estimators subjective and inconsistence (Engle and Granger, 1987). Unlike the VECM, the OLS technique is not also well suited to handle the problem of endogeneity.

4.2 Data

This study employs annual time series data covering the period from 1985 to 2015direved from World Bank dataset, South African Reserve Bank and OECD data. The year 1985 was chosen predominately due that it was the very same South Africa in collaboration with other SADC countries started to applying fiscal discipline by means of debt-to-GDP targeting. Variables employed in this study are gross domestic product which is the dependent variable and budget deficit, real interest rate, labour force, gross fixed capital formation and unemployment being the independent variables. All variables are expressed as percentages and are not subjected to the natural logarithm since it would yield biased estimations.

Table 3.1 below presents the summary of all variables used in the study as well as their sources:

Table 3.1: Data type and sources

Variables	Indicator name	Measurement	Source derived from:
RGDP	Real gross domestic product	Annual %	World Bank Data
BDIF	Budget deficit	% of GDP	South African Reserve Bank
RIR	Real interest rate	Annual percentage	World Bank Data
LAB	Labour force	% of total labour force	World Bank Data
GFCF	Gross fixed capital formation	% of GDP	World Bank Data
UN	Unemployment	% of GDP	World Bank Data

4.3 Methodology

Choosing and applying a methodology in econometric analysis linking to time series data and the objectives of the study is very much essential. Since most of the methodologies have their own weakness and strengths, it becomes a challenge to choose an appropriate methodology. However, The VECM is a standing out estimation technique to employ in this nature of the study. According to Enders (1995), time series properties are very dynamic in nature and they require methodologies that take into consideration the inherent setback, for instance data trends, feedback effects between historical and current values and the stochastic performance of data. The VECM has an advantage over other estimators such as Ordinal Least Squared (OLS) when modelling time series data more specifically macroeconomic time series (Johansen, 1988). The framework is best in capturing both short-run and long-run effects of variables. This study adopted a quantitative nature since it produces a descriptive data and from an econometrics point of view it is very essential to utilise statistical packages such as Eviews package. Therefore, Eviews 9 will be employed in the analysis process as one of the frequently used econometric tools.

4.4 Model specification

The model specified in this study relies on the theoretical framework. From both demand and supply sides of the economy, variables such as budget deficit, gross fixed capital formation, interest rate and labour are identified as the key variables explaining growth. However, it is appropriate to include in the empirical model those reforms variables that also influence economic growth. Therefore it is appropriate to include variable such as unemployment rate. Adopting and modifying the model used by Aslam (2016), the Key variables in the empirical model are defined as follows:

$$RGDP = f\,(BDIF, RIR, LAB, GFCF, UN) \quad (9)$$

Where:

RGDP : real gross domestic product,

BDIF : budget deficit,

RIR : real interest rate,

LAB : labour force,

GFCF : gross fixed capital formation,

UN : unemployment

Using the VAR Framework stochastic model of regression fundamental in the regression analysis is specified as follows:

$$RGDP = \delta_0 + \delta_1 BDIF + \delta_2 + \delta_3 RIR + \delta_4 LAB + \delta_5 GFCF + \delta_6 UN + \mu_t \quad (10)$$

The multivariate cointegration methodology advanced by Johansen following the VAR framework process will specify the model as follows:

$$RGDP_t = \delta_0 + \delta_1 BDIF_t + \delta_2 RIR_t + \delta_3 LAB + \delta_4 GFCF_t + \delta_5 UN_t + \mu_t \quad (11)$$

Equation (10) can be transformed into the VEC form as follows:

$$\Delta RGDP_t = \delta_0 + \delta_1 \Delta BDIF_{t-1} + \delta_2 \Delta RIR_{t-1} + \delta_3 \Delta LAB_{t-1} + \delta_4 \Delta GFCF_{t-1} + \delta_5 \Delta UN_{t-1} + \xi_{t-1} + \mu_t \quad (12)$$

Δ : Difference operatives

ξ_{t-1} : Lagged significance of error term derived from the long-run Cointegration relationship and it utilised to apprehend the short-run dynamics

The prior expectation of the study is that labour and gross fixed capital formation (capital) are positively related with growth as stated in the Cobb-Douglas production function. Based on numerous empirics, (Fischer, 1993; Adam and Bevan, 2005) budget deficit is associated with slow economic growth and the crowding out of private investment through their effect on interest rate, investor's sensitivities and inflation rate (Easterly and Schmidt-Hebbel, 1993 and Catão and Terrones, 2005). As a result, the study expect budget deficit and interest rate to be negatively related with economic growth.

4.5 Estimation technique

As mentioned above, this study employed the (VECM) econometric approach to analyse the relationship between budget deficit and economic growth in South Africa. The VECM technique comprises the following process or steps:

4.5.1 Augmented Dickey Fuller and Phillip-Perron Test of Unit Root

Cointegration necessitates that the variables be integrated of the same order. The first stage is to test each variable to determine its order of integration. In this study, the Augmented Dickey Fuller (ADF) and Phillip-Perron (PP) tests are applied to assess the stationarity or order of integration in the variables under study. If it occurs that the variables are non-stationary at levels, the study therefore proceeds to test it at first difference.

The ADF test is applied using the following:

$$\Delta Y_t = \alpha + \beta t + \delta Y_{t-1} + \sum_{i-1}^{n} \lambda \Delta Y_{t-1} + \varepsilon_t \quad (12)$$

Using the AR (ρ) process, the hypothesis for the ADF test will be quantified as follows:

H_0: $\delta = 1$ implies that the variable has unit root (non-stationary), and

H_1: $\delta = <1$ implies that the variable does not have stationary (stationary)

Then once the stationarity is established using the ADF, the PP test of stationarity can be performed to check the robustness of ADF results. The test can be performed using the following equation:

$$\Delta Y_t = \beta_o X_t + \alpha Y_{t-1} + \mu_t \quad (13)$$

4.5.2 Determination of lags length

There a numerous measures that can be used for selecting the suitable lag length such as Akaike Information Criteria (AIC), Hanna and Quinn Information Criteria (HQIC), Final Prediction Errors (FPE) and Schwartz Bayesian Information Criteria (SBIC) are also utilised in determining the maximum lag order for the cointegration test. The Final Prediction Errors (FPE) and Akaike Information Criteria (AIC) are the most reliable criteria when observations used in the study are sixty and below (Liew: 2004).

4.5.3 Cointegration Test

Since this study is aimed at examining the long-run relationship between budget deficit and economic growth, then cointegration analysis is very essential. In other words, it is imperative to test empirically that the unit root series are cointegrated in order to determine the long-run relationship. To test for the long-run relationship between variables under-study, there are two recognized processes known as Engel-Granger two step approach (1987) and the Johansen Maximum Likelihood Estimation process. However this study employs the Johansen Maximum Likelihood Estimation process since it is the preferred process because of its ability to test for multiple cointegrating vectors. Johansen procedure also permits for testing both restricted and unrestricted forms of cointegrating vectors and the speed of adjustment parameters.

According to Asteriou and Hall (2011), the Johansen approach is concerned with two assessments namely: the Trace test and the Maximum Eigen Value. The tests are the probability ratio test for the proposition that there are at most ‘’r’’ cointegrating vectors. The trace test and the maximum Eigen value test can be conducted using the following formula:

$$J_{trace} = -T \sum_{i=r+1}^{n} In\ (1 - \lambda i)$$

$$J_{\max Eigen} = -TIn\ (1- \lambda r + 1)$$

Where *T is* the sample size and λ is the i^{th} largest canonical correlation.

The Johansen and Juselius approach of cointegration in equation 12 can be quantified as:

$$\Delta Y_t = \prod Y_{t-1} + \sum_{i=1}^{P-1} \Gamma i \, \Delta_{t-1} + \beta_{xt} + \mu_t \quad (14)$$

Where:

Y_t : K vector of non-stationary variables

X_t : Vector of deterministic variables

μ_t : Error term with zero mean value and fixed variance.

$\prod$: Coefficient matrix or number of cointegrating vectors

β : Cointegrating vectors (the long-run relationship)

α : Speed of adjustment of the endogenous variables in response to disequilibrium shocks

Γ : Capture the short-run dynamic adjustments

The VECM approach can be applied on equation 12 above as follows:

$$\Delta Y_t = \mu + \Gamma \Delta Y_{t-1} + \ldots \ldots \ldots + \Gamma_{k-1} \, \Delta Y_{t-k+1} - \prod \Delta \, Y_{t-1} + \mu_t \quad (15)$$

Where:

Γ : Estimated parameters

Δ : Difference operatives

μ_t : Vector of Impulses representing unexpected measure in K vector of non-stationary variables

4.5.4 Vector Error Correction Model (VECM)

Engle and Granger (1987) articulated that if two series are cointegrated at the same order of integration, for instance I (1), then it is essential to employ the VECM in order to administrate the combined behaviour of the series of the dynamic system. One of the basic principles of VECM is that there should at least be one cointegrating association between the variables understudy. The importance of the VECM is that it takes both long-run and as well as short-run adjustment into consideration and it also offer evidence regarding the causal factors that may affect variables.

