ANALYSING THE RELATIONSHIP BETWEEN BUDGET DEFICIT AND CURRENT ACCOUNT DEFICIT IN NAMIBIA.

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BY

ACHILES NAFIMANEKWE SHIFIDI

201037424

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MAIN SUPERVISOR: DR J.M. NYAMBE

UNIVERSITY OF NAMIBIA

ABSTRACT

One of macro-economic theories suggests that there exists a causal relationship running from budget deficit to current account deficit, and this concept is referred to as the Twin Deficit Hypothesis. Previous studies on the twin deficit hypothesis generated mixed findings. Some of the studies supports the hypothesis while others do not. This study is aimed at analysing the relationship between budget deficit and current account deficit in Namibia, while taking into account interest and exchange rates as intermediating variables in the transmission mechanism. The study used the quarterly time series data covering the period 1990 first-quarter to 2014 quarter-four. The study employs the following variables; budget balance, current account balance, exchange rate, and interest rate. The Unrestricted Vector auto Regression technique was employed to analyse the relationship. The result shows that budget deficit does influence current account deficit in Namibia. However, interest rate and exchange rate were insignificant in influencing both current account and budget balance. The results supports the Keynesian theory that there is a positive uni-directional relationship between budget deficit and current account deficit, and the direction of causality runs from budget deficit to current account deficit. It is therefore, recommended that the Government of the Republic of Namibian should maintain a favourable budget balance in order to improve current account balance.

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DEDICATION

This thesis is dedicated to my beloved parents Mr Ferdinand Shifidi and Mrs Martha Shifidi, my siblings that had to bear with my absence during the course of my study, and for their support morally and financially during the duration of my studies.

DECLARATIONS

I, Achiles Nafimanekwe Shifidi, hereby declares that this study is a true reflection of my own research, and that this work, or part thereof has not been submitted for a degree in any other institution of higher education.

I, Achiles Nafimanekwe Shifidi, grant the University of Namibia the right to produce this dissertation in whole or in part, in any manner or format, which the University of Namibia may deem fit, for any person or institution requiring it for study and research; providing that the University of Namibia shall waive this right if the whole dissertation has been or is being published in a manner satisfactory to the University.

……………………………………. Date……………………………

Achiles Nafimanekwe Shifidi

ABBREVIATIONS

AfDB	African Development Bank
ARDL	Autoregressive Distributed Lag
BD	Budget Deficit
BoF	Balance of Payments
BoN	Bank of Namibia
CA	Current Account
CAD	Current Account Deficit
CMA	Common Monetary Area
ECM	Error Correction Model
EXC	Exchange Rate
EU	European Union
GDP	Gross Domestic Product
GMM	Generalised Method of Moment
INT	Interest Rate
IRF	Impulse Response Function
NSA	Namibia Statistics Agency
REH	Ricardian equivalence proposition
SACU	Southern African Customs Union

SADC	Southern African Development community
SSA	Sub-Sahara Africa
TDH	Twin Deficit Hypothesis
VAR	Vector Auto Regression
VAR GARCH	Vector Auto Regression Generalized Autoregressive Conditional Heteroscedasticity
VECM	Vector Error Correction Model
WAEMU	West African Economic and Monetary Union

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CHAPTER ONE: INTRODUCTION

1.1 Background of the study.

Following the recent developments in the global economy such as the financial crisis and the debt crisis in the Eurozone in 2008 to 2009, and 2011 respectively, debates about twin deficits hypothesis particularly in the developed economies resurfaced. Such an awakening attracted attention from both academics and policymakers. It has been argued that public sector wastefulness in some economies such as United States, post 2001 era have accounted for the accumulation of large global imbalances, which possibly contributed to the global financial and economic crises of 2008 to 2009 (Aloryito, Senadza, & Nketiah-Amponsah, 2016). The argument first came up in the 1980s, when a significant deterioration in the USA current account balance was accompanied by a sharp rise in the federal budget deficit (Bartolini & Lahiri, 2006). This period also marked a strong appreciation of the U.S currency.

Despite the importance of maintaining a healthy current account, there is still no clear consensus regarding the effect of budget balance on current account balance (Bluedorn, & Leigh, 2011). Due to the critical effects of budget deficits on an economy, prudent management remains one of the key objectives of macro-economic policy. It has been argued that government budget deficit is one of the important causes for the current account deficit (Vyshnyak, 2000). However, according to Nickel, and Vansteenkiste, (2008), empirical work on the causal relationship between the current account and fiscal policy has been rather leaving matters open.

Even though budget deficit occurs for various reasons, it is usually refers to a deliberate effort by the government to stimulate demand by either increasing government spending or lowering taxes (Krugman, 2008). While budget imbalances can lead to positive economic growth, in some cases a very high and persistent budget deficit can instead slow down economic growth. In June 2011, the International Monetary Fund warned that a continuous budget deficits could result in economic crisis brought on by slow economic growth (Boccia, Reinhart & Rogoff, 2012). In the course of time, non-stop economic contraction can create an even greater global financial crisis than the recession that hit the world in 2007 to 2008 (Verick & Islam, 2010). Further, huge and prolonged budget deficit could discouraged the government from spending enough on development, which makes the supply side fragile.

Current account balance declining over the past years has been attributed to three major reasons: first, some countries are net importers of goods and services or have a high marginal propensity to import (Khalid & Guan, 1999). Second, countries have a low savings and investment to accommodate for exports of moderate or high quality goods and services. For example, economies with low levels of investment will heavily rely on exports of raw commodities, and therefore, weakening exchange rate meaning changes in international commodities prices heavily affect their economies thereby deteriorating or improving current account balances. This lowers the country's export capability therefore worsening balance of payment. Thirdly countries rely heavily on both internal and external loans to finance their expenditure will contribute to deterioration of current account balances. This is due to the fact that large deficits will reduce foreign reserves and given that at least part of deficit is caused by the inflow of money borrowed money.

According to Aloryito, Senadza, and Nketiah-Amponsah (2016), budget and current account deficits of most countries in Sub-Saharan Africa (SSA) appear relatively large or have been widening over the past few years accompanied by positive output growth and steady decline in inflation. One of the macro-fiscal structural challenges that Namibia needs to overcome in a medium to long term is the reversal of the twin deficits for the government budget and current account (Namibia Ministry of Finance, 2016). This is largely due to the implication of current account imbalances on a nation's long term economic growth prospects (Bakarr, 2014). Over the past few years, the argument that fiscal deficit can worsen current account imbalances, has been at the forefront of policy debates among policymakers and economists. This concern focusses on the extent to which fiscal adjustment can contribute to resolving external deficit, especially if it continues persisting.

These imbalances could slow down economic activities and cause some decline in output produced and thereby reducing the well-being of a nation (Bakarr, 2014). With regards to Namibia, the 2015/16 budget deficit will increase from 5.3 to 8.3 percent of GDP unless, timely action to contain the current spending was considered (MoF, 2016).

In some occasions over the past few years, the Namibian Government has tightened its fiscal policy on the understanding that a change in the fiscal stance will improve current account balance, *ceteris paribus*. Even though microeconomic significance of persistent external deficit has appeared prominently in Namibian policy discussions, in the past few years, more or less surprisingly there is little research that has been done on the empirical relationship between Namibia economy's budget deficit and current account deficit.

The relationship between budget deficit and current account deficit has some major policy implications for a various reasons. First, large and persistent deficits leads to indebtedness mainly because of borrowing both internally and externally, and this puts a burden on the coming generations (Harko, 2009). Furthermore, inflation which results from the twin deficit increase, could lower the country's credit ratings and this will cause capital outflow at the same time making it difficulties for countries to get funds from abroad. Budget deficit and Current account deficits can affect the long term growth of an economy (Baharumshah, Lau & Khalid, 2006). It is against this background that this study was conceived to analyse the relationship between government budget deficit and current account deficit.

1.2 Over view of balance budget and current Account balance in Namibia.

Namibia is an upper middle-income country with an estimated annual GDP per capita of US$ 5 210 in 2015 (African Development bank, 2016), with a good track record of macroeconomic management. Namibian economy growth has remained stable at moderate levels. Namibia has recorded on average a growth of 5.3% in 2015/16 from 6.4% in 2014/15 on the back of low global commodity prices, and prevailing drought conditions which was expected to continue until 2015/16 financial year (African Development bank, 2016). However, like other developing countries, Namibia is faced with challenges such as poverty, high budget deficit, high unemployment, high degree of inequality, high current account deficit etc.

Namibia is small open economy country, which is closely linked to South African economy, which is also Namibia's leading source of imported commodities, and it accounted for almost 59.6% of total imports in 2016/17 (BoN, 2016). Namibia does export too, mainly natural commodities, such as Diamonds, Uranium, zinc, gold, Copper etc. This tendency of dependency on exporting raw materials makes Namibia vulnerable to external shocks, such as tighter financial conditions and fluctuations in commodity prices.

Namibia financial sector is in line with South African financial sector, as Namibia is member Common Monetary Area (CMA), together with Lesotho, South Africa and Swaziland, in which their currencies are pegged to South African currency which is the biggest and most developed economy in the CMA. So this means that they share the same exchange rate. Exchange rate is crucial for small import-dependent countries, such as Namibia, as it can influence both current account and budget balance either directly or indirectly.

Namibia's tightening up of monetary policy to contain the rising of credit linked to luxury imports, as well as low global oil prices has reduced inflation from 5.3% in 2014/15 to 3.5% in 2015/16 fiscal year. Despite this, depreciation of the Namibia dollars as well as predicted higher food prices attributed to drought are likely to cancel out the gains, from reduction in global oil prices, and contraction of monetary policy (AfDF, 2016).

Despite strict government measures which seek to bring about fiscal discipline in Namibia, the twin deficit problem continues to be a concern for the country. One feature of the country's fiscal operations indicates that Namibia is running both budget and current account deficit for the past few years (AfDF, 2016). This is due to an effort by the government to improve economic growth, by supporting free education system, as well as upgrading infrastructure. A strong growth in expenditure over the years led to a faster growth in public debt and the weakening of macroeconomic account for which medium-term policy response is necessary (Namibia ministry of Finance 2017).

The lack of a self-regulating monetary policy has led to the use of fiscal policy instrument as a foremost countercyclical tool to stimulate economy, after an economic recession (AfDF, 2016). Namibia's fiscal policy has remained expansionary over the past years with the intentions of providing support of addressing socio-economic development challenges and economic growth (MoF, 2017). However, this increase has not been matched by a proportionate increase government revenue.

Government's balance budget is expected to improve, during the 2016/17 fiscal year, this due to government's fiscal consolidation endeavour. Namibia's average budget deficit as a percent of GDP is expected to drop to 6.3, from 8.3 percent during the 2015/16 financial year (MoF, 2017). This belief is established principally on the recent downward revision of the 2016/17 mid-term budget review, as a government's additional fiscal consolidation effort (MoF, 2017).