4.5.5 Diagnostic and Stability tests

The diagnostic and stability tests are employed to prove whether the model used in this study is properly specified of not. The diagnostic tests used in this study are as follows:

Normality of residuals (Jarque-Bera)

The normality test is conducted to confirm that the model estimated is not suffering from misspecification problem of any sort. One of the Classical Linear Regression Model (CLRM) assumptions is that the model is normally distributed with zero mean and constant variance. The Jarque-Bera test is used to test for normality in the variable and the test is done by following the steps outlined below:

Firstly, the second, third and fourth moments of the residual (û) are estimated and also keeping in mind that μ_3 is the skweness and μ_4 is the kurtosis in the regression equation as:

$$\mu_2 = \frac{\sum \hat{u}2}{n}\ ;\ \mu_3 + \frac{\sum \hat{u}3}{n};\ \mu_4 \frac{\sum \hat{u}4}{n} \tag{16}$$

Secondly, the Jarque-Bera statistic is estimated using the following equation:

$$JB = n\left[\frac{\mu_3^2}{6} + \frac{(\mu 4-3)2}{24}\right] \tag{17}$$

If it is found that the P-value is less than the level of significance α (usually 0.05), the null hypothesis is rejected.

White heterosdasticity test

White (1980) suggested a more wide-ranging test for heterosdasticity that does not assume any prior determination of heterosdasticity unlike the Breusch-Pagan test. The test can be performed by following the steps outlined below:

White's test assumes a model with two independent variables like the one below:

$$Y_i = \beta_1 + \beta_2 X_{2i} + \beta_3 X_3 + e_i \tag{18}$$

Firstly: take the equation (9) and estimate the regression model and acquire a residual $\hat{e}_i$ of this regression equation.

Secondly: estimate the supporting regression below:

$$\hat{e}_i^2 = a_1 + a_2X_{2i} + a_3X_{3i} + a_4X_{2i}^2 + a_5X_{3i}^2 + a_6X_{2i}X_{3i} + v_i \quad (19)$$

Thirdly: formulate the null and alternative hypotheses. The null hypothesis of homoscedasticity is:

$$H_0 = a_1 = a_2 = \ldots = a_p = 0 \quad (20)$$

The alternative is that at one of α is not zero.

Fourthly: test the significance of equation (9) with the Chi-squared test.

If it is found that the P-value is less than the level of significance α (usual 0.05), the null hypothesis is rejected.

Serial correlation test

The Breusch-Godfrey LM test established by Breusch (1978) and Godfrey (198) is used in this study to test for serial correlation. The reason Breusch-Godfrey LM test was chosen is that it offers a convincing results and it takes into consideration the higher orders of serial correlation. The test can be applied using the following equation:

$$Y_t = \beta_1 + \beta_2X_{2t} + \beta_3X_{3t} + \ldots\ldots + \beta_kX_{kt} + \mu_t \quad (21)$$

And

$$\mu_t = p_1\mu_{t-1} + p_2\mu_{t-2} + \ldots\ldots + p_p\mu_{t-p} + \varepsilon_t \quad (22)$$

The Breusch- Godfrey LM test combines two equations in one as follows:

$$Y_t = \beta_1 + \beta_2X_{2t} + \beta_3X_{3t} + \ldots\ldots + \beta_kX_{kt} + \mu_t + p_2\mu_{t-2} + \quad p_p\mu_{t-p} + \varepsilon_t \quad (23)$$

The tested hypotheses are:

$H_0 = p_1 = p_2 = \ldots = p_p = 0$ no autocorrelation.

H_a= at least one of the ρ is not zero, therefore serial correlation.

If it is found that the P-value is less than the level of significance α (usual 0.05), the null hypothesis is rejected.

4.6 Granger Causality test

Engel and Granger (1987) debated that if cointegration exists between two variables in the long-run model, there must either bi-directional of unidirectional causality between them. The interest on running this test was to study the root and the effect between budget deficit and economic growth in South Africa. The Granger causality test for two stationary variables can be performed to test for the following hypothesis:

H_0= x_t does not cause y_t

H_1 = x_t does cause y_t

To determine which hypothesis holds, the Granger Causality test was tested using the following equations:

$$y_t = a_1 + \sum_{i=1}^{n} \beta i \, x_{t-i} + \sum_{j-1}^{m} \gamma_j y_{t-j} + e_{1t} \quad (24)$$

$$x_t = a_2 + \sum_{i=1}^{n} \theta i \, x_{t-i} + \sum_{j-1}^{m} \delta \mathrm{j} y_{t-1} + e_{2t} \quad (25)$$

4.7 Variance Decomposition test

The Variance Decomposition is utilised to provide evidence concerning the relative significance of each random shock or innovation to the variables in the VAR framework. According to Enders (2010) the Vector Moving Average (VMA) is:

$$y_t = \mu + \emptyset_p y_{t+1} + \ldots + \emptyset_p y_{t+2} + \varepsilon_t \quad (26)$$

If the attention was on y_t , the n-step ahead forecast error is:

$$y_{t+n} - \mathrm{E}\,(y_{t+n}) = \emptyset_{11}(0)\, \varepsilon^s y_{t+n-1} + \ldots \emptyset_{11}\,(\text{n-1})\, \varepsilon^s y_{t+1} \quad (27)$$

Like the impulse response function, the Forecast Error Variance Decomposition establishes what is known as innovation accounting.

4.8 The Impulse Response Function

It is a tradition to interpret the VARs using the Impulsive Respond Function (IRFs). According to Sims (1980), the IRFs are useful in the VAR framework since they allow tracing out the time path of the numerous shocks on the variables. Plotting the impulse respond function is a useful technique to

visually represent the behaviour of the series in response to the various shocks. Mujuta (2013) pointed out that impulse responses trace out the response of present and forthcoming value of one VAR errors, assuming that this error returns to zero following periods and that all other errors are contemporaries to zero. In the estimation, IRFs to interpret results because it is very difficult to use individual coefficients as articulated by Bjonness (2012).

4.9 Conclusion

This chapter speaks to the methodology that was utilised to study the relationship between budget deficit and economic growth in South Africa. This study use annual time series data since it is appropriate for this study. The VECM technique is chosen for analysing both short-run and long-run relationship between the variables understudy. The efficiency and legitimacy of the model developed in this study will be subjected to the diagnostic and stability test which are performed in chapter five of this study.

CHAPTER FIVE

ESTIMATIONS, PRESENTATION AND INTERPRETATION OF RESULTS

5.1 Introduction

This chapter specifically responded to the question which was raised in chapter one of whether the relationship between budget deficit and economic growth exist? The response to this question profoundly depends on the conclusion drawn in the later stage of this chapter. For instance, if the relationship between budget deficit and economic growth is found to be positive, then it would mean that budget deficits are effectively enhancing or rather stimulating economic growth in South African. If that is the case, then the study will fail to reject the null hypothesis of positive relationship between budget deficit and economic growth.

To ensure that all research questions are answered, the study analysed other related factors that may assist in explaining the effect of budget deficit on economic growth. This means that the model estimated in this study incorporated other essential variables of which the economic impact of budget deficit may have been affected. Such variables are real interest rate, labour force, gross fixed capital formation and unemployment. Furthermore, the study followed the econometric procedures to ensure that the purpose of the study is fulfilled, such procedures are: ADF and the PP techniques, Johansen cointegration technique, Vector Error Correction Model estimation, diagnostic tests of the residuals and the stability test, Granger Causality, variance decomposition and impulsive respond function.

The ADF and the PP techniques are employed to test for stationarity and also to assess the presence of unit root since it is always a challenge when using macroeconomic time series data. The Johansen cointegration technique is employed to detect the long-run relationship between the variables under-study. To capture the long-run and the short-run effects of budget deficit on economic growth, the Vector Error Correction Modelling is fully utilised. The model diagnostic and stability test are conducted to ensure that the model estimated is of good fit, techniques such as the Jacque-Bera, white heteroskedasticity, and LM test of autocorrelation as outlined in chapter 4 were helpful. Subsequent to ensuring the model validity and reliability, the study furthermore performed the variance decomposition and general impulsive respond function to detect the behaviour of shocks in the variables employed towards economic growth of South Africa.

5.2 Stationarity test

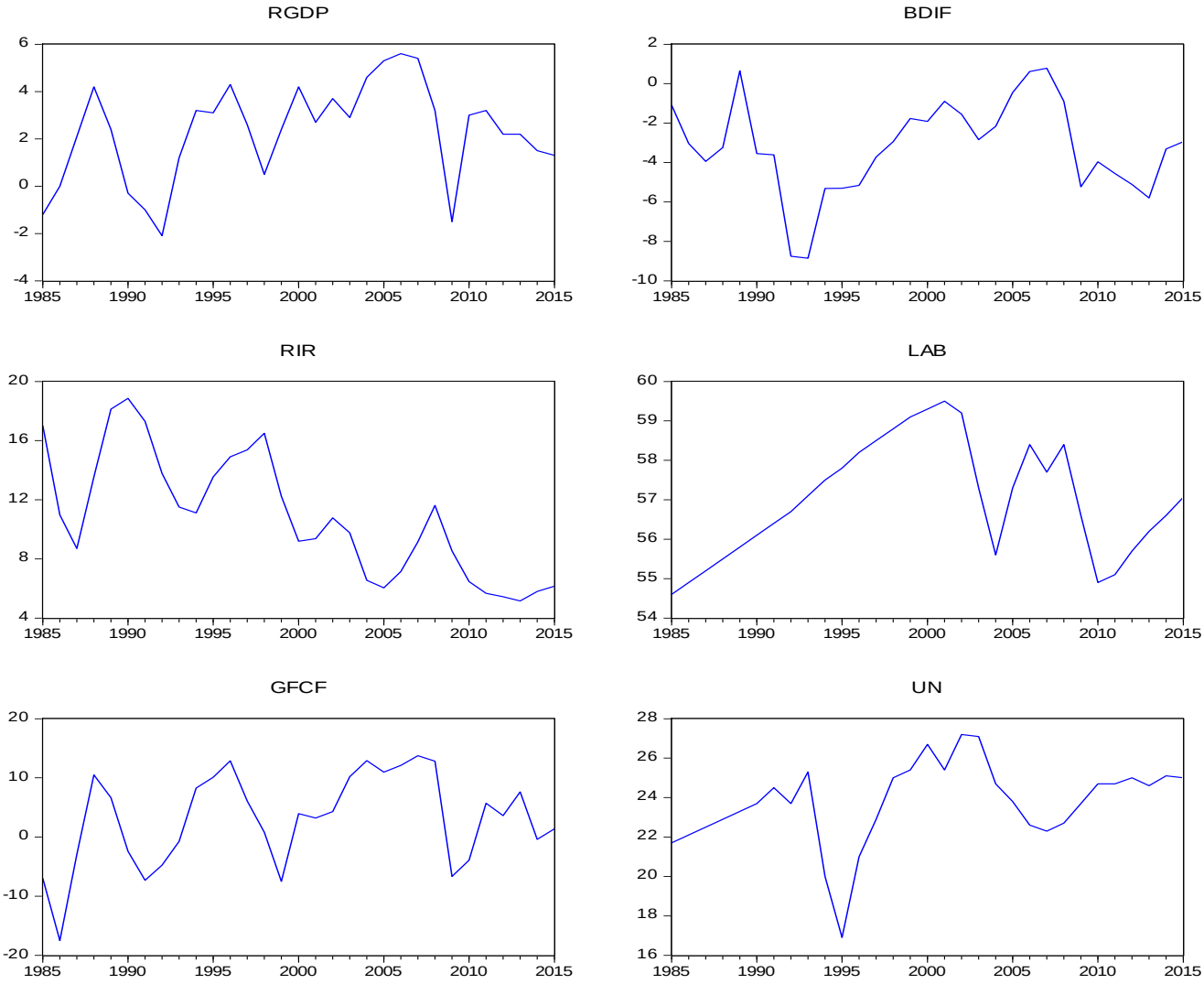
Wooldridge (2009) defined stationarity as a process where probability distributions, that is, the mean and the variance are stable over time. To assess the stability of the variance and the mean, the study employed the ADF test and the PP test as already explained in the previous chapter. The purpose of the tests is to examine the order of integration in the time series variables. According to Gujarati and Porter (2009), it is advisable to plot a line graph to visually analyse the variables to have an indication of the expected nature of a series. Subsequent to the graphic analysis, the study proceeded to determine the order of integration by employing the ADF and PP since it not enough to judge only using the graphical illustration.

The t-value statistic value is compared against the critical values obtained in Eviews to determine whether the variables employed in this study are stationary. If the study found that the t-value is greater than critical values at 5% levels of significance, then the variable would be known to be non-stationary. The study tested the variable at intercept, trend and intercept and none.

5.2.1 Visual inspection/ Unit root test

The variables employed in this visual inspection are RGDP, BDIF, RIR, LAB, GFCF and UN. If the variables are non-stationary, they will at that point be differenced to get rid of the non-stationarity. The graphical results are as follows:

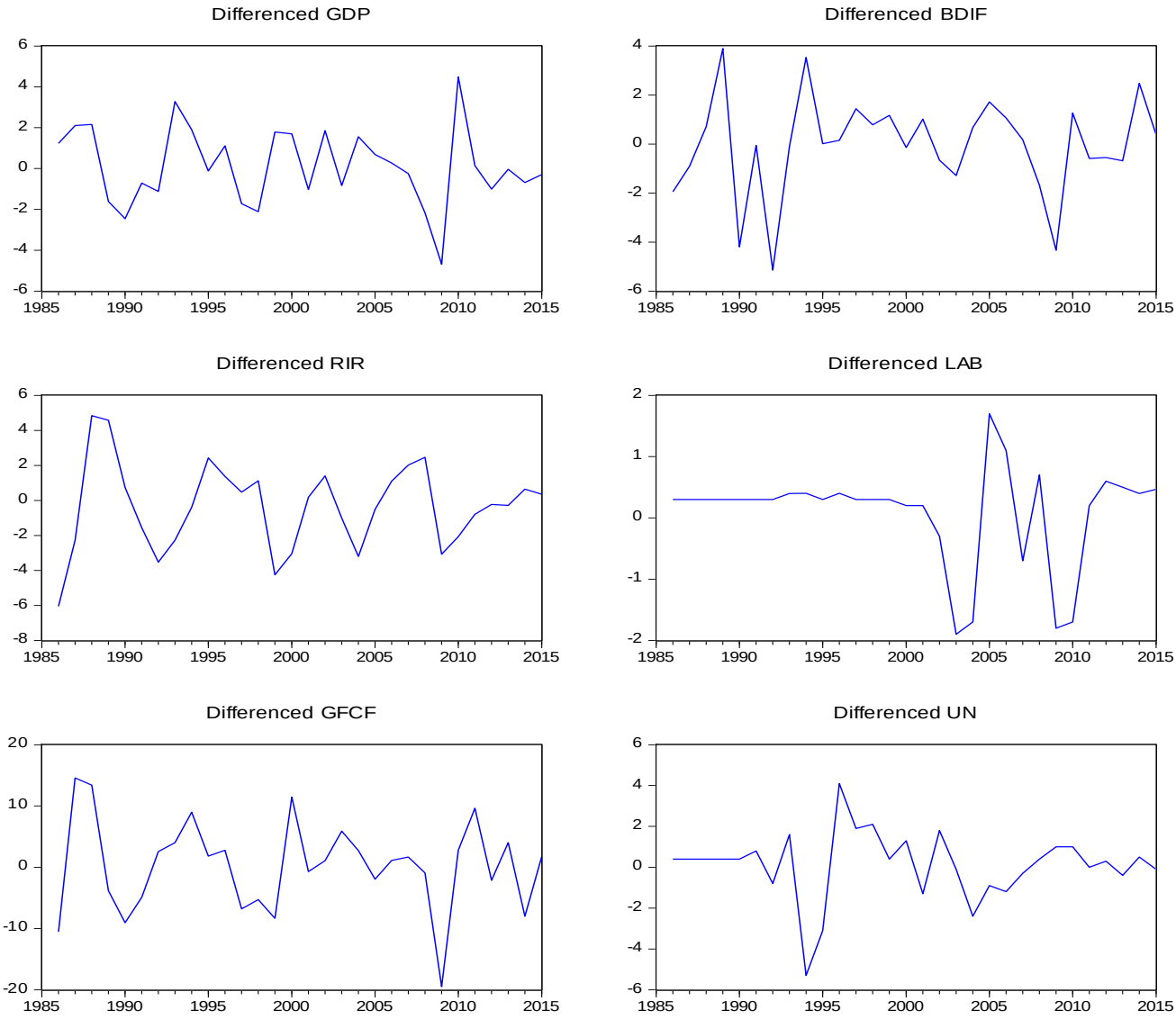
Figure 5.1: Graphical representation of variables at levels



It is clear from the above graphical illustration that the variables employed in this study are non-stationary at levels. The trends on the graphs are either upwards sloping or downwards sloping which means that their mean and variance are not constant overtime. Using data that is non-stationary is not advisable since it yield spurious or nonsensical results. In such case, the variables are differenced ones and the results are presented in figure 5.2 below.

It is then evident from table 5.2 below that subsequent to differencing the variables, the existence of stationarity became evident. Since the mean and the variance were constant overtime, the null hypothesis of non-stationary is rejected and the study concludes that variables are stationarity at first difference. Since it is not sufficient to conclude based on the graphical illustration, the study proceed to test the stationarity by means of ADF and PP processes.

Figure 5.2: Graphical representation of variables at first difference



5.2.2 Augmented Dickey Fuller test

As it was done in the visual inspection, the ADF also tests the variables firstly at levels then if the presence of non-stationary is observed then the study will further test the variable at first difference. The stationarity is determined by comparing the t-value against the critical values. The hypothesis tested is as follows:

H_0 = *The times series is non-stationary*

H_1 = *The times series is stationary*

Table 5.1: Augmented Dickey Fuller test at levels

variables	Models	t-values(lags)	5% critical value	Conclusion	Order of integration
RGDP	Intercept	-2.964(0)	-3.182	Stationary	I (0)
	Trend and Intercept	-3.029(0)	-3.568	Non-stationary	I (0)
	None	-1.748(0)	-1.953	Non-stationary	I (0)
BDIF	Intercept	-2.148(0)	-2.964	Non-stationary	I (0)
	Trend and intercept	-2.104(0)	-3.568	Non-stationary	I (0)
	None	-0.909(0)	-1.953	Non-stationary	I (0)
RIR	Intercept	-0.735(2)	-2.971	Non-stationary	I (0)
	Trend and Intercept	-2.499(1)	-3.568	Non-stationary	I (0)
	None	0.925 (2)	-1.953	Non-stationary	I (0)
LAB	Intercept	-2.510(1)	-2.968	Non-stationary	I (0)
	Trend and Intercept	-2.400(1)	-3.574	Non-stationary	I (0)
	None	0.489(0)	-1.952	Non-stationary	I (0)
GFCF	Intercept	-2.315(0)	-2.981	Non-stationary	I (0)
	Trend and Intercept	-3.028(0)	-3.568	Non-stationary	I (0)
	None	-2.510(0)	-2.968	Non-stationary	I (0)
UN	Intercept	-2.399(0)	-2.964	Non-stationary	I (0)
	Trend and Intercept	-2.487(0)	-3.568	Non-stationary	I (0)
	None	0.156(0)	-1.952	Non-stationary	I (0)