Growth in government expenditure declined during 2016/17, also as a result of the consolidation effort. Overall government expenditure is estimated to fall by 4.9 percent to N$61.5 billion in the 2016/17 fiscal year, compared to a 10.1 percent increase in the 2015/16 fiscal year. Total expenditure as a percentage of GDP has fallen by 4.6 percent to 38.8 percent during the 2016/17, compared to the preceding financial year (MoF, 2017).

During 2016/17 government revenue has contracted, this can be largely attributed to high base effects, a slowdown in global economic activities, and low Southern African Customs Union

(SACU) receipts. Total revenue in 2016/17 is estimated to drop by 1.3 percent of GDP, i.e. to N$51.5 billion. This contraction is in contrast with a positive growth of 4.6 percent which was recorded in the previous fiscal year (MoF, 2017).

Namibia's current account position has deteriorated, as a result of global slowdown in economic activities. Current account recorded a surplus averaged over 11 percent of GDP from 2005 to 2008, but declined to a deficit of 2.2 percent of GDP in 2011/12, this is due to the fall in Namibia's exports, along with a sharp drop in SACU revenues, as a result of a slowdown in the South African economy. In 2012/13 the deficit declined to 0.3 percent of GDP after exports recovery, and SACU bonuses. Namibia's capital account balance recorded a slightly less surplus in 2012/13 compared to 2011/12 fiscal year. Nevertheless, the surplus was enough to prevent balance of payment (BOP) from relapsing into a deficit. By the end of 2012, Namibia's reserves was 3 to 4 months of imports as it fell from the previous year, but remained sufficient to maintain the currency peg arrangement (Stork, Calandro & Gamage 2014).

Widening of current account deficit, has become one of the critical macroeconomic policy issues. In 2016, it stood at 11.9 percent of GDP, this is largely caused by a negative trade balance and thereby putting pressure on balance of payment. BOP remained positive at N$ 906 million in 2016, compared to N$ 10.1 billion in 2015. This fall was due to a decline in capital account (Bank of Namibia, 2017).

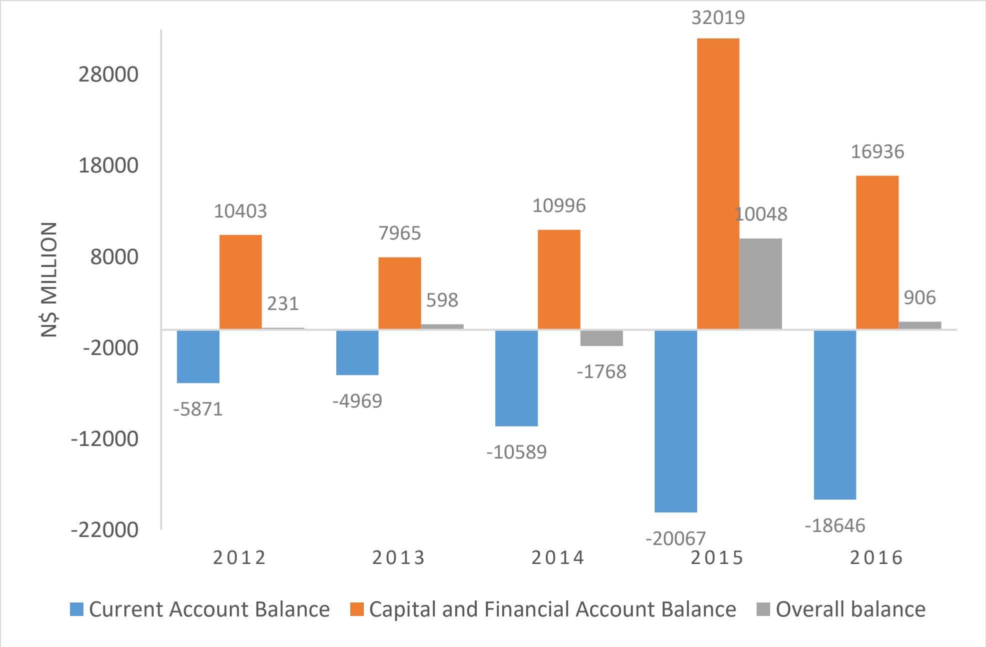

Figure 1: Current account balance and the Balance of payment in Namibia

Source: Bank of Namibia 2016

Current account deficit remained high despite its improvement during 2016, which is derived mostly from improved trade balance. The current account recorded a declined deficit of N$18.6 billion, compared with a deficit of N$20.0 billion in 2015. The improvement was reinforced by slower growth in the imports and growing of exports receipt. The value of exports commodities rose on a yearly basis, following firm increases in major export categories, namely uranium, gold, manufactured products and re-exports. At the same time, the value of imports grew marginally during 2016, despite declines in key import categories such as fuel, machinery, vehicles and consumer goods (BoN, 2016).

Reflecting high borrowing, Namibia's public debt to GDP ratio has increased by 2.8 percent, from 38.5 percent to 40.7 percent of GDP at the end of 2016 (BoN, 2016). This shows a deterioration from 2012/13 public debt ratio which was 26.3 percent of GDP. However, this level is too way much above the set government debt ceiling benchmark of 35 percent of GDP, which was set by the Namibian government (MoF, 2017).

1.3 Problem statement

In recent decades, a number of countries both, developed and developing countries, have been experiencing persistent budget deficits accompanied by unstable current account scenarios. It is noted that in order to attain economic stability and sustained macro-economic growth, both budget deficit and current account deficits have to be kept under control (Stephen, 2010). However, keeping a balance between these two scenarios proved to be a challenge for a number of countries.

Some researchers believed that budget deficit is one of the important causes of current account deficit. Up to date, empirical evidence on the causal relationship between current account and budget balance continues to yield contradictory results (Bartolini, & Lahiri, 2006). It is this existing gap, which aroused the need to investigate the relationship between budget deficit and current account deficit, to establish the Namibia’s position among these contradictory views.

Egwaikhide, Ayodele, Oyeranti, and Tchokote (2002) analysed the causal relationship between the two deficits in African countries. According to their study, the transmission mechanism between the two variables may not necessarily be direct, but through effects on other variables such as exchange rate and interest rate. This is because exchange rate and interest rate affects important variables, which can influence current account balance, investment and GDP.

Empirical work has therefore shifted the focus to the extent, if there any, which budget deficit affect current account and vice versa, and the channels through which they affect each other. A better understanding of this causal can be helpful in formulating and implementation of better macro-economic policies necessary for tackling the budget deficit and current account deficit, which are considered to be hindering economic growth.

Despite government's effort on reducing budget deficit and current account deficit, many developing countries still continues to run a twin deficits. In spite of all, it appears that there is research gap in Namibia regarding understanding the causal nature of the relationship between budget and current account deficits (MoF, 2016). The fact that, budget and current account deficits continue to increase, this calls for a need to examine their causal link. Once this causal link is established, it will help policymakers, and general public to do the best they can to put it under control.

1.4 Objectives

The main objective of this study is to study the relationship between government budget deficit, current account deficit, interest rate and exchange rate in Namibia.

The specific objective is:

- To examine the causal relationship between budget deficit and current account deficit, in Namibia.
- To establish the significance of intermediating variables in explaining the relationship between the two deficits in Namibia.

1.5 Hypotheses

Hypothesis 1

$H_0 \neq 0$. There is no relationship between budget deficit and current account deficit.

$H_1 = 0$. There is a relationship between budget deficit and current account deficit.

Hypothesis 2

$H_0 \neq 0$. Intermediating variables are insignificant in explaining twin deficit relationship

$H_1 = 0$. Intermediating variables are significant in explaining twin deficit relationship.

1.6 Justification

Namibia for the past few years has been experiencing current account imbalance and budget deficit. However, the twin deficit is considered to be hindering economic progress. Enhancing a resilience of Namibian economy requires that, there be fiscal safeguard and improved production capacity. This is well stated in the Namibia Vision 2030 which is aimed at transforming Namibia into an industrialised country by the year 2030.

For a long time, economists and policymakers have worried about the relationship between government budget deficits and current account deficit. Harambee Prosperity Plan is Namibia's development programme from 2016 to 2020, an action plan towards prosperity for all people. One key pillar of Harambee Prosperity Plan is economic advancement, however, large and persistent current account deficit is among other factors that contributes to economic crises and depletion of international reserves.

This study investigates the causal relationship in Namibia. This will contribute to the existing literature and help fill up the gap. This will help public and policymakers in seeking to understand the deficit problem so that they, may be aware of such when making informed decisions.

The mixed findings of the previous studies poses a challenge on policy formulation. Therefore this study is aimed at providing a policy direction to the Namibian government on the twin deficits matter, as it requires a serious attention, if Namibia is to attain economic stability and sustained macro-economic growth.

1.7 Limitations

The study is concentrating on analysing the relationship between budget deficit and current account deficit in Namibia. The concern of this study is that some of the determinants that may influence the variables of interest (budget deficit and current account deficit) could all not be included in the scope of coverage.

1.8 Delimitations

The study is delimited to only budget deficit, current account deficit, and interest rate and exchange rate variables to analyse the twin deficit relationship in Namibia. This is because of interest rate and exchange rate relevance in explaining budget and current account deficit.

1.9 Outline of the study

The study is structured in five chapters. Chapter one is the introduction of the study, chapter two discusses the key theories and empirical literature review. Chapter Three highlights the methodology used in the context of data sources, data analysis, and econometrics package used. The unit root, co-integration, and the specification of Vector Auto-regression model (VAR) are introduced. Chapter four presents the research findings and discussions along with the results of statistical analysis. Chapter five is a summary of findings of the study, conclusion and recommendations and recommendations of the study.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The underlying theoretical framework as well as empirical studies which were done related to the study, were reviewed in this chapter. It consist of two sections which are theoretical and empirical literature.

2.2 Theoretical literature

In most of the previous literature, only two prime approaches were known to exploring the relationship between budget deficit and current account deficit in an economy. These are: Keynesian approach and Ricardian equivalence. However, these are not the only possible outcomes of these relationships.

According to the work of Rauf, and Khan, (2011), this causal link reasoning can best be demonstrated using a national income identity:

$$Y= C + I + G + (X - M)\ldots\ldots\ldots\ldots \qquad (1)$$

Where; Y is national income, C is private consumption, I is real investment, G is government spending on goods and services, X is exports of goods and services and M is imports of goods and services.

Current Account is defined as (CA)

$$CA = X - M + F\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \qquad (2)$$

Where: F is the net transfer payment, which represents income received by the country's citizens and companies abroad, and the aggregate amount that foreign citizens and overseas companies earn in that country. For simplicity it is assumed that net factor payments are not large items in the current account.

According to the national income identity in an open economy, national saving is equals to:

$$S = Y - C - G + CA \qquad (3)$$

Where, Y – C – G = I, which represents Investment, so we have:

$$S = I + CA \qquad (4)$$

The distinction between saving decisions is therefore:

$$S = S_P + S_G \qquad (5)$$

Where, S_P is private saving, S_G is government saving, after taxes, part of disposable income that is not consumed. In general we have:

$$S_P = Y - T - C \qquad (6)$$

S_G is defined as government saving which is the difference between government revenue (T) and government spending G, while T is defined as tax, and TR is transfer payment. This leads us to:

$$S_G = T - G - TR \qquad (7)$$

From definition of national saving, we have:

$$S = Y - C - G = (Y - T - C) + (T - G - TR) = S_P + S_G = I + CA \qquad (8)$$

This can be re written as:

$$S_P = I + CA - S_G = I + CA - (T - G - TR) \qquad (9)$$

Rearranging this

$$CA = S_P - I - (G + TR - T) \qquad (10)$$

Where, an expression (G + TR -T) represents government budget deficit, CA is the current account balance, (S_P – I) is the private saving and investment balance.