**/ [**]/ (***) denotes significance at 10%, / [5%]/ (1%), level of significance respectively*

Table 5.1 tends to come to an agreement with figure 5.1 above that variables are non-stationary at levels. Applying the ADF test variables at levels under the models of intercept, trend and intercept, none of the variables turns out to be non-stationary at 1%, 5% and 10% level of significance. Therefore the study fails to reject the null hypothesis of non-stationary and conclude that variables are not stationary at levels. Table 5.2 below tests the same variables at first difference and the result yield are presented as follows:

Table 5.2: Augmented Dickey Fuller test at first difference

Variable(s)	Model	t-values(lags)	5% critical value	Conclusion	Order of integration
ΔRGDP	Intercept	-5.266(0)	-2.967***	Stationary	I (1)
	Trend and Intercept	-5.232(0)	-3.574***	Stationary	I (1)
	None	-5.361(0)	-1.953***	Stationary	I (1)
ΔBDIF	Intercept	-5.080(0)	-2.968***	Stationary	I (1)
	Trend and intercept	-4.988(0)	-3.574***	Stationary	I (1)
	None	-5.166(0)	-1.953***	Stationary	I (1)
ΔRIR	Intercept	-7.246(0)	-2.968***	Stationary	I (1)
	Trend and Intercept	-7.215(0)	-3.574***	Stationary	I (1)
	None	-6.703(0)	-1.953***	Stationary	I (1)
ΔLAB	Intercept	-3.732(0)	-2.967***	Stationary	I (1)
	Trend and Intercept	-3.786(0)	-3.574***	Stationary	I (1)
	None	-3.368 (0)	-1.953***	Stationary	I (1)
ΔGFCF	Intercept	-5.463(3)	-2.981***	Stationary	I (1)
	Trend and Intercept	-6.166(3)	-3.595***	Stationary	I (1)
	None	-5.215(0)	-1.953***	Stationary	I (1)
ΔUN	Intercept	-4.747(0)	-2.968***	Stationary	I (1)
	Trend and Intercept	-4.659(0)	-3.574***	Stationary	I (1)
	None	-4.819(0)	-1.953***	Stationary	I (1)

**/ [**]/ (***) denotes significance at 10%, / [5%]/ (1%), level of significance respectively*

Table 5.2 demonstrates that when the ADF test is applied to variables at first difference, under the same models of intercept, trend and intercept, none of the variables turns out to be stationary at 1%, 5% and 10% level of significance. As a result, the study rejects the null hypothesis of non-stationary and concludes that variables are stationary and integrated at order I (1).

5.2.3 Phillip-Peron test

To test for the robustness of the ADF results, the PP test of stationarity was also applied. The PP test of stationarity is performed as follows:

H_0 = *The time series is non-stationary*

H_1 = *The time series is stationary*

Table 5.3: Phillip Perron test at levels

Variable(s)	Model	t-values(bandwidth)	5% critical value	Conclusion	Order of integration
RGDP	Intercept	-2.964 (4)	-3.094	Non-stationary	I (0)
	Trend and Intercept	-2.901(4)	-3.568	Non-stationary	I (0)
	None	-1.709(3)	-1.953	Non-stationary	I (0)
BDIF	Intercept	-2.179(4)	-2.964	Non-stationary	I (0)
	Trend and intercept	-2.138(4)	-3.568	Non-stationary	I (0)
	None	-0.743(9)	-1.952	Non-stationary	I (0)
RIR	Intercept	-1.110(5)	-2.964	Non-stationary	I (0)
	Trend and Intercept	-2.464(2)	-3.568	Non-stationary	I (0)
	None	1.710(5)	-1.952	Non-stationary	I (0)
LAB	Intercept	0.241 (4)	-2.964	Non-stationary	I (0)
	Trend and Intercept	-2.052(3)	-3.568	Non-stationary	I (0)
	None	1.965(4)	-1.953	Non-stationary	I (0)
GFCF	Intercept	-1.641(14)	-2.964	Non-stationary	I (0)
	Trend and Intercept	-2.192(5)	-3.568	Non-stationary	I (0)
	None	-2.408(29)	-3.265	Non-stationary	I (0)
UN	Intercept	-2.561(2)	-2.964	Non-stationary	I (0)
	Trend and Intercept	-2.679(2)	-3.568	Non-stationary	I (0)
	None	0.221(2)	-1.952	Non-stationary	I (0)

**/ [**]/ (***) denotes significance at 10%, / [5%]/ (1%) level of significance respectively*

According to Philip-Perron test, all variables are non-stationary at 1, 5 and 10 per cent level of significance. Therefore without any doubt, the study cannot reject the null hypothesis of non-stationary. The non-stationarity in the variables was removed by testing the variables at first difference and the following table yield the results of PP test at first difference:

Table 5.4: Phillip Perron test at first difference

Variable(s)	Model	t-values(bandwidth)	5% critical value	Conclusion	Order of integration
ΔRGDP	Intercept	-7.192(20)	-2.968***	Stationary	I (1)
	Trend and Intercept	-10.161(23)	-3.574***	Stationary	I (1)
	None	-7.278(20)	-1.953***	Stationary	I (1)
ΔBDIF	Intercept	-6.671(20)	-2.968***	Stationary	I (1)
	Trend and intercept	-6.949(22)	-3.574***	Stationary	I (1)
	None	-6.923(20)	-1.953***	Stationary	I (1)
ΔRIR	Intercept	-8.046(6)	-2.978***	Stationary	I (1)
	Trend and Intercept	-9.675(11)	-3.574***	Stationary	I (1)
	None	-6.74(1)	-1.953***	Stationary	I (1)
ΔLAB	Intercept	-3.401(6)	-2.968***	Stationary	I (1)
	Trend and Intercept	-3.492(6)	-3.574**	Stationary	I (1)
	None	-3.299(3)	-1.953***	Stationary	I (1)
ΔGFCF	Intercept	-6.717(28)	-2.968***	Stationary	I (1)
	Trend and Intercept	-11.211 (28)	-3.574***	Stationary	I (1)
	None	-5.256(11)	-1.953***	Stationary	I (1)
ΔUN	Intercept	-4.759(5)	-2.967***	Stationary	I (1)
	Trend and Intercept	-4.644(5)	-3.574***	Stationary	I (1)
	None	-4.852	-1.953***	Stationary	I (1)

**/ [**]/ (***) denotes significance at 10%, / [5%]/ (1%) level of significance respectively*

According to PP test, at first difference all variables are stationary at 1, 5 and 10 percent level of significance. The variables were tested at same models which are trend and intercept, intercept and none. Therefore the study rejects the null hypothesis of non-stationary and concludes that the

variables are integrated at the same order of I (1). Since there was evidence of stationarity in the variables, the study therefore proceeds estimating a non-spurious model of budget deficit and economic growth for South Africa.

5.3 Lag length selection criteria result

Table 5.5: selection of lag length used in the study at level form

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-257.4724	NA	2172.326	21.87270	22.11813	21.93781
1	-327.6234	NA	83.33474*	27.00851	30.02599*	27.95355*
2	-250.3030	69.32171	89.38630	26.08987*	32.12483	27.97994

NOTE: asterix (*) indicates lag order selection of criterion, LR: Sequential modified LR test Statistics (each test at 5% level). FPE: Final Prediction Error. AIC: Akaike Information Criterion. SC: Schwarz Information Criterion. HQ: Hannan Quinn Information Criterion

It is very fundamental under the Johansen methodology to conduct a lag length selection criterion to establish the number of lag to use. According to Liew (2004), assessing the lag length of autoregressive process of time series is a fundamental econometric application. The lag selection can be done through the basis of Final Prediction Error (FPE), Akaike Information Criteria (AIC), Schwartz Bayesian Information Criteria (SBIC), and Hanna and Quinn Information Criteria (HQIC). The test was conducted and a lag of 1 was selected as reflected in table 8 above. The lag of 1 was selected based on the FPE, SIC and HQ results and it was used throughout the analysis of the study

5.4 Johansen cointegration test

Based on the optimum lag length of one, the Johansen test for cointegration is employed to analyse the long-run association between the variables. This technique employed two test statistics known as the Trace statistics and the Maximum Eigen-value statistics to assist in evaluating the null hypothesis of $\Upsilon = 0$ in contrast to the alternatives of $\Upsilon > 0, 1, 2,$ or 3. The results obtained from the analysis are reflected on table 5.6 and 5.7 below as follows:

Table 5.6: Cointegration test using the Trace Test

Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Value	Prob.**
None *	96.50334	95.75366	0.0444
At most 1	61.00516	69.81889	0.2058
At most 2	35.60699	47.85613	0.4164
At most 3	20.65744	29.79707	0.3793
At most 4	8.979829	15.49471	0.3672
At most 5	2.354730	3.841466	0.1249
Trace test indicates 1 cointegrating equation(s) at the 0.05 level **denotes rejection of the hypothesis at the 0.05 level*			

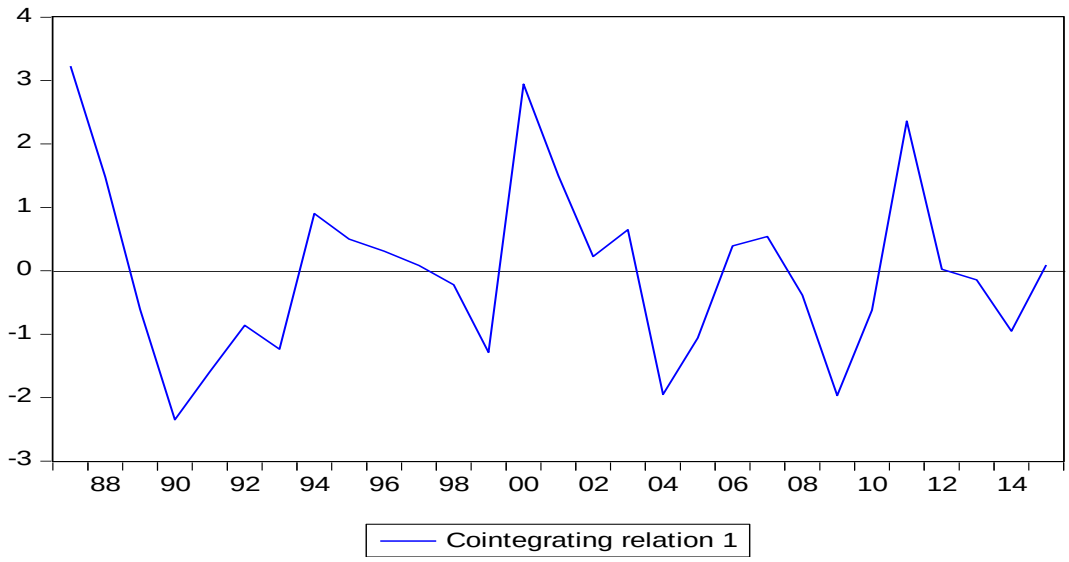
The Trace test results as reflected in table 5.6 suggest that there exist 1 cointegrating equation. The results obtained show that in the case of the trace test, the null hypothesis of no cointegrating equation is rejected since the test statistics of 96.503 is bigger than the 5% critical value of 95.753 at none. This was a clear indication that there existed one cointegrating equation at the 5% level.

Table 5.7: Cointegration test using the Maximum Eigenvalue Test

Hypothesized No. of CE(s)	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None*	45.49818	40.07757	0.0300
At most 1	25.39817	33.87687	0.3586
At most 2	14.94955	27.58434	0.7522
At most 3	11.67761	21.13162	0.5797
At most 4	6.625100	14.26460	0.5344
At most 5	2.354730	3.841466	0.1249
Max-eigenvalue test indicates 1 cointegrating equation(s) at the 0.05 level **denotes rejection of the hypothesis at the 0.05 level*			

The Maximum Eigenvalue test also indicated that at none, the maximum eigenvalue statistics of 45.498 was bigger than the critical value of 40.078. As a result, the Maximum Eigenvalue also suggested one cointegrating equation at the 5% level. Since both trace test and maximum eigenvalue suggest 1 cointegrating equation, the study rejects the null hypothesis of $Y = 0$. Therefore, the study concludes that there exists a long-run association amongst the variables under-study. The long-run relation was also analysed using the graphical illustration as follows:

Figure 5.1: Johansen cointegration test in a graphical form



It is evident from figure 5.1 above that there existed a long-run economic equilibrium association between the variables under study. The mean and the variance were constant over time; hence the blue line is fluctuating around the zero.

5.5 The VECM estimation result

The study further estimated a correction Model to capture both the long-run and the short-run effect between the variables under-study. The results of the long-run estimation results are reflected in table 5.8 and the short-run in table 5.9 below.

5.5.1 The Long-run Relationship

Table 5.8: Long-run results: RGDP

Variable(s)	Coefficient	Standard Errors	t-statistics
BDIF (-1)	-0.214	0.054	-3.964
RIR(-1)	-0.046	0.035	-1.302
LAB(-1)	0.238	0.090	2.630
GFCF (-1)	0.285	0.027	10.611
UN(-1)	-0.153	0.068	-2.239

The relationship reflected in table 5.8 can be presented in a formula form as follows:

$$RGDP_t = -11.610 - 0.214BDIF_t - 0.409RIR_t + 0.238LAB_t + 0.285GFCF_t - 0.153UN_t + \varepsilon_t$$

The long-run relationship between the variables as described in the equation above suggests that there is a negative long-run significant relationship between BDIF and RGDP in South Africa. These results are consistent with the neoclassical theory and supported by study conducted by Fatima, Ahmed and Rehman (2012), Herbert (2012) and Mohanty (2011). In a nutshell, the results confirmed that budget deficits are detrimental towards economic growth in South Africa. This study also proved a long-run negative relationship of RIR and UN towards RGDP and a long-run positive relationship between GFCF and LAB towards RGDP. Very explanatory variables, in exception of RIR, were statistically significant in explaining the dependent variable since they have t-values greater than two absolutely.

The implication of the negative relationship between BDIF and RGDP was that 1% increase in BDIF would deteriorate RGDP by 0.21% in South Africa. Furthermore, a 1% increase in RIR and UN would also reduce RGDP by 0.04%, 0.29% and 0.15% respectively. LAB and GFCF was found to be growth enhancing since 1% increase in both variables would improvement the economy by 0.24% and 0.29% respectively.

5.5.2 Short-run Relationship

The short-run results are presented in table 5.9 below:

Table 5.9: short-run results: GDP

Variable(s)	Coefficient	Standard Errors	t-statistics
CointEq1	-0.287	0.406	2.411
D(GDP(-1))	-0.149	0.354	-0.423
D(BDIF(-1))	-0.171	0.204	-0.841
D(RIR(-1))	-0.345	0.188	-2.830
D(LAB (-1))	-0.371	0.394	-0.940
D(GFCF(-1))	-0.019	0.067	-0.278
D(UN(-1))	-0.230	0.189	-1.219

The coefficient of the error term is -0.29 and statistically significant with t-value of -2.41. This suggests that about 29% of the variation in the real GDP from its equilibrium level is correlated within a year. Based on this result, the adjustment of the GDP to restore long-run equilibrium is weak at 29% per annum.

5.6 Diagnostic check results

According to Koop (2009), subsequent to estimating a model it is very essential to test for stability and the diagnostic tests to examine if the model is of good fit. The main objective of the diagnostic tests is to build test statistics which is used to correct specification of the model. These tests are also very essential in examining the credibility of the conclusion drawn from a model used in the study. The diagnostic tests performed here are the ones outlined and explained in chapter 4 and are subjected to their own hypothesis. Defiantly

5.6.1 Jarque-Bera results

The Jarque-Bera test was performed in this study to ensure that the estimated residuals are normally distributed. The model with residuals that are not normally distributed produces nonsensical and misleading results. Table 5.10 below presents the results and the tested hypothesis are as follows:

H_0 : Normally distributed

H_1 : Not normally distributed

Table 5.10: Jarque-Bera test

Component	Jarque-Bera	df	Prob.
1	0.326816	2	0.8492
2	0.405067	2	0.8167
3	0.533309	2	0.7659
4	0.982581	2	0.6118
5	0.432967	2	0.8053
6	0.453492	2	0.7971
Joint	**3.134233**	**12**	**0.9945**

Based on the results reflected in table 5.10, it is evident that the model estimated was normally distributed with the joint probability of 0.95. As a result, the study fails to reject the null hypothesis of normal distribution. In other words, the residual of the model developed were normally distributed.

5.6.2 Breusch-Godfrey Serial Correlation LM Test

When employing a time series data, serial correlation is always a challenge and it can result in the underestimation of standard errors, thereby making t-value to be overestimated. According to Gujarati and Porter (2010), the evidence of serial correlation in the residuals is an indication that

there could be an omission of an essential variable. Table 5.11 below presents the LM test obtained from the analysis. The hypothesis of the LM test is as follows:

H_0 : No serial correlation

H_1 : Serial correlation

Table 5.11: VEC Residual Correlation LM Test

Lags	LM-Stat	Prob.
1	27.25787	0.8526
2	36.67770	0.4373

However, based on table 5.11 above, it is evident that the model estimated is not suffering from serial correlation with the probability value above 5% level of significance. In other words, the study fails to reject the null hypothesis of no serial correlation and conclude that there is no serial correlation in the model.

5.6.3 White heteroskedasticity Test

The hypothesis to test the White's test of heteroskedasticity is outlined below as follows:

H_0 : Homoscedasticity

H_1 : Heteroskedasticity

Table 5.12: VEC Residual Heteroskedasticity Tests: White

Chi-squared	Df	Prob.
299.838	294	0.394

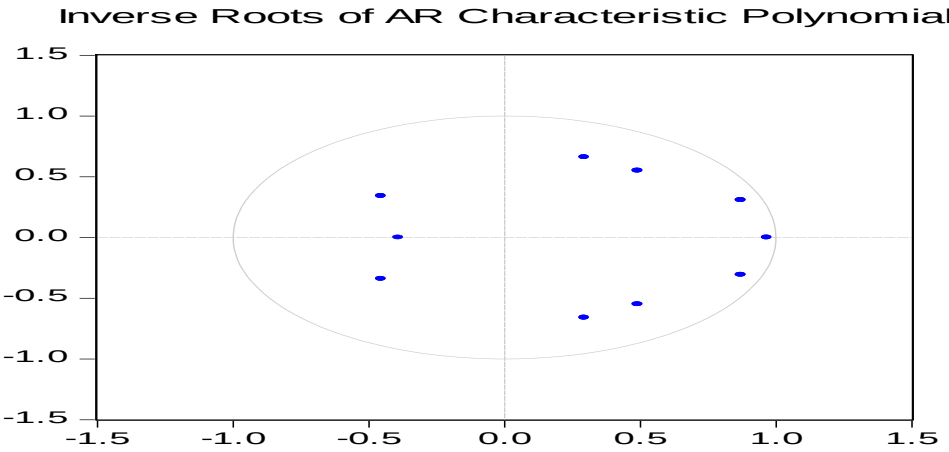
If the model is heteroskedastic, it means that it does not have a constant variance and judging from the results obtained in this study, the estimated model is homoscedastic since the variance are constant. The probability of Chi-squared is 0.394 which is above 5% level of significance and as a result the study fails to reject the null hypothesis of no heterosdasticity. This means that the model estimated is homoscedastic.