(T – G – TR) = (X – M) + (I – S)…………………………………………... (11)

Equation 11 states that government budget surplus is equal to current account surplus plus the excess of investment over private saving (Freeman, Topel, Swedenborg, Norman, & Mclure, 1988). Suppose that government increases its spending (G), or cuts its taxes (T), thereby creating budget deficit. This equation indicates that CA must fall or (I – S) must decline or both.

In this case net exports i.e. the trade balance simply equals to the private saving investment gap plus the balance budget. Thus assuming a stable saving investment gap, an increase in public sector deficit will directly increase the current account deficit and current account deficit will worsen budget deficit, which is the traditional twin deficit relationship. This shows a positive bi-directional relationship between budget deficit and current account deficit. However, in the context where international financial market are available to finance investment, the bi-directional relationship may not necessarily exist, and even if it exist the two deficits may not move together and in the same direction (Van Bon, 2014).

Previous literatures has been centred on the validity of the Keynesian conventional proposition as well as Ricardian equivalence conventional proposition view in explaining the twin deficit issues. However, these are not the only possible outcomes of these relationships.

(a) Keynesian approach

I. Absorption approach

Assuming saving investment gap is stable, an increase in government budget deficit will lead to a deterioration of current account balance. Theoretically this mechanism can be well explained by Keynesian income-expenditure approach. An increase in government expenditure will lead to increase in domestic absorption, which will lead to an increase in domestic/ national income. Increased national income will induce imports and will eventually reduce or worsen current account balance, which is the twin deficit hypothesis.

But, as Feldstein (1992) states it is not always inevitable that all the adjustment in the above identity will come from net exports, if for example investments fall then the adjustment in the trade balance that is required by the increased deficit would be smaller. Theoretically the mechanism behind the twin deficits could simply be explained through the Keynesian income-expenditure approach. An increase in budget deficits will increase domestic absorption and, thereafter domestic income increases. Increased income will induce imports and eventually will reduce the surplus or increase the deficit in the trade balance. This is how the public sector deficit and external sector deficits become twins.

II. Mundell-Flemming approach

It is based on a well-known Mundell-Fleming framework, which states that an increase in budget deficit will induce upward pressure on interest rate, this will lead to inflow of capital and appreciation of exchange rate. The appreciation of exchange rate makes country’s exports less competitive and make imports more attractive. Thereby worsening the current account under a flexible system. However, under a fixed exchange rate regime, budget deficit incremental will lead to higher real income or prices and this will worsen current account balance. By the way of explanation, running a persistent budget deficit will ultimately widen current account deficit in both fixed and flexible exchange rate regime even though transmission mechanism are different (Salvatore, 2006). Mundell Fleming view is that there is an indirect relationship from public imbalances to domestic interest rates then transfers to exchange rate and finally influences current account balances (Ahmad & Aworinde, 2015). But, more emphasis is laid on this link happens in a short run i.e. the model portrays a short run relationship between budget balance and current account balance through interest rate and exchange rate mechanisms. Researchers like Njoronge (2010) have found this to be true and in fact found support for the role of intermediating variables like exchange rate and interest rates as explained in the Mundell-Flemming approach.

Thus, the Keynesian hypothesis can be briefed as follows. First, there exist a positive relationship between budget deficit and current account deficit. Second, there is a uni-directional Granger causality that runs from budget deficit to current account deficit.

(b) Ricardian Equivalence hypothesis

The second hypothesis is the Ricardian equivalence proposition (REH). Modern governments finance their spending by two ways namely, taxing or borrowing. If it uses taxes, then current taxpayers fund government activities. However, if the government is to fund its activities by borrowing, the interest on government debt must be paid by future taxpayers. While deficit avoids the need for the government to impose taxes when it spends, as this will just shift taxation to future taxpayers. So in simple terms, Keynesian economist assumes that if the government increase spending today holding tax constant, aggregate demand will increase. However, according to Ricardian equivalence since agents (taxpayers) are rational forward looking, they will be aware of paying back government expenditure in the future date. So they will save enough of their current income, by reducing their consumption in order to save up for higher future taxes. (Barro, 1996). So government expenditure borrowing to finance tax cut will have no effect on consumption, so as aggregate demand. This theorem assume that for any change in government budget will be Ofsted by a change in private saving, therefore whether its debt financing or taxes should not affect the current account, and their impact is the same (Thomas, & Abderrezak, 1988). That is to say, there is no granger causality relationship between budget deficit and current account deficit. Regardless of the presumptions, some researchers have found evidence in support of this view (Nickel and Vansteenkiste 2008); Ratha, 2009).

(c) Current Account targeting

The two are not the only testable approaches as far as the interaction between the two deficits are concerned. There is a uni-directional causality that runs from current account to government budget. This outcome occurs when a decline in current account balance leads to a slower economic growth and hence increase budget deficit. This mostly applies to small open developing countries that highly depend on foreign capital inflow to finance their economic development (Egwaikhide et al., 2002) That is to say, the country budgetary position is directly influenced by large capital inflows or through debt accumulation and with that a country will in the end run into budget deficit. (Baharumshah et al., 2006).

(d) Bi-directional Causality relationship

There is a bi-directional relationship between balance budget and current account balance. That is to say, budget deficit granger causes current account deficit and vice versa. Twin deficits is defined as a long run (positive) relationship between budget deficit and current account deficit. In other words, the feedback of causality runs from both directions and it is expected that budget balance and current account balance to enter into co-integrating space. This can best be explained by equation 11. In this equation net exports i.e. the trade balance simply equals to the private saving investment gap plus the budget balance. Thus assuming a stable saving investment gap, an increase in public sector deficit will directly increase the current account deficit and current account deficit will worsen budget deficit, which is the traditional twin deficit relationship. This shows a positive bi-directional relationship between budget deficit and current account deficit.

(e) Twin divergence

This happens when budget balance worsen, current account balance improves or when current account deficit, improves budget balance is referred to as twin divergence. A twin divergence is possible, and can be attributed to two factors; the partial Ricardian equivalence movement of private saving, as private savings increases and investment crowding out effect, as investment declines this is due to the increase of real interest rate. This improves current account balance, at the same time nominal exchange rate depreciates, as opposed to relative price level changes (real exchange rate depreciates), (Kim, & Roubini, 2008). So when the two balances are affected by output shocks, then twin divergence is more likely. It is more likely occur due to output shocks than fiscal shocks (Van Bon 2014).

2.3 Empirical literature

Current account imbalances is considered as one of the factors that could lead to a downturn in economic activities and cause some decline in output growth. Researchers have tried to analyse the relationship between current account deficit and budget deficit relationships in different economies. Nevertheless, their studies have found a mixed outcomes, supporting each of the above said theories.

Turkish economy has functioned according to the outward-oriented growth model since January 1980, when structural changes and transformation decisions were agreed upon. But, a persistent current account deficit mess has been experienced since the adoption of this growth model. This motivated Azgün (2012) to test the twin deficits hypothesis in Turkish economy for a period from 1980 to 2009. The direction of this relationship has been analysed using Vector Auto Regression (VAR) Granger causality test and regression analysis. The findings reveals that there is a uni-directional causality that runs from budget deficit to current account deficit. Acaravci and Ozturk (2008) also examined the general validity of twin deficits hypothesis for Turkish for almost similar period, as they used data from 1987 quarter 1 to 2005 quarter 4. In their study, they did not use VAR model, they used autoregressive distributed lag (ARDL) model and the bounds test for co-integration to assess the short-run and long-run dynamics between the twin deficits in Turkey. Empirical analysis however, supports the Keynesian view that there is a long-run relationship between budget deficit and current account imbalances.

However, Erdogan and Yildirim (2014) who similarly analysed the relationship between budget deficit and current account deficit. They analysed the relationship between budget deficit and current account deficit in Turkish economy covering the period from 2001 quarter 1 to 2012 quarter 2 using both co-integration and ARDL model. The study found out that budget deficit has negative and statistically meaningful effect on current account balance. Two of the results revealed that Turkish economy was in favour of Keynesian approach, although they used different analytical approaches.

Neaime (2008) examined the relationship between budget deficit and current account balance in a small open economy of Lebanon. Using data from 1970 to 2006, to analyse weather there is a short as well as long run equilibrium relationship between budget deficit and current account balance. The study found that, there is a positive uni-directional causal relationship in the short run between budget deficit and current account balance that runs from fiscal deficit to current account balance. Therefore, Neaime (2008) concluded that, Lebanese government must introduce fiscal adjustment measures to avoid future depreciation of domestic currency and currency crises.

According to Perera and Liyanage (2012) both theoretical and empirical evidence proves that persistent budget deficit contributes to current account deficit and thus, there is positive long run relationship between budget deficit and current account deficit. Sri Lankan has been experiencing a persistent high budget deficit and current account deficit, just like many other emerging countries. In their study, they tried to examine the twin deficit hypothesis interacting with exchange rate and interest rate using both annual and quarterly data and employing multivariate empirical method, and they used data from 1960 to 2009. The outcome of their study shows a long run relationship between budget deficit and current account deficit in Sri Lanka. At the same time unidirectional causation which runs from budget deficit to current account balance.

Bakar (2014) examined the short run and long run relationship between budget deficit and current account deficit in Sierra Leone economy within the framework of the bound test approach and Toda Yamamoto (1995) causality analysis. Using the yearly data from 1980 to

2012, the study revealed that in the long run budget deficit, real GDP and political instability have positive impact on current account deficit. Furthermore, the short run estimates shows that budget deficit and war dummy were the most significant variables impacting current account deficit in the Sierra Leone economy. The granger causality revealed that, there exist a uni-directional causality that runs from budget deficit to current account deficit and from current account balance to real GDP, but there is no feedback effect. But, the study also found out that, there was no causality evidence between current account balance and other explanatory variables.

Deniz and Çelik (2009) investigated the twin deficit hypothesis for a group of emerging countries using quarterly data from 1996 quarter 1 to 2006 quarter 4. According to their study, in most of literature of twin deficit hypothesis on emerging market, the focus was on explaining the relationship between government budget balance and current account balance through methods of correlation, causality, co-integration and ECM. Their study tried to test the validity of the twin deficit hypothesis using six emerging countries which are; Czech Republic, Brazil, Colombia, Republic of South Africa and Turkey. However, their study was different from traditional studies which investigate these relationships, in the sense that it employed panel co-integration technique to six emerging market. The study concluded that unlike the previous studies, using advanced econometric techniques for the panel data the study supports twin deficit hypothesis.