5.6.4 Inverse Roots of AR Characteristic Polynomial test

To test for stability in the model, the study employed the Inverse Roots of AR Characteristics Polynomial. According to the test, all the AR polynomial should fall with the unit circle. According to figure 5.2 below, it is evident that all the AR polynomial had roots with modulus which are less

than one and they lie within the unit circle. This was a good indication that the estimated VEC model is stable and stationary.

Figure 5.2: Inverse Roots of AR Characteristic Polynomial



5.7 Pairwise Granger Causality Tests

The Pairwise Granger Causality test is performed to analyse the cause and the effect relationship between variables employed in the analysis and to also examine the causal link between BDIF and RGDP more specifically. The study of cause and effect plays an imperative role in economic theory when analysing the behaviour of variables. The results are presented in table 5.13 as follows:

Table 5.13: Pairwise Granger Causality results

Null hypothesis:	**Obs**	**F-statistic**	**Prob.**	**Conclusion**
BDIF does not Granger cause RGDP	29	0.504	0.610	No causality
RGDP does not Granger cause BDIF	29	0.037	0.037	Causality
RIR does not Granger cause RGDP	29	4.769	0.017	Causality
RGDP does not Granger cause RIR	29	2.998	0.068	No causality
LAB does not Granger cause RGDP	29	1.443	0.255	No causality
RGDP does not Granger cause LAB	29	1.550	0.232	No causality
GFCF does not Granger cause RGDP	29	1.303	0.707	No causality
RGDP does not Granger cause GFCF	29	2.872	0.009	Causality
UN does not Granger cause RGDP	29	0.351	0.290	No causality
RGDP does not Granger cause UN	29	5.699	0.076	No causality

Based on the result presented in table 5.13 above, the BDIF does not Granger Cause RGDP instead, RGDP does Granger Cause BDIF. This simply implies that the economic growth of South Africa is not affected by changes in budget deficit rather economic growth influence the level of budget deficit and this makes economic sense. Further, the causal link between budget deficit and economic growth is found to be uni-directional since it runs on one direction. The rest of the results are reflected in table 5.13 above.

5.8 Variance Decomposition results of RGDP on the independent variables

The Variance Decomposition in essence denotes the breakdown of the forecast error variance for a specific time distance. Unambiguously, the Variance Decomposition splits the variation in an endogenous variable into the component shocks to the Vector Error Correction Model (VECM). According to Ludi and Ground (2006), this analysis provides information regarding the relative importance of each random innovation in affecting the variables in the VECM. The Variance Decomposition of GDP results are presented in table 5.14.

Table 5.14: Variance Decomposition results: RGDP

Period	S.E.	RGDP	BDIF	RIR	LAB	GFCF	UN
1	1.592204	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	2.275472	76.63155	5.116885	13.03147	2.877831	0.270964	2.071295
3	2.706356	64.32098	7.544030	23.18199	3.259627	0.191692	1.501675
4	2.965966	58.66716	10.90624	25.07187	3.609359	0.272342	1.473028
5	3.153743	56.36553	13.20223	24.42105	4.363728	0.292476	1.354995
6	3.344279	56.18206	13.83730	23.55084	4.952699	0.260203	1.216909
7	3.562731	56.21723	13.82003	23.39119	5.202530	0.240440	1.128586
8	3.781891	55.50901	13.93888	24.01840	5.289202	0.218400	1.026114
9	3.977382	54.50027	14.36898	24.63080	5.373942	0.197747	0.928259
10	4.149264	53.71825	14.88924	24.84260	5.511549	0.184865	0.853492

Cholesky ordering: RGDP, BDIF, RIR, LAB, GFCF, UN

From Table 5.14, the study presents the comparative significance of each structural shock to the variables in the system. The study reports the variance decomposition of GDP over a 10 quarters period ahead. In explaining its own shocks, 100% of GDP variance can be explained by its own innovation in the first period. It is also evident that as time goes by; its contributions are progressively reducing until it reaches 53.7% in the last quarter. Nonetheless, it remains the highest contribution over the 5 years forecasted as compared to the other variables and this brings to the conclusion that over 5 years ahead, GDP discrepancies can be explained by its own shocks.

Following GDP itself, the 2nd up to the 8th period demonstrates the importance of BDIF, RIR, LAB, GFCF and UN in explaining the variation of GDP. It is evident that from the second year, BDIF accounts for 5.1% in the variation of GDP, RIR accounts for 13% while LAB, GFCF and UN accounts for 2.9%, 0.3% and 2.1% respectively. Based on the analysis, the GDP is mainly influenced by RIR and BDIF. Based on the results obtained, the study undoubtedly associates discrepancies in the level of GDP in South Africa to be explained by the contributions in real interest rate, budget deficit and labour.

5.9 Generalised Impulse response results

The study further applied the General Impulsive Response Function to trace the effect of one-time shock to one of the innovations on the current and future values of the endogenous variables. In other words, the General Impulse Response Function (GRIF) demonstrates the effects of shocks on the adjustment path of the variables. This sort of analysis is very fundamental particularly when we want to access how shocks to economic variables resound through a system. This study employed the GIRF as proposed by Pesaran and Shin (1998) as a replacement for of the simple Impulse Response Function (IRF) mainly due to its numerous shortcomings.

The GIRF over the 10 years for the VECM estimation is shown in Appendix 3. In this study, the response of GDP to a shock in itself is significantly positive over the period of the study. Moreover, Appendix 1 reveals that the response of GDP to shocks from BDIF is seen to be positive in the first two years. Afterwards, the response of GDP is seen to be negative. This negative response allows us to justify the decrease in the economic growth in South Africa due budget deficits. This response is as expected in the neoclassical theory which justifies that increase in budget deficit will cause economic growth to decrease in South Africa.

The results further reveal that a shock in RIR causes GDP to respond negatively from the start till the end of 10 years. For that reason we conclude that the response of GDP to a shock from RIR is perceived to have detrimental behaviour. GDP is seen to respond positively form the 1st until 10th year from shock in GFCF. The study further observed that GDP respond negatively to shocks coming from UN. The outcome of the GIRF reveals that as adjustment in the level of GDP will cause BDIF, RIR, LAB and UN to respond negatively through all the years.

5.10 Conclusion

This study carried out in this chapter was in order to test the research hypotheses: Budget deficit have a positive effect on economic growth of South Africa as the null hypothesis. The alternative, on the other hand, specified that budget deficit have a negative effect on economic growth of South Africa. The study used the macroeconomic time series data ranging from 1985 to 2015 to apply the VECM. Based on the results obtained in this chapter, the study reject the null hypothesis that budget deficit has positive effects on economic growth of South Africa. The study therefore concludes that budget deficits in South Africa have negative effects on economic growth, meaning that they are not effective in stimulating economic growth. These results are believed to be efficient and consistent based on the diagnostic and stability test undertaken in this study.

CHAPTER SIX

SUMMARY, CONCLUSION AND POLICY RECOMMENDATION

6.1 Introduction

The main objective of this study has been to examine the nature of the relationship between South Africa's budget deficit and economic growth for the period 1985 to 2015. The study incoporated variables such as gross capital formation, real interest rate, unemployed and labour force participation to assist in explaining the behaviour of budge deficit towards economic growth. The study employed the VECM technique to discover both short-run and long-run relationship between variables used. the VECM technique encompasses procedures such as testing variables for order of integration using ADF and PP method, determining the maximum lag length, assessing the long-run association between variables using the Johansen cointegration technique, estimation of both short-run and log-run relationship. Subsequent to long-run and short-run estmation, the study perfomed the stability and diagnostic test followed by variation decomposition and the implusive respond funtion.

6.2 Key findings

This study started by asking the nature of the relationship between the budget deficit and economic growth in South Africa. To answer this question, the study adopted the Vector Error Correction Modelling procedures. The study analysed the behaviour of variables such as budget deficit, real interest rate, unemployment, gross capital formation and total labour force towards economic growth in South Africa. The cointegration analysis confirmed the existence of 1 cointegrating vector and this suggests that there is a long-run association among variables. A significant negative relationship between budget deficit and economic growth was discovered. This implies that an increase in budget deficit result in economic growth reduction in South Africa. These results supported the neoclassical hypothesis that clearly stated that budget deficit is detrimental towards growth and development of a country.

Furthermore, the study discovered a significant positive relationship of labour and gross capital formation towards economic growth in South Africa. Labour and capital has ever been regarded as main economic drivers for both emerging and advanced economies. This study found that 1% increase in labour and capital increase economic growth of South Africa by 0.24% and 0.29% respectively. These results are consistent with the Cobb-Douglas production function propositions. It

would make an economic sense that unemployment and economic growth are negatively related since an increase in unemployment rate is accompanied by reductions in economic growth. This study discover that 1% increase in unemployment diminish economic output of a country by 0.15%. All the explanatory variables, in exception of real interest rate were statistically significant in explaining the dependent variable and results obtained in this study were conforming to economic theory.

The short-run model estimated revealed that there is convergence towards equilibrium in the long-run although the adjustment is weak at 29% per annum. The diagnostic and stability test were applied to the model to assess whether the model is of good fit. The results obtained confirmed that the model do not suffer from heteroskedasticity, serial correlation and normality challenges. The polynomial test confirmed the stability of the model since all the AR polynomial had roots with modulus which are less than one and they lie within the unit circle.

This study further analysed the Granger causality test to assess the causal link between budget deficit and economic growth in South Africa. The Granger causality test indicated that budget deficit does not Granger cause economic growth. Instead, economic growth does Granger cause budget deficit. The causal link between budget deficit and economic growth is found to be uni-directional since the causal link run from economic growth to budget deficit not the other way around.

Based on the above results, this study concludes that budget deficits are detrimental to economic growth in South Africa. These results are believed to be efficient and consistent based on the diagnostic and stability test undertaken. The study also acknowledges that budget deficits can also promote growth and development in other developing countries depending on the component of the fiscal policy. For instance, in other developing countries the deficits are spent o productive components such as investing on health care, education and energy etc.

6.3 Policy recommendations

Firstly, as it was highlighted in the previous chapter that budget deficit is detrimental towards economic growth, it is thereby recommended that government of South Africa should put much emphasis on reducing the rate of budget deficit. The budget deficits can be reduced through strengthening of policies such as fiscal consolidation and austerity measures in spending departments and public entities. Furthermore, the government of South Africa should also enhance its revenue generation capacity in order to curb borrowings and budget deficits.

Secondly, since it was evident that labour force and gross fixed capital formation are the main economic driver in South Africa, government should implement effective investment incentives which will be aimed at improving investment, generating employment and enhancing output. Government should also work together with private sectors, labourers and other stakeholders to create efficient environment that will coerce economic growth to the privileged rate. Furthermore, there is a need for government to increase their investment of human capital, for instance, building of new education and training institutes that provide the trained labour that will be helpful in increasing the economy of South Africa.

Lastly, the study also examined the effects of interest rate on economic growth of South Africa. The result found that interest rate is negative related with economic growth. However the growth can be enhanced by lowering the interest rate which will increase the investment. South African authorities should perform reforms that would augment the role of interest rate in order to mobilize funds for investment purpose. This may be done through a complete regulation of the interest rate. This is essential for an enduring economic performance.

6.4 Limitations and suggestion for further studies

Firstly, this topic of the effect of budget deficit on economic growth is affected by many sociological factors such as poverty, unemployment, human capital as well as economic issues such as inflation, investment and national savings. Therefore, due to lack of consistent data covering our entire period of study, certain variables were omitted from the analysis. However, key variables as suggested by literature were included in the analysis.

The other limitation of the study is that the econometric result obtained is limited by the quality of data. This limitation arises from the problem of inconstancy of data as reported by different institutions as well as poor record keeping. However, the study used data from the reliable sources which invest much in data collection such as South African Reserve bank.

This study used certain key variables to analyse the behaviour of budget deficit towards economic growth. Such variables include unemployment, labour force, interest rate and gross fixed capital formation. As an area for further studies, other macroeconomic variables as a technological advancement, export, real exchange rate and consumption by household, business and government may be incorporated as they are important in assisting to explain the effects of budget deficit on

economic growth. It is again suggested that studies should analyse the effect of budget deficit on economic growth using data beyond 1985.

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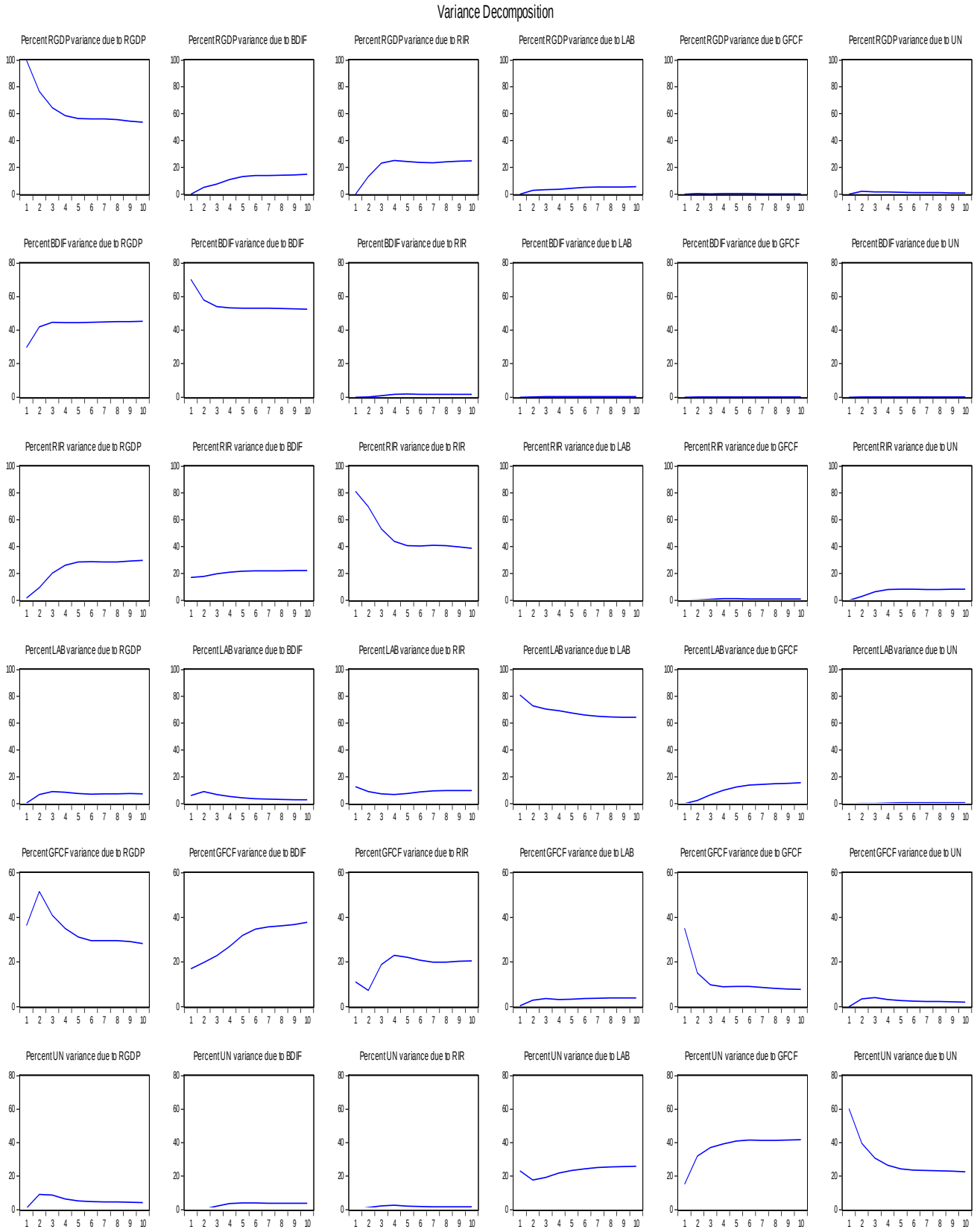
LIST OF APPENDIXES