Saidam and El-Namrouty (2015) analysed the effect of budget deficit on current account balance in the Palestinian economy from 1996 to 2012. This was done to determine appropriate economic tools that can be used to reduce current account deficit. They used statistical analysis to illustrate the impact of budget deficit on current account. The findings of the study confirms the positive relationship between budget deficit and current account balance in Palestinian economy. Akdoğana & Geldia (2013) empirically analysed the link of current account balance to its major determinants such as budget balance, exchange rate and interest rate in 7 European Union (EU) member countries; Bulgaria, Greece, Ireland, Italy, Latvia, Portugal and Spain, using data from 2000 to 2011. Using the panel data analysis of co-integration, the study found a long run relationship between current account balance and its determinants such as budget balance, exchange rate and interest rate. The long run interest rate coefficient is found to be statistically significant in all estimation techniques. While on the other hand, the evidence of the existence of twin deficit hypothesis is said to be weak for the selected member countries.

Elhendawy (2014) analysed a relationship between government budget deficit and current account balance in the Egyptian economy, this was due budget deficit which was being experienced by the economy. Elhendawy (2014) used data from 1980 to 2011 to analyse these relationship. The study was trying to address the important question of whether these noticeable budget deficits have influences on the current account component of the Egyptian economy, thus creating imbalances therein as well. The findings showed a clear existence of a short and long run relationship linking budgetary deficits to their current account counterparts. The Granger causality test reveals that while budget deficits lead to one lag current account deficits, the latter in turn have arguably been the source of two lags deficits in the government budget, which gives a plausible testimony confirming the reverse hypothesis. The Error Correction Model (ECM) was used in analyses of which the results indicates that a 10 percent increase in the government budget deficit will highlight itself by a further 7 percent increase in the first lag but will also cause a one lag increase of 8.7 percent in the current account deficit. These findings lend strong support to the twin deficit hypothesis in the Egyptian case.

West African Economic and Monetary Union (WAEMU) countries have been experiencing a persistent high budget and current deficits for a very long time. Kouassi (2016) empirically examined the twin deficits hypothesis for these countries. The framework of panel VAR approach over covering the period from 1975 to 2013. In addition to the common view which claims one way relationship between budget deficit and current account balance, and vice versa (bilateral relationship), the association between the twin deficits appears to be stronger when grants (aid) are taken into account. Overall, the relationship between the twins deficits found in the study is weaker than it was expected. In evaluating the transmission mechanism, it came out that budget deficit influence current account through imports, which supports the Keynesian absorption.

Chaoneka (2014) examined the relationship between budget balance and current account balance covering the period from 1980 to 2011, for nine country individually. This was done within the framework of Granger causality test and VAR approaches on time series. The Granger causality results supports twin deficit relationship, and causal runs from fiscal deficit to external deficit for two countries: Malawi and Zambia together with SADC group average. The inverse link runs from external balance to fiscal balance for another two countries: Swaziland and Zimbabwe. While Botswana confirms a bi-directional causality and Mozambique confirms a Ricardian equivalence proposition. Angola, Seychelles and South Africa results were inconclusive. The conclusion of this study point to the existence of a direct causal link that goes from fiscal deficit to current account deficit. This indicates that fiscal tightening tent to improve current account directly. However, in Zimbabwe and slightly Swaziland the current account can be used to tackle government budget. While Malawi and

Zambia, exhibit twin deficit, suggest that policymakers must think carefully about fiscal consolidation. However, these relationships tend to change over time depending on the dynamics, and complexity of the economy.

Imoh and Ikechukwu (2015) maintaining a favourable budget balance and current account balance proved to be a challenge in SSA. Based on past data of these countries, both budget deficit and trade balance have concurrently trended in a negative region. This suggest that there is exist presence of twin deficit in SSA. To empirically explain this relationship, they adopted a panel data model, using data from 1970 to 2013. They used the Generalised Method of Moments (GMM) estimation technique to estimate the model. They used this technique because of its advantages as it takes care of serial correlation problem that may occur as an upshot of including the lagged value of the dependent as a regressor. Their study found out that there positive and significant impact of budget deficit on the trade balance, which confirm twin deficits. A long run impact of budget deficit on the trade balance is discovered to be 60 percent.

According to Mandishekwa, Tambudza and Marufu (2014) some economist argues that the two deficits are independent of each other, while some others believe that there exist a relationship, however the direction of the relationship is uncertain. Majority of Keynesian economist are in support of the twin deficits hypothesis while others are contrasting this theory, in support of Ricardian equivalence. The Ricardian equivalence argues that budget deficit and current account deficit are independent of each other. Mandishekwa, Tambudza and Marufu (2014) tried to test for the applicability of twin deficit hypothesis in Zimbabwean economy, using data from 1980 to 2011, this was due to the argument of persisting budget and current account deficit being experienced in Zimbabwe. The granger causality along with co-integration techniques were used to estimate the relationship. According to the findings of the study, twin deficits hypothesis holds using Johansen co-integration and Granger causality based two lag length. This conclude that persisting budget deficit will lead to current account deficit. This is in contrast to Chaoneka (2014) who did a panel data for nine different SADC countries, including Zimbabwe, examining the twin deficits covering the period from 1980 to 2011, using Granger causality test and VAR approaches on time series. In Zimbabwe the study revealed that current account can be used to tackle government budget which supports the theory of current account targeting.

According to Chege (2016) previous empirical tests of the twin deficits hypothesis have generated mixed findings, this could be due to the fact that most studies failed to take into account structural breaks and volatility clustering. This motivated Chenge (2016) to examine the twin deficits hypothesis in three East African countries which are Kenya, Tanzania and Uganda on time series data covering the period of thirty seven years old, starting from 1980 to 2016 while allowing for structural breaks and conditional heteroscedasticity. Bai and Perron Global Optimisation method of identifying the number and location of structural breaks was used in the study. The relationship between budget balances and current account balances was estimated using VAR-GARCH technique. This is because VAR-GARCH technique improves the reliability of the results. The results of Bai and Perron test indicates that structural breaks exist in all the countries with Uganda having a large number of structural breaks. The results of VAR-GARCH test revealed that there exist a positive and significant relationship between fiscal balance and current account balances in Kenya and Tanzania. The study also revealed that there is a positive but insignificant relationship between fiscal balance and current account balance in Uganda. This reveals that allowing for structural breaks in the model makes VARs technique more appropriate since failure of unit root is minimised. It further revealed that allowing Conditional heteroscedasticity in the model results to efficient coefficients which is more reliable.

Njoroge (2014) investigated these relationships, this was due to the fact that, most of the existing studies on twin deficits hypothesis focuses on its relevance in already developed economies, in addition, Njoroge (2014) have concentrated on analysing the twin deficits on a bivariate approach using annual data. His study wanted to analyse the relevancy of the twin deficits hypothesis nexus for Kenya using quarterly data in a multivariate approach which current account, budget deficit, exchange rates and interest rates. This analysis used data covering the period from 1970 quarter 1 to 2012 quarter 1. To estimate if the twin deficits relationship exist, co-integration test was done using Johansen and Juselius model, the study further applied the VAR model to estimate Impulse Response Function (IRF) and variance decomposition. Finally, the study investigated the causal relationship of current account deficit and budget deficit in the framework of Toda-Yamamoto's Granger causality test. The study concluded that twin deficits hypothesis does not exist in Kenya when both exchange rates and interest rates are included. The study concluded that budget deficit does not directly influence current account deficit, but the effect is indirect through transmission mechanisms, from government deficit to interest rate, then interest rate influences exchange rate, and finally exchange rate influences current account deficit. This supports the twin deficits hypothesis but through Mundell Fleming approach. More, Chege (2016) did a panel data for three East African countries including Kenya, analysing the twin deficits at the same time taking into account structural breaks and conditional heteroscedasticity using data from 1980 to 2016. The results of VAR-GARCH test revealed that there exist a positive and significant relationship between fiscal balance and current account balances in Kenya and Tanzania.

According to Ratha (2011) in Keynesian economy, budget deficit will lead to increase absorption, causing imports to increase, and thereby worsening trade balance so as current account. Furthermore, it also causes domestic interest rate to rise, leading to appreciation of domestic currency, and thereby, contributing to current account deficit. However, according Ricardian equivalence, increase in budget deficit implies high future taxes, so people would save more and consume less. As a result, intertemporal shift between budget deficit and taxes will have no impact on interest rate, so as on current account. This lead to phenomena becoming an empirical issue, and with recent fiscal expansion to curb recession makes it timely to revisit this phenomenon, especially developing countries confronted with twin deficits. They made a case study of India, using the bound testing approach to co-integration and ECM on monthly and quarterly data covering the period from 1998 to 2009. The outcome suggest that the twin deficits theory holds for India in a short run which validates Keynesian hypothesis, but it does not hold in a long run which validates Ricardian equivalence hypothesis. While, Banday and Aneja (2016) who also did the same study in India almost at the same time, with longer time frame from 1990 to 2013, found existence of bi-directional relationship, but them, they used a different approach.

Ogbonna (2014) investigated the empirical relationship between budget deficit and current account balance South African economy, using data covering the period from 1960 to 2012. Ogbonna employed co-integration analysis and VAR granger non causality to examine the existence of short term causalities for South African economy, so as no long run steady-state relationship was established between twin deficits in South Africa. The study found out that there is no short run relationship between budget deficit and current account deficit in South

Africa. This absence suggest that Ricardian equivalence proposition in a short run time frame, holds for the South African economy within the period horizon. This is because people are rational, and they know that tax reduction, is temporal and therefore people will save extra portion of their income to pay for high future taxes. This implication suggests that national saving position will be sustained by an increase in private savings for future increase in taxes. This shows lack of private consumption responsiveness to expansion of budgetary control. On contrary, the outcome further evidence supports existence of current account targeting hypothesis in the short run. Current account targeting postulate a positive and significant causal relationship between the budget and current account balance, which runs from current account to budget deficit. This suggest that current account balance can be used to supervise budget balance developments in South Africa in a short run. This study will help both academics and policymakers to compare the findings of those of Namibia, as the two countries' economies are very closely linked.

Ngakosso (2016) investigated the twin deficits hypothesis in the economy of Democratic Republic of Congo (DRC) using the data from 1980 to 2013. Ngakosso (2016) used ARDL approach to co-integration to examine the long term causal relationship between budget balance and current account balance. The findings of study was not in support of Keynesian approach, but rather it found a positive link that runs from current account balance to the budget balance in the DRC. However, in short term, the two balances diverge before it starts to converge in the long run through the restoring force. Therefore, if the Congo republic is attempting to consolidate its budget it requires a good command of the current account, because it can predict budget balance. So, the twin deficit hypothesis was invalidated by the study.

Aloryito, et al. (2016) investigated the twin deficits hypothesis of most countries in SSA, as they have appeared have been widening over the past several years in the face of positive output growth and steady decline in inflation. They used data for 41 countries from 2000 to 2012. They used the system GMM estimation technique, their major findings indicates that fiscal deficits tend to improve the current account and vice versa, thereby rejecting the twin deficits hypothesis in favour of the twin divergence proposition.