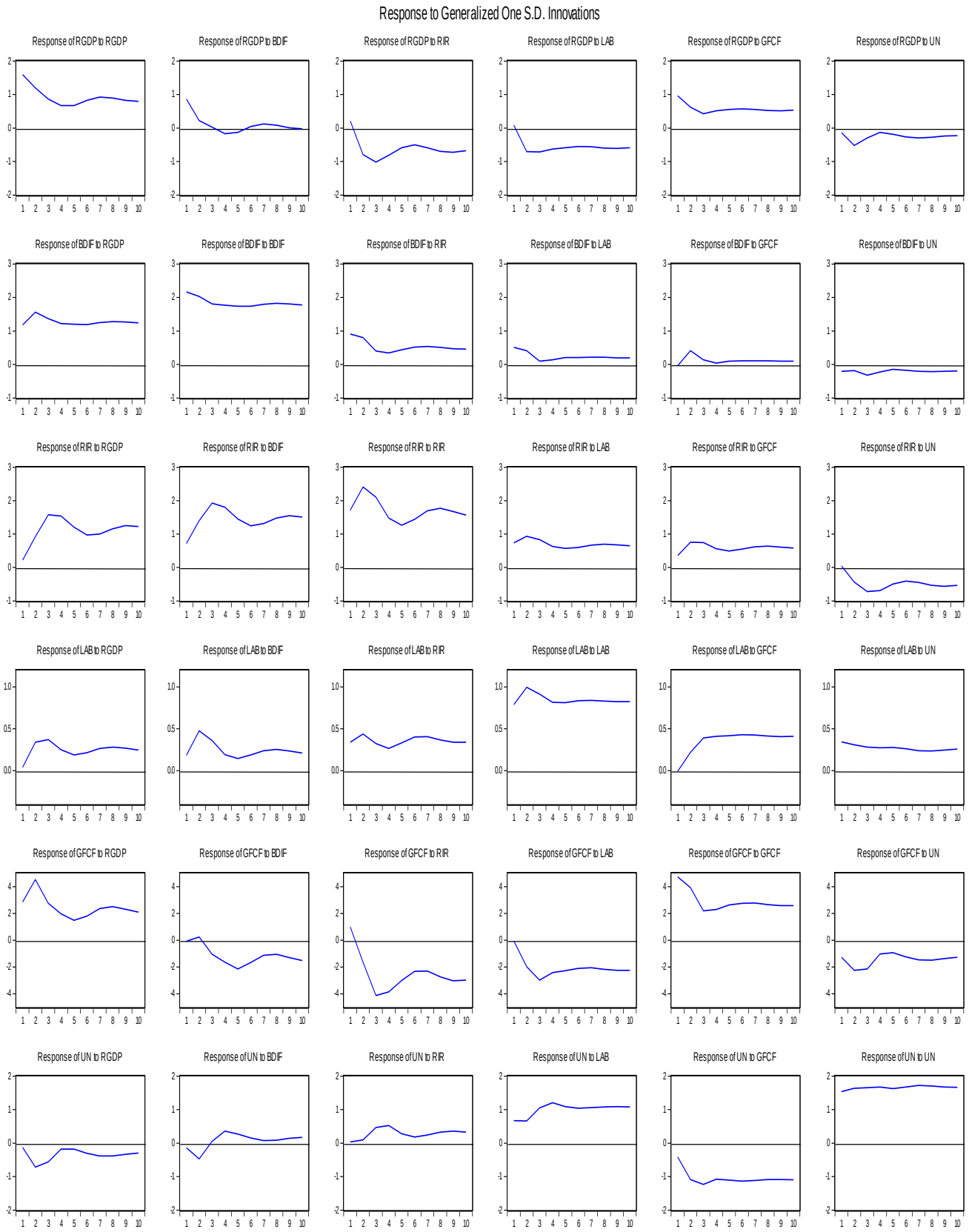
Appendix 1: Data used in the study

YEARS	RGDP	BDIF	RIR	GFCF	UN	LAB
1985	-1,2	-1,1	17,0	-7,0	21,7	54,6
1986	0	-3,0	11,0	-17,5	22,1	54,9
1987	2,1	-3,9	8,7	-2,9	22,5	55,2
1988	4,2	-3,2	13,5	10,5	22,9	55,5
1989	2,4	0,7	18,1	6,6	23,3	55,8
1990	-0,3	-3,5	18,9	-2,4	23,7	56,1
1991	-1	-3,6	17,3	-7,3	24,5	56,4
1992	-2,1	-8,8	13,8	-4,7	23,7	56,7
1993	1,2	-8,9	11,5	-0,7	25,3	57,1
1994	3,2	-5,3	11,1	8,3	20,0	57,5
1995	3,1	-5,3	13,5	10,1	16,9	57,8
1996	4,3	-5,2	14,9	12,9	21,0	58,2
1997	2,6	-3,7	15,4	6,1	22,9	58,5
1998	0,5	-2,9	16,5	0,8	25,0	58,8
1999	2,4	-1,8	12,2	-7,5	25,4	59,1
2000	4,2	-1,9	9,2	3,9	26,7	59,3
2001	2,7	-0,9	9,4	3,2	25,4	59,5
2002	3,7	-1,6	10,8	4,3	27,2	59,2
2003	2,9	-2,8	9,8	10,2	27,1	57,3
2004	4,6	-2,2	6,6	12,9	24,7	55,6
2005	5,3	-0,5	6,0	11,0	23,8	57,3
2006	5,6	0,6	7,1	12,1	22,6	58,4
2007	5,4	0,8	9,2	13,8	22,3	57,7
2008	3,2	-0,9	11,6	12,8	22,7	58,4
2009	-1,5	-5,2	8,5	-6,7	23,7	56,6
2010	3	-4,0	6,5	-3,9	24,7	54,9
2011	3,2	-4,6	5,7	5,7	24,7	55,1
2012	2,2	-5,1	5,4	3,6	25,0	55,7
2013	2,2	-5,8	5,2	7,6	24,6	56,2
2014	1,5	-3,3	5,8	-0,4	25,1	56,6
2015	1,3	-2,9	6,2	1,4	25,0	57,1

Appendix 2: the graphic results of Variance decomposition



Appendix 3: Generalised impulse response results



Appendix 4: VEC Residual Normality Tests

VEC Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Date: 10/16/16 Time: 21:44
Sample: 1985 2015
Included observations: 29

Component	Skewness	Chi-sq	Df	Prob.
1	-0.235198	0.267371	1	0.6051
2	-0.286215	0.395942	1	0.5292
3	-0.084191	0.034260	1	0.8532
4	-0.242410	0.284020	1	0.5941
5	0.172806	0.144333	1	0.7040
6	-0.170386	0.140319	1	0.7080
Joint		1.266245	6	0.9735

Component	Kurtosis	Chi-sq	Df	Prob.
1	3.221801	0.059445	1	0.8074
2	2.913099	0.009125	1	0.9239
3	3.642656	0.499050	1	0.4799
4	2.239658	0.698561	1	0.4033
5	2.511257	0.288634	1	0.5911
6	2.490905	0.313173	1	0.5757
Joint		1.867988	6	0.9314

Component	Jarque-Bera	df	Prob.
1	0.326816	2	0.8492
2	0.405067	2	0.8167
3	0.533309	2	0.7659
4	0.982581	2	0.6118
5	0.432967	2	0.8053
6	0.453492	2	0.7971
Joint	3.134233	12	0.9945

Appendix 5: VEC Residual Serial Correlation LM Tests

VEC Residual Serial Correlation LM Tests

Null Hypothesis: no serial correlation at lag order h

Date: 10/18/16 Time: 20:13

Sample: 1985 2015

Included observations: 29

Lags	LM-Stat	Prob
1	27.25787	0.8526
2	36.67770	0.4373

Probs from chi-square with 36 df.

Appendix 6: VEC Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)

VEC Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)
Date: 10/18/16 Time: 20:13
Sample: 1985 2015
Included observations: 29

Joint test:

Chi-sq	df	Prob.
299.8375	294	0.3949

Individual components:

Dependent	R-squared	F(14,14)	Prob.	Chi-sq(14)	Prob.
res1*res1	0.570456	1.328051	0.3013	16.54323	0.2813
res2*res2	0.503816	1.015383	0.4888	14.61068	0.4053
res3*res3	0.483934	0.937737	0.5470	14.03409	0.4472
res4*res4	0.529759	1.126567	0.4133	15.36300	0.3538
res5*res5	0.503819	1.015395	0.4888	14.61076	0.4053
res6*res6	0.506548	1.026541	0.4808	14.68990	0.3997
res2*res1	0.537176	1.160649	0.3922	15.57811	0.3398
res3*res1	0.322919	0.476929	0.9108	9.364660	0.8070
res3*res2	0.273177	0.375851	0.9612	7.922140	0.8933
res4*res1	0.506921	1.028071	0.4797	14.70070	0.3989
res4*res2	0.355958	0.552694	0.8604	10.32279	0.7382
res4*res3	0.393479	0.648747	0.7859	11.41089	0.6535
res5*res1	0.440632	0.787733	0.6693	12.77833	0.5440
res5*res2	0.388395	0.635041	0.7970	11.26344	0.6652
res5*res3	0.564509	1.296261	0.3170	16.37077	0.2913
res5*res4	0.546322	1.204207	0.3665	15.84334	0.3230
res6*res1	0.578706	1.373638	0.2802	16.78247	0.2680
res6*res2	0.537286	1.161161	0.3919	15.58129	0.3396
res6*res3	0.590349	1.441102	0.2515	17.12012	0.2498
res6*res4	0.492305	0.969685	0.5226	14.27683	0.4293
res6*res5	0.653683	1.887529	0.1234	18.95681	0.1666

Appendix 7: VEC Residual Portmanteau Tests for Autocorrelations

VEC Residual Portmanteau Tests for Autocorrelations

Null Hypothesis: no residual autocorrelations up to lag h

Date: 10/18/16 Time: 20:14

Sample: 1985 2015

Included observations: 29

Lags	Q-Stat	Prob.	Adj Q-Stat	Prob.	df
1	15.81580	NA*	16.38065	NA*	NA*
2	49.29435	0.9381	52.33909	0.8894	66

*The test is valid only for lags larger than the VAR lag order.

df is degrees of freedom for (approximate) chi-square distribution

Appendix 8: Pairwise Granger Causality Tests

Pairwise Granger Causality Tests
Date: 10/16/16 Time: 21:40
Sample: 1985 2015
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
BDIF does not Granger Cause RGDP	29	0.50447	0.6101
RGDP does not Granger Cause BDIF		3.77030	0.0377
RIR does not Granger Cause RGDP	29	4.79688	0.0177
RGDP does not Granger Cause RIR		2.99822	0.0688
LAB does not Granger Cause RGDP	29	1.44364	0.2558
RGDP does not Granger Cause LAB		1.55035	0.2327
GFCF does not Granger Cause RGDP	29	0.35127	0.7074
RGDP does not Granger Cause GFCF		5.69971	0.0094
UN does not Granger Cause RGDP	29	1.30364	0.2901
RGDP does not Granger Cause UN		2.87228	0.0761
RIR does not Granger Cause BDIF	29	1.37034	0.2732
BDIF does not Granger Cause RIR		1.11031	0.3458
LAB does not Granger Cause BDIF	29	0.27171	0.7644
BDIF does not Granger Cause LAB		2.68921	0.0883
GFCF does not Granger Cause BDIF	29	1.16120	0.3301
BDIF does not Granger Cause GFCF		0.44278	0.6474
UN does not Granger Cause BDIF	29	0.19949	0.8205
BDIF does not Granger Cause UN		2.63815	0.0921
LAB does not Granger Cause RIR	29	1.20719	0.3166
RIR does not Granger Cause LAB		0.34139	0.7142
GFCF does not Granger Cause RIR	29	3.79127	0.0371
RIR does not Granger Cause GFCF		3.34882	0.0522
UN does not Granger Cause RIR	29	3.11312	0.0628
RIR does not Granger Cause UN		0.12423	0.8837
GFCF does not Granger Cause LAB	29	0.29311	0.7486
LAB does not Granger Cause GFCF		0.53723	0.5912
UN does not Granger Cause LAB	29	0.42052	0.6615
LAB does not Granger Cause UN		0.50821	0.6079
UN does not Granger Cause GFCF	29	1.07195	0.3582
GFCF does not Granger Cause UN		1.02606	0.3736