According to Sackyi and Opoku (2016) Ricardian equivalence and a twin divergence hypothesis has become debatable mainly in developing nations. In contributing to this debate they empirically examine the relationship between budget balance and current account balance in Ghanaian economy over the period from 1960 to 2012 by employing co-integration technique and allowing structural breaks. Empirical evidence proves that budget deficit improves current account balance. In other words, their study provides evidence of the twin divergence hypothesis, and therefore, twin divergence should be more accepted over twin deficits counterpart.

Merza, Alawin and Bashayreh (2012) attempted to investigate the twin deficits relationship for Kuwaiti economy, for quarterly period from 1993 quarter 4 to 2010 quarter 4. To analyse this relationship, firstly, they tested for stationarity of the two variables, estimates the co-integration regression, applies the VAR model, estimates the IRF, and tests for the existence and direction of causality. However, granger causality only shows uni-directional causal that runs current account to budget balance. In addition, their study found a negative long run relationship between current account and budget balance that is an increase in current account will worsen government budget balance. This findings were in support of the Kuwait economy; since an improvement in the current account is driven primarily by improvement in the trade balance will cause central government to spend more than it receive, causing a decrease in government budget balance. Their conclusion was not in favour of twin deficit hypothesis.

The development Indian economy brought the question of validity of the twin deficits hypothesis. Banday and Aneja (2016) empirically analysed the causal relationship between budget deficit and current account balance in the Indian economy covering the period from 1990 to 2013. They used a co-integration test, which suggest that budget balance and current account balance have a long run association and move with each other for a long period of time. Granger causality test found an existence of bi-directional relationship between two deficit variables.

2.4 Conclusion

Research on the relationship between budget deficit and current account deficit is based mainly on five theoretical approaches. The Keynesian hypothesis which postulates that widening of budget deficit leads to a decline in current account balance. The Current account targeting which assume that a decline in current account balance leads to a slower economic growth and hence worsen budget deficit. The bi-directional causality which postulates that there a bi-directional causal relationship between budget balance and current account balance. In other words, there is a positive long run causal relationship between current account deficit and budget deficit. The Ricardian equivalence which proposes that the two balances are independent of each other. Finally, the twin diverging which suggest that when budget balance worsen, current account deficit will tend to improves or when current account deficit worsen, improves budget balance.

The empirical literature review shows mixed findings. This could be different techniques which were employed by the researchers, in the analysis, data set differences could be also one of the contributing factors. Various analysis techniques were employed by empirical researchers, such as GMM, ARDL, VAR, Bound test, VAR-GARCH, ECM, and VECM. With VAR technique being used by most of the researchers. On data part, most researchers used time series data, while some others used panel data approach to perform their analysis.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter focuses on the methodology, employed to analyse the relationship between Budget Deficit and Current Account Deficit in Namibia using VAR econometrics technique. This chapter outlines data sources and collection, as well as the econometric package used to analyse this data. It explained how unit root, co-integration and specification of VAR are conducted. It further, highlighted the justification for the model used.

3.2 Research design

The study will use quantitative time series data of Namibia spanning from the period 1990Q1 to 2014Q4, to assess the relationship between budget deficit and current account deficit. However, due to the effects that transmission mechanisms between the two scenarios might have, exchange rate and interest rate were added to the analysis.

3.3 Data sources

The study utilises quarterly time series data of Namibia spanning from the period 1990Q1 – 2014Q4. Current account, budget balance, exchange rate and interest rate data sourced from Namibia Statistics Agency (NSA) as well as IMF's International Financial Statistics (IFS).The estimation package used in the analysis of this study is E-VIEWS (version 10) econometric package, as it is one of the best package that suits for estimating systems of equations like VAR models. Data for Current account balance and Budget balance are expressed as percentage of GDP.

3.4 Procedure

Current account balance data and budget deficit, interest and exchange rate data are sourced from Bank of Namibia (BoN) as well as IMF's International Financial Statistics (IFS).

3.5 Model specification

The study utilised the VAR's model Sims (1980), described the VAR technique as important as it treats the variables symmetrical in a structural sense with each variable having an equation explaining its development based on its own lag and the lag of other variables within the system. There are two types of VAR; Unrestricted VAR or Vector Error Correction (VEC). What we have been calling a VAR is the unrestricted VAR. A vector error correction (VEC) model is a restricted VAR that has cointegration restrictions built into the specification, so that it is designed for use with non-stationary series that are cointegrated (Kalumbu, 2014). The restricted VAR specification restricts the long-run way of behaviour of the endogenous variables to converge to their cointegrating relationships while accomodating a wide range of short-run dynamics. The cointegration term is known as the error correction term since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments (Njoroge, 2014). The general VAR model used in this study is specified as follows in a system of 4 equations:

Bd = f (bd, cad, int, exc)…………………………………………………………………….. (3.5.1)

Cad = f (bd, cad, int, exc)…………………………………………………………………... (3.5.2)

Int = f (bd, cad, int,exc)………………………………………………………………………… (3.5.3)

Exc = f (bd, cad, int, exc)…………………………………………………………………….... (3.5.4)

Where CAD – Current Account Deficit

BD – Budget Deficit

INT – Interest rate, and,

EXC – nominal exchange rate

The VAR model shown below shows that exchange rate and interest rate are converted into natural logarithms, while budget deficit and current account deficit are shown as percentage of GDP. Since some of the values are negative, semi-logarithms regression equations is employed, as it is impossible take logarithms of negative numbers. In this study, the model by Njoroge (2014) has been adopted as follows:

$$\boldsymbol{CAD_t = \alpha_1 + \sum_{i=1}^{n} \beta_i CAD_{t-i} + \sum_{j=1}^{n} \beta_j BD_{t-j} + \sum_{k=1}^{n} \beta_k LNINT_{t-k} + \sum_{l=1}^{n} \beta_l LNEXC_{t-l} + \mu} \quad \text{........} \; (12)$$

$$\boldsymbol{BD_t = \alpha_2 + \sum_{i=1}^{n} \beta_i BD_{t-i} + \sum_{j=1}^{n} \beta_j CAD_{t-j} + \sum_{k=1}^{n} \beta_{k=1} LNINT_{t-k} + \sum_{l=1}^{n} \beta_l LNEXC_{t-l} + \mu_2} \text{.......} \; (13)$$

$$\boldsymbol{LNINT_t = \alpha_3 + \sum_{i=1}^{n} \beta_{i=1} LNINT_{t-i} + \sum_{j}^{n} \beta_{j=1} CAD_{t-j} + \sum_{k=1}^{n} \beta_k BD_{t-k} + \sum_{l=1}^{n} \beta_l LNEXC_{t-l} + \mu_3} \; . \; (14)$$

$$\boldsymbol{LNEXC_t = \alpha_4 + \sum_{i=1}^{n} \beta_i LNEXC_{t-i} + \sum_{j=1}^{n} \beta_j CAD_{t-j} + \sum_{k=1}^{n} \beta_k BD_{t-k} + \sum_{l=1}^{n} \beta_l LNINT_{t-l} + \mu_4} \text{...} \; (15)$$

Where;

In the above equations α_1, α_2, α_3, α_4, are constant parameters. While μ_1, μ_2, μ_3 and μ_4 are disturbance terms, and β_i, β_j, β_k and β_l are the coefficients for the variables, budget balance, capital account balance, exchange rate and interest rate respectively. Lnexc stands for log of nominal exchange rate and Lnint is log of interest rate.

The system of equations from equations (12) to (15) presents the unrestricted Vector Auto Regressive (VAR) model, in which each variable is explained by itself and other variables of concern in the VAR model.

Definitions and Measurement of Variables

The study used quarterly data from 1990 to 2014 which includes budget balance, current account balance, exchange rate and interest rate.

Budget deficit (BD): it is a country's government spending less revenue it takes it has collected either as tax or other forms of revenue and it is taken a ratio of GDP.

Current Account deficit (CAD): current account deficit is derived from the sum of the country's export of goods and services less the value of imports of goods and services, plus net factor payment. (Net factor payment is income paid to factors of production in a country by the rest of the world less payment to foreign factors of production by domestic economy which is the difference between Gross National Product (GNP) and Gross Domestic Product (GDP)). CAD is taken as a ratio of GDP.

Exchange rate (EXC): is the price of one currency in terms of another. In this study direct quotation of exchange rate will be used and it taken in nominal terms, where domestic currency are expressed in terms of US dollar.

Interest rate (INT): the rate which is charged for the use of the money and in this case it is the treasury bills which is a short-term interest rate.

3.6 Research ethics

This study shall adhere to all ethical behaviours of respect, honesty and truthful reporting in order to enhance existing knowledge. All information provided with regards to this study has been treated confidentiality.

3.7 Data Analysis

The study attempted to explore relationship between budget deficit and current account deficit, by utilising a Vector Auto Regression (VAR) technique. Through the VAR technique, the study attempted to reveal if there exist a causal relationship between budget deficit and current account deficit, while taking exchange rate and interest rate into account as intermediate variables. The VAR technique was discovered by Sims (1980) who described the VAR models as credible. Sims further, described the VAR technique as important in that it treats the variables symmetrical in a structural sense with each variable having an equation explaining its development based on its own lag and the lag of other variables within the system. According to Sims (1980) the VAR technique is also supported, because is it a theory-free technique. Usually, VAR reports results from Granger causality tests, impulse responses functions and variance decompositions were used in the analysis. According to Watson (1994) VAR technique has proven to be successful for forecasting dynamic systems of interrelated time series variables both short and long-term horizons.

3.7.1 Unit Root test

Many economic and financial time series exhibit trending behaviour, when this is the case, it is usually said that these time series are non-stationary. An important econometric task is that of determining the most appropriate form of the trend in the data. If the data are trending, then some form of trend removal is required. To accomplish this, time series data will have to be differenced until they are stationarity is attained. The importance of having stationary data is to avoid spurious results which can lead to incorrect conclusions. Given the obvious non-stationarity of the time series data, unit root tests are performed to establish whether the data is stationary using, the Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) test.

The whole idea for unit root test to search for data generating process namely:

(a) Pure random walk, which means there is no intercept and no time trend items:

$$\Delta y_t = ʛ y_{t-1} + \sum_{t=1}^{p} \alpha_t \Delta y_{t-1} + \mu_t \tag{16}$$

(b) Random walk with drift, which means there is intercept and no time trend item;

$$\Delta y_t = \alpha + ʛ y_{t-1} + \sum_{t=1}^{p} \alpha_t \Delta y_{t-1} + \mu_t \tag{17}$$

(c) Random walk with drift and time trend, which means there intercept and time trend item:

$$\Delta y_t = \alpha + \gamma t + ʛ y_{t-1} + \sum_{t=1}^{p} \alpha_t \Delta y_{t-1} + \mu_t \tag{18}$$

This model refers to a situation, where the variance of the series is not stationary. This refers to the effect which is not carried over to the following period or the value of the current period does not depend on the prior period’s value.

3.7.2 Co-integration

The following step would be to conduct tests for co-integration. According to Asteriou (2007) if there are two or more variables in a model, there is always a possibility of having more co-integrated vector. Two variables are said to be co-integrated if they have a long run relationship or equilibrium relationships between them (Gujrati, & Sangeetha, 2007). The co-integration test can be applied in several ways, depending on the nature of the equation that is tested. If it is a single equation, the Engle Granger test is used, but, if it is a multivariate system, then the Johansen Approach is performed to determine the existence of the long run equilibrium relationship among variables.

3.7.3 Granger causality

The VAR can be considered as a means of conducting granger causality test. A Granger causality is a useful technique is used to investigate whether one time series can correctly forecast another (Granger, 1969), and it is based on multiple regression analysis. Granger causality does not mean changes in one variable cause changes in another, but implies a correlation between the current values of one variable and the past values of others. If there are two series Yt & Zt, then Granger causality technique is used to see how much of a current Z can be explained by past values of Z and to have knowledge whether by adding lagged values of another series X can help in explaining the variance of Z or not. If there are two series Yt & Zt, then it is said that Zt doesn't granger cause Yt if all lagged coefficients for Zt are zero, that is:

$$\mathbf{Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \ldots \alpha_p Yt\text{-}p + \beta_1 Z_{t-1} + \ldots + \beta_p Z_{t-p} + \varepsilon_{t-p}} \qquad (20)$$

Then $\beta_1 = \beta_2 = \ldots = \beta p = 0$, that is lagged of Zt has no effect on Yt.

For the direction of causality, Granger causality was utilized in determining whether budget deficit Granger causes current account deficit or if current account Granger causes budget deficit, and also determine the nature of causality. However, since this technique is affected by the number of lags, it requires first to determine the number of lags. There are five criteria used to indicate the number of lags which are; Akaike Information Criterion (AIC), Final Prediction Error (FPE), Hannan-Quinn (HQ) and Schwarz Information Criterion (SC).

3.7.4 Impulse Response function.

Estimating VAR enables one to derive the impulse response function (IRF). An impulse response refers to the feedback of any dynamic system in response to an external change or shock over time. The analysis is commonly used to discover the dynamic association amongst variables in VAR models. Granger causality test may not depict a complete depiction about the interaction between variables in the system. A shock to one variable is transmitted to all of the endogenous variables through the dynamic VAR system. It is often interesting to know the responses of one variable to an impulse of another variable in the system that involves other more variables (i.e. the interaction between or among the endogenous variables in system).

3.7.5 Variance decomposition

This technique defines how much of the forecast error variance for any variable in the system is explained by innovations to each explanatory variable over a series of time spans (Stock & Watson, 2001). It is an alternative method to Impulse response function for analysing the effects of shocks to the exogenous variables. Variance decomposition technique measures the contribution of each type of shock to the forecast error variance.

CHAPTER FOUR: EMPIRICAL ESTIMATIONS AND DISCUSIONS

4.1 Introduction

This chapter presents the empirical estimation of the study as well as the economic interpretation of the results obtained using the methodology explained in the previous chapter. Unit root test was conducted first, then we go on to estimate VAR diagnostic test and then, Johansen co-integration test was performed followed by Granger causality test. Finally, Impulse response function and Variance decomposition. Diagnostic test consist of econometrics test of stability test, lag criteria and lag exclusion test.

4.2 Unit root test

The study investigated the integration property, since most of the macroeconomic time series data are non-stationary (Asteriou & Hall 2007). This is done to avoid spurious results. ADF as well as PP test were used to test for unit root. The Null hypothesis was rejected that the series are non-stationary in favour of stationary the estimated ADF and PP calculated static should be greater than critical value. Otherwise, if the calculated value of ADF and PP is less than the critical value we do not reject null hypothesis i.e. series are non-stationary.

Table 4.1: Unit root results

Variable	**Model specification**	**ADF**		**PP**		**O.I**
		Level	**1st difference**	**Level**	**1st difference**	

BD	**Intercept**	-3.354128 (-2.891234)**	-3.421200 (-2.892536)**	-2.160359 (-2.890926)	-4.287645 (-2.89123)**	**1**
	Trend & Intercept	-3.324316 (-3.15398)***	-3.454133 (-3.15516)***	-2.150830 (-3.455842)	-4.278401 (-3.45631)**	**1**
CAD	**Intercept**	-1.450807 (-2.891234)	-4.407570 (-2.891234)**	-0.789396 (-2.890926)	-4.490812 (-2.89123)**	**1**
	Trend & Intercept	-2.334003 (-3.456319)	-4.439306 (-3.456319)**	-2.196465 (-3.455842)	-4.540191 (-3.45631)**	**1**
LNEXC	**Intercept**	-1.233721 (-2.890926)	-7.951420 (-2.891234)**	-1.282890 (-2.890926)	-7.959869 (-2.89123)**	**1**
	Trend & Intercept	-1.936489 (-3.456319)	-7.921279 (-3.456319)**	-1.892321 (-3.455842)	-7.927341 (-3.45631)**	**1**
LNINT	**Intercept**	-1.605747 (-2.891234)	-6.762979 (-2.891550)**	-1.271346 (-2.890926)	-6.315857 (-2.89123)**	**1**
	Trend & Intercept	-3.284450 (-3.15398)***	-6.730465 (-3.456805)**	-2.579442 (-3.455842)	-6.282226 (-3.45631)**	**1**

Note: (represents 10%) (** represents 5%) (*** represents 1%)*

I.O is order of Integration, BD is budget deficit, CAD is current account deficit, LNEXC is exchange rate and LNINT is interest rate.

H_0: There is unit root (Non-stationary)

H_1: There is no unit root (Stationary)

All the four variables namely, budget deficit, current account deficit, exchange rate and interest rate were found to be non-stationary at level as reported unit root test, that is; their variance is not constant over time. Having proved the presence of unit root in levels, the next step is therefore to difference it. However, after the first difference they became stationary. Hence there was no unit root at first difference with some variables being stationary at 5% and others at 10% levels of significance. In conclusion the results indicates that the variables are integrated of the order 1.

4.3 Co-integration test

Two or more variables are said to be co-integrated if they have a long run relationship or equilibrium relationships between them (Gujrati, & Sangeetha, 2007), so, the co-integration test was performed using the Johansen co-integration test. This test was done by employing the Johansen co-integration test based on trace and Maximum Eigen values of the dynamic matrix.

Co-integration test results

Table 4.2: Unrestricted Co-integration Rank test (Trace)

Hypothesized No of CE(s)	Eigen Value	Max-Eigen Statistic	0.05 Critical Value	Probability
None	0.216500	39.17755	47.85613	0.2533
At most 1	0.099735	15.51112	29.79707	0.7461
At most 2	0.049741	5.319721	15.49471	0.7740
At most 3	0.003815	0.370758	3.841466	0.5426

Note: Trace test indicates no co-integration at the 0.05 level

Table 4.3: Unrestricted co-integration test (Maximum Eigenvalue)

Hypothesized No of CE(s)	Eigen Value	Max-Eigen Statistic	0.05 Critical Value	Probability

None	0.216500	23.66643	27.58434	0.1468
At most 1	0.099735	10.19140	21.13162	0.7265
At most 2	0.049741	4.948963	14.26460	0.7483
At most 3	0.003815	0.370758	3.841466	0.5426

Note: Max-eigenvalue test indicates no co-integration at the 0.05 level

H_0: There is no co-integration among the variables

H_1: There is co-integration

As shown in Table 4.2 and Table 4.3, two co-integration test namely, Trace test and Maximum Eigenvalue test fail to reject the null hypothesis of no co-integration at 5% level of significance. Hence acceptance of the null, that there is no co-integration equation, as the all the p value is greater than 5%. The two test are similar, however, at times these are conflicting each other Trace test is chosen as it is more robust than the Maximum eigenvalue. Table 4.2 shows that Trace test cannot reject the null hypothesis as, the p value (probability) is 0.2533 which is greater than the 0.05 level. Since, results shows that there is no-integration among the variables, so there is no need to procced with restricted VAR. The unrestricted VAR is then employed**.**

4.4 Vector Auto-Regression

Having tested for the univariate characteristics of the variables, the Vector Auto-regression

Model is estimated. The unrestricted Vector Auto-regression procedure can be used even in a situation where the variables are not cointegrated (Kalumbu, 2014). The unrestricted VAR is a procedure used to produce forecasts of economic variables and it is also helpful in cases where there is a need to examine the effects of economic shocks (Engle & Granger, 1987). In this scenario, the VAR technique is used to test the relationship of budget deficit, current account deficit, exchange rate and interest rate.

Table 4.4: Vector Auto-regression

	BD	CAD	LNEXC	LNINT
BD(-1)	1.606620	0.207486	0.600791	-2.004757
	(0.07889)	(0.11222)	(0.91047)	(0.94903)
	[20.3654]	[1.84900]	[0.65987]	[-2.11242]
BD(-2)	-0.720306	-0.164600	-0.567020	1.786320
	(0.07306)	(0.10393)	(0.84322)	(0.87893)
	[-9.85874]	[-1.58381]	[-0.67244]	[2.03237]
CAD(-1)	0.030689	1.615540	-0.345867	0.753416
	(0.05455)	(0.07759)	(0.62954)	(0.65620)
	[0.56261]	[20.8214]	[-0.54940]	[1.14815]
CAD(-2)	0.014242	-0.676798	0.301163	-0.441627
	(0.05128)	(0.07294)	(0.59177)	(0.61683)
	[0.27776]	[-9.27942]	[0.50892]	[-0.71596]
LNEXC(-1)	0.004859	-0.005661	1.163063	0.189361
	(0.00972)	(0.01382)	(0.11214)	(0.11689)
	[0.50012]	[-0.40957]	[10.3717]	[1.62003]
LNEXC(-2)	-0.007572	0.007278	-0.204449	-0.231334
	(0.00964)	(0.01371)	(0.11124)	(0.11595)
	[-0.78560]	[0.53079]	[-1.83785]	[-1.99504]
LNINT(-1)	-0.009348	0.003653	-0.031985	1.270021
	(0.00826)	(0.01174)	(0.09528)	(0.09931)
	[-1.13236]	[0.31111]	[-0.33571]	[12.7881]
LNINT(-2)	0.003134	0.004594	0.002068	-0.364332
	(0.00835)	(0.01188)	(0.09641)	(0.10049)
	[0.37514]	[0.38667]	[0.02145]	[-3.62561]
C	0.014083	-0.019290	0.156061	0.263302
	(0.00826)	(0.01175)	(0.09537)	(0.09941)
	[1.70422]	[-1.64109]	[1.63632]	[2.64859]
R-squared	0.969567	0.982252	0.979006	0.972207
Adj. R-squared	0.926831	0.940657	0.937119	0.929708
Sum sq. resids	0.002661	0.005385	0.354482	0.385143
S.E. equation	0.005468	0.007778	0.063111	0.065783
F-statistic	354.4294	615.7010	518.7833	389.1496
Log likelihood	376.1247	341.5926	136.4252	132.3603
Akaike AIC	-7.492340	-6.787605	-2.600514	-2.517558
Schwarz SC	-7.254945	-6.550210	-2.363119	-2.280163
Mean dependent	-0.028990	0.029161	1.786261	2.280113
S.D. dependent	0.030026	0.055927	0.417217	0.377967
Determinant resid covariance (dof adj.)		2.22E-14		
Determinant resid covariance		1.51E-14		

Log likelihood	1003.160
Akaike information criterion	-19.73796
Schwarz criterion	-18.78838

Table 4.4 indicates the VAR estimation output, each column corresponds to one equation in the VAR where the variable on top of column is the endogenous variable which is expressed as a function of its own 2 lags and two lags of other 3 variables and a constant. The number in [ ] represents the t statistic, the number in ( ) represents standard error and the number on top of them represents the coefficient. In this estimation output BD (-1) is significant variable to explain BD as the t statistic is [20.3654] which is greater than 2. However, it is insignificant to explain variable CAD, this is shown by the t statistic [1.84900], which is less than 2, in spite of that, BD (-1) is significant in explaining variable LINT as its t statistic is greater than 2 in absolute terms. Row 4 shows that CAD (-2) is significant as its t statistic is greater than 2. However, it is insignificant to explain both variables BD, LNEXC and LNINT. Row 8 indicates that LNINT (-2) is only significant to explain LNINT, but insignificant to explain other variables.

4.5 VAR diagnostic

4.5.1 Lag length criteria

The optimal lag length procedure is done to determine the level of lags and the point at which the model will converge. To select the lag order, we choose the lags established by majority of the tests. The results based on the four-variable VAR system with the maximum lag number 8 is presented in the Table 4.5.

Table 4.5: Lag criteria.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	323.5498	NA	1.13e-08	-6.946734	-6.837091	-6.902481
1	860.1513	1014.877	1.37e-13	-18.26416	-17.71594	-18.04289
2	946.0707	155.0284	3.01e-14*	-19.78415*	-18.79736*	-19.38587*
3	953.8349	13.33425	3.62e-14	-19.60511	-18.17975	-19.02982
4	968.4520	23.83224	3.77e-14	-19.57504	-17.71111	-18.82275
5	979.7104	17.37697	4.24e-14	-19.47196	-17.16946	-18.54265
6	990.4817	15.68877	4.87e-14	-19.35830	-16.61722	-18.25198
7	1002.778	16.84020	5.45e-14	-19.27778	-16.09813	-17.99445
8	1025.303	28.89063*	4.95e-14	-19.41962	-15.80140	-17.95928

Notes: * indicates lag order selected by the criterion,

Where,

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

FPE: Final Prediction Error

AIC: Akaike Information Criterion

SC: Schwarz Information Criterion

HQ: Hannan-Quinn Information Criterion

The result from the test for lag length criteria based on four-variable VAR system with the maximum lag number eight. The Table suggest that the lag length is set at two, the optimal lag length is set at two according the majority rule as four Information criteria suggested that FPE, AIC, SC and HQ all selected lag length of two.

4.5.2 VAR stability condition

There are two types of VAR namely, the restricted VAR which is also known as VECM and the unrestricted VAR. The restricted VAR is used when variables are co-integrated. While, unrestricted VAR on other hand is conducted when variables are not co-integrated. This study however, employed unrestricted VAR technique, as the variables found to be not co-integrated. It was first used to test the stability of the model, as well as lag length criterion. The results on the unrestricted VAR are presented in Figure 4.1.

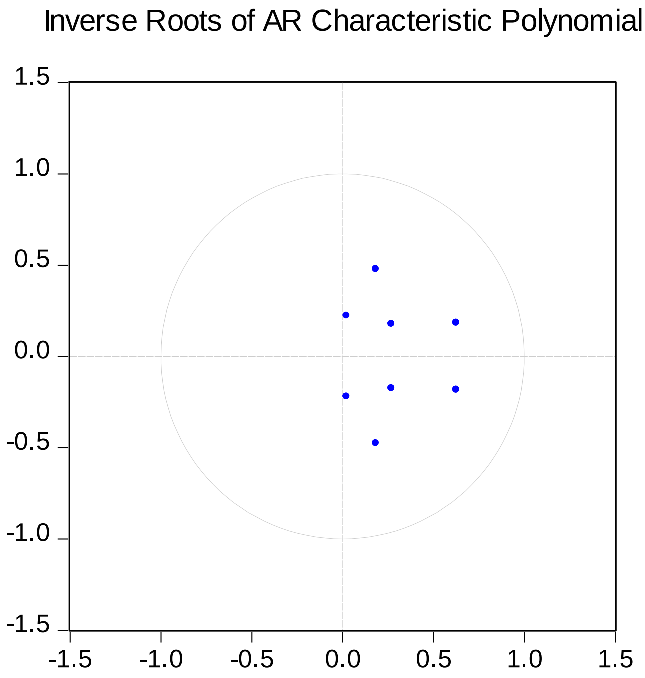

Figure 4.1: VAR stability

For model to be stable all roots should lie inside the circle and the modulus has to be less than one, as shown in the Figure 4.1. This shows that the VAR model did not violate the stability condition which is one of the characteristics. The next step was to conduct the VAR.

4.6 Granger causality test

Although the Johansen co-integration test can confirm whether the long run equilibrium relationship exist or not, it does not explain the direction of causality. Therefore Granger causality test was conducted to determine the direction of influence of the variables on one another. The Table 4.6 summarises the results of granger causality of all the four variables.

Table 4.6: Granger causality results

Dependent variable: BD			
Excluded	Chi-sq	df	Prob.
CAD	6.722595	2	0.0347
LNEXC	2.514947	2	0.2844
LNINT	5.764724	2	0.0560
All	8.737360	6	0.1889
Dependent variable: CAD			
Excluded	Chi-sq	df	Prob.
BD	3.614737	2	0.1641
LNEXC	0.601448	2	0.7403
LNINT	4.400410	2	0.1108
All	6.487346	6	0.3709
Dependent variable: LNEXC			
Excluded	Chi-sq	df	Prob.
BD	0.459031	2	0.7949
CAD	0.303133	2	0.8594
LNINT	0.925074	2	0.6297

Excluded	Chi-sq	df	Prob.
All	3.138745	6	0.7912

Dependent variable: LNINT

Excluded	Chi-sq	df	Prob.
BD	4.482539	2	0.1063
CAD	2.664767	2	0.2638
LNEXC	6.918939	2	0.0314
All	10.38203	6	0.1095

When p (probability) value is greater than α which is the level of significance, then the variable is insignificant for predicting the other variable. Hence the variable does not granger causes the other and therefore we accept the null hypothesis. On other hand, when p-value is less than α, then the variable is does not Granger causes the other and therefore we accept the null hypothesis.

Where; α is 5% or 0.05

In this case, current account deficit is the only variable that is able to Granger-cauuse budget deficit with 0.0347. While exchange rate also predicts interest rate with 0.0314 which is less than 5% percent level of significance.

4.7 Impulse Responsive Function

Since the individual coefficient in the estimated VAR models are difficult to interpret. The impulse response function is employed to trace out the response of one-time shock or innovation to the endogenous variable in the VAR system. The impulse response will be zero if one of the variables does not Granger causes the other variables taken as group (Chaoneka, 2014). Impulse response function finds out how the dependent variable responds to a shock administered to one or more equations in the system. The results are presented in a Figure 4.2.

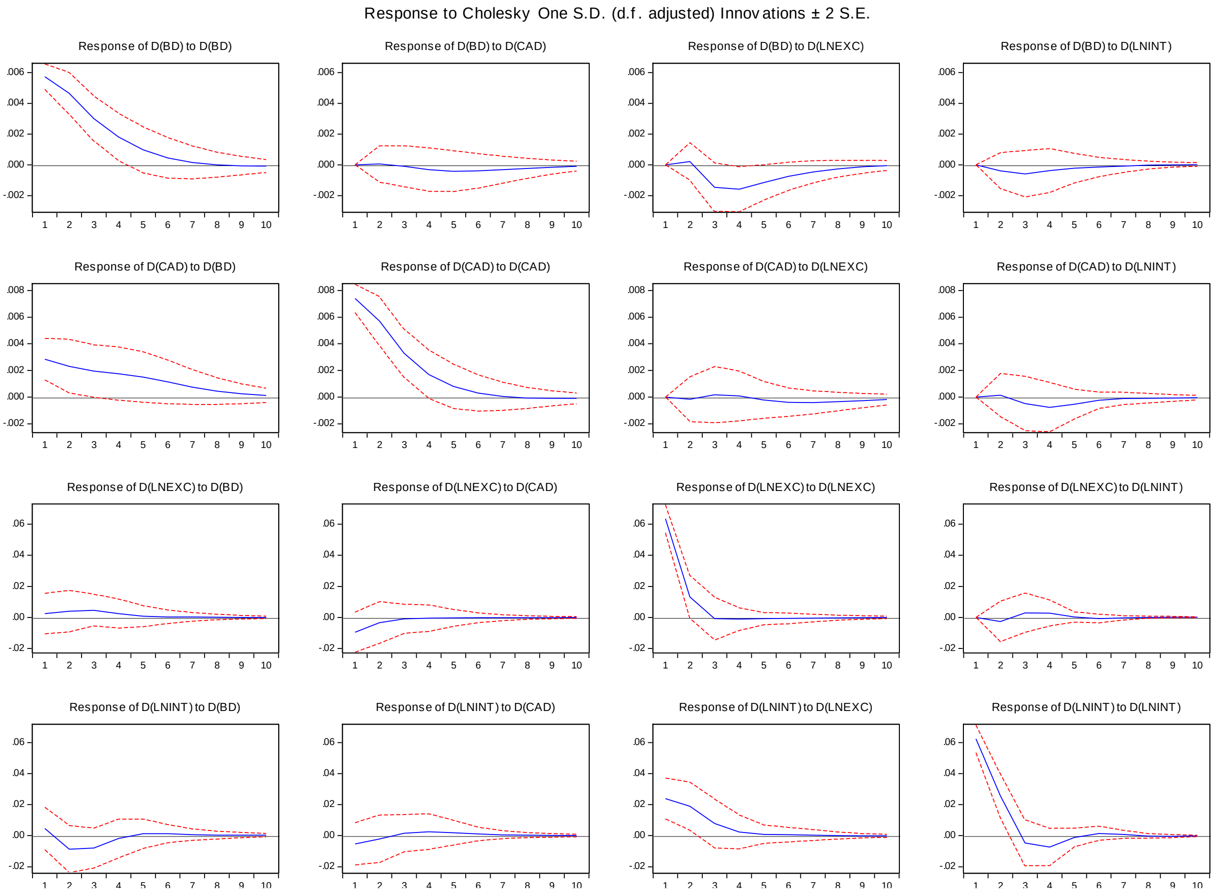

Figure 4.2: Impulse Response Function

Figure 4.2 shows the response of budget deficit to the shocks in the current account deficit, exchange rate and interest rate. The same also applies to current account deficit, exchange rate as well as interest rate. The vertical axis presents the quarterly impact measures of an innovation or a shock on each dependent variable while horizontal axis in each figure presents up to 10 quarters following an innovation or shock. The Numbering used is based on rows, where the first impulse response is in first row. Second impulse response is in row 2, third impulse response is in row 3 and so on onward.

Row 1, column 1 presents the impulse response of budget deficit from its own shock. A shock to budget deficit which is temporally, as they all return to their initial equilibrium in a long-run, as shown in the graphs above. Row1, column 2 presents the impulse response of budget deficit from shock to current account deficit. A shock/ innovation to current account has a short-run negative effect on budget deficit, which is insignificant. In a long run the shock does not have any effect on money demand. In conclusion all the effects of shock on all variables are temporally as it is shown by the graphs, as all lines return to the initial equilibrium in a long run.

4.8 Variance Decomposition

Variance decomposition is used to determine the importance of variables in explaining movements in other and themselves in a VAR model (Reside, 2001). The Variance decomposition analysis is just complements Granger causality test results. The result of variance decomposition is shown in Table 4.7.

Table 4.7: Variance Decomposition

Variance Decomposition of BD

Variance period	BD	CAD	EXC	INT
1	100.0000	0.000000	0.000000	0.000000

2	99.63378	0.004396	0.084753	0.277067
3	95.94443	0.019140	3.277915	0.758512
4	92.42631	0.157039	6.520044	0.896606
5	90.59604	0.386174	8.083070	0.934716
6	89.72443	0.592863	8.730471	0.952235
7	89.34266	0.727489	8.972831	0.957018
8	89.19617	0.798465	9.048841	0.956523
9	89.14782	0.829987	9.066232	0.955957
10	89.13454	0.841783	9.067747	0.955925

Variance Decomposition of CAD

Variance period	BD	CAD	EXC	INT
1	12.87276	87.12724	0.000000	0.000000
2	13.32933	86.62128	0.026981	0.022415
3	14.88789	84.83906	0.049838	0.223209
4	16.61536	84.83906	0.052588	0.686884
5	17.99375	81.02202	0.088713	0.895513
6	18.78334	80.08161	0.204757	0.930292
7	19.11482	79.61907	0.331283	0.934826
8	19.22099	79.41664	0.424035	0.938334
9	19.24584	79.33468	0.478156	0.941323
10	19.24814	79.30503	0.504382	0.942445

Variance Decomposition of EXC

Variance period	BD	CAD	EXC	INT
1	0.130994	2.229301	97.63970	0.000000

2	0.491614	2.386852	96.95623	0.165309
3	0.970640	2.392552	96.27848	0.358332
4	1.092032	2.392226	95.98429	0.531447
5	1.102983	2.395568	95.96949	0.531964
6	1.104500	2.396863	95.95166	0.546975
7	1.105644	2.397812	95.94509	0.551449
8	1.106001	2.398633	95.94394	0.551429
9	1.105987	2.399139	95.94324	0.551633
10	1.106079	2.399362	95.94290	0.551656

Variance Decomposition of INT

Variance period	BD	CAD	EXC	INT
1	0.486807	0.617804	12.61274	86.28265
2	1.722565	0.568962	16.52658	81.18189
3	2.779889	0.596378	17.16801	79.45573
4	2.805208	0.702994	17.06221	79.42959
5	2.829269	0.766655	17.05393	79.35015
6	2.855657	0.785813	17.04420	79.31433
7	2.862001	0.790798	17.04204	79.30516
8	2.864169	0.792276	17.04137	79.30219
9	2.866076	0.792643	17.04077	79.30051
10	2.867616	0.792674	17.04077	79.29894

The results reported in Table 4.7 shows that Variance decomposition in budget deficit, current account deficit, exchange rate and interest rate are attributed to their own shocks, decreases as the time horizon increases. For instance, Budget deficit accounts for 99.63% variation of the fluctuation in Budget deficit in quarter 2 compared to 89.14% experienced in quarter 9. This both in short run and long run budget deficit variations are to a large extent explained by budget deficit and each of the other variables explain less than 11% of the variation. Impulse on Current account deficit accounts for 84.83% in short run compared to 79.33% in a long run. This is to say, variations on current account is largely explained by itself. In addition, the shocks to attributed to other variables keeps on increasing as the time horizon increase, for example shocks to exchange rate can cause 3.27% fluctuation in Budget deficit in the 3rd quarter compared to 9.06% in the 9th quarter.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This chapter gives a brief summary of all the previous chapters. It also highlights some policy implications given the findings of the study. The main purpose of the study was to analysing the relationship between budget deficit and current account deficit in an attempt to validate whether the twin deficits hypothesis holds for Namibia for the period 1990-2014, using VAR model. The study reveals that current account deficit affects budget deficit only in a short-run, while in a long run it has no effect on budget deficit. The study found out that a shock to current account does not have any significant impact on budget deficit in a long run. While a shock to budget deficit does have a significant effect on current account deficit in Namibia.

The other objectives was to establish the significance of intermediating variables in explaining the relationship between the two deficits in Namibia. A shock to exchange rate does not have a significant impact on current account deficit. A shock to interest rate was not found have any significant impact on all other variables. There is a possibility of uni-directional relationship running from budget deficit to current account deficit. Thus, there is a strong possibility of twin deficit as proposed by the Keynesian approach. One can therefore conclude that there is a possibility of uni-directional relationship running from budget deficit to current account deficit. However, these findings are slightly different from what was expected for a small open economy as Namibia which is highly dependent on imports and exports of raw materials in the sense that both interest rate and exchange rate are found to be insignificant in explaining the twin deficit hypothesis. Despite the deviation in findings however, the results are still consistent with those by Bakar (2014); Deniz and Çelik (2009).

5.2 Policy Recommendations

Based on the result obtained in the study, Namibia has shown a uni-directional relationship between budget deficit and current account deficit, and the direction of causality runs from budget deficit to current account deficit. For the purpose of policy lessons, an increase in government budget deficit will lead to an increase in current account deficit. The Government should try to curb increasing public expenditures as way of reducing its adverse effect on the current account balance. It is recommended that policy makers should use fiscal adjustments to address current account deficit. The Ministry of Finance must make sure that budget deficits are kept under control. Although the paper tried to be as comprehensive as possible, there is still room for further studies. Future researchers are advised to attempt using simultaneous equation models since, in most cases, they give better results. Similarly, it is suggested that future researchers use absolute figures instead of the percentage of GDP figures used in the study. These may give a clearer depiction than the current research.

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APPENDIX

Variance Decomposition

Variance Decomposition of D(BD): Period	S.E.	D(BD)	D(CAD)	D(LNEXC)	D(LNINT)
1	0.005743	100.0000	0.000000	0.000000	0.000000
2	0.007401	99.63378	0.004396	0.084753	0.277067
3	0.008142	95.94443	0.019140	3.277915	0.758512
4	0.008506	92.42631	0.157039	6.520044	0.896606
5	0.008651	90.59604	0.386174	8.083070	0.934716
6	0.008705	89.72443	0.592863	8.730471	0.952235
7	0.008725	89.34266	0.727489	8.972831	0.957018
8	0.008732	89.19617	0.798465	9.048841	0.956523
9	0.008735	89.14782	0.829987	9.066232	0.955957
10	0.008736	89.13454	0.841783	9.067747	0.955925

Variance Decomposition of D(CAD): Period	S.E.	D(BD)	D(CAD)	D(LNEXC)	D(LNINT)
1	0.007939	12.87276	87.12724	0.000000	0.000000
2	0.010052	13.32933	86.62128	0.026981	0.022415
3	0.010769	14.88789	84.83906	0.049838	0.223209
4	0.011071	16.61536	82.64517	0.052588	0.686884
5	0.011217	17.99375	81.02202	0.088713	0.895513
6	0.011288	18.78334	80.08161	0.204757	0.930292
7	0.011320	19.11482	79.61907	0.331283	0.934826
8	0.011335	19.22099	79.41664	0.424035	0.938334
9	0.011342	19.24584	79.33468	0.478156	0.941323
10	0.011344	19.24814	79.30503	0.504382	0.942445

Variance Decomposition of D(LNEXC):

Period	S.E.	D(BD)	D(CAD)	D(LNEXC)	D(LNINT)
1	0.064393	0.130994	2.229301	97.63970	0.000000
2	0.065991	0.491614	2.386852	96.95623	0.165309
3	0.066229	0.970640	2.392552	96.27848	0.358332
4	0.066342	1.092032	2.392226	95.98429	0.531447
5	0.066353	1.102983	2.395568	95.96949	0.531964
6	0.066364	1.104500	2.396863	95.95166	0.546975
7	0.066368	1.105644	2.397812	95.94509	0.551449
8	0.066369	1.106001	2.398633	95.94394	0.551429
9	0.066370	1.105987	2.399139	95.94324	0.551633
10	0.066370	1.106079	2.399362	95.94290	0.551656

Variance Decomposition of D(LNINT):

Period	S.E.	D(BD)	D(CAD)	D(LNEXC)	D(LNINT)
1	0.067230	0.486807	0.617804	12.61274	86.28265
2	0.074977	1.722565	0.568962	16.52658	81.18189
3	0.075965	2.779889	0.596378	17.16801	79.45573
4	0.076423	2.805208	0.702994	17.06221	79.42959
5	0.076473	2.829269	0.766655	17.05393	79.35015
6	0.076509	2.855657	0.785813	17.04420	79.31433
7	0.076519	2.862001	0.790798	17.04204	79.30516
8	0.076520	2.864169	0.792276	17.04137	79.30219
9	0.076522	2.866076	0.792643	17.04077	79.30051
10	0.076523	2.867616	0.792674	17.04077	79.29894

Cholesky Ordering: D(BD) D(CAD) D(LNEXC) D(LNINT)

Co-integration

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.216500	39.17755	47.85613	0.2533
At most 1	0.099735	15.51112	29.79707	0.7461
At most 2	0.049741	5.319721	15.49471	0.7740
At most 3	0.003815	0.370758	3.841466	0.5426

Trace test indicates no cointegration at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

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

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.216500	23.66643	27.58434	0.1468
At most 1	0.099735	10.19140	21.13162	0.7265
At most 2	0.049741	4.948963	14.26460	0.7483
At most 3	0.003815	0.370758	3.841466	0.5426

Max-eigenvalue test indicates no cointegration at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

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

Co-integration of Budget Deficit and Current Account deficit

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.122437	14.22170	15.49471	0.0771
At most 1	0.015882	1.552887	3.841466	0.2127

Trace test indicates no cointegration at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

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

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.122437	12.66881	14.26460	0.0880
At most 1	0.015882	1.552887	3.841466	0.2127

Max-eigenvalue test indicates no cointegration at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

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

VAR stability test

Root	Modulus
0.627093 - 0.183408i	0.653364

0.627093 + 0.183408i	0.653364
0.185503 - 0.477593i	0.512354
0.185503 + 0.477593i	0.512354
0.270149 - 0.175458i	0.322127
0.270149 + 0.175458i	0.322127
0.022594 - 0.220773i	0.221926
0.022594 + 0.220773i	0.221926

No root lies outside the unit circle.

VAR satisfies the stability condition.