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Investigating for Twin Deficits Hypothesis in South Africa

BigBen Chukwuma Ogbonna*
Department of Economics, Ebonyi State University, Abakaliki, Nigeria
bigbenogbonna@yahoo.com

Abstract
This study examines the empirical relationship between fiscal deficit and current account imbalance employing data for South Africa for the period of 1960 to 2012. We employ co-integration analysis and VAR granger non causality process to investigate the existence of short term causalities for the economy under consideration as no long run steady-state relationship was established among economic variables of interest. The results indicate no evidence of twin deficits hypothesis for South Africa in the short-run. The absence of evidence of the twin deficits phenomenon for South Africa in the short-run time frame, suggests that the Ricardian equivalence proposition (REP) holds for the economy under consideration within such time horizon. This concept is of the view that since people are rational, they know that the reduction in taxes, resulting from the government expansionary fiscal policy of tax cut or increase in public debt, is temporal and will save the extra disposable income to pay for the future higher taxes. This by implication suggests that the national savings position will be sustained because the decrease in government savings represented by increased fiscal deepening will be adequately compensated by the additional precautionary private savings for expected future increase in taxes. This indicates lack of responsiveness of private consumption to fiscal impulse and thus casts doubts on the efficacy of the use of fiscal policy in the management of external balance. In effect, this suggests that fiscal policy should not be intended for improvement in current account balance or in the least should not be used in isolation to supervise developments in current account stance in the short-run for South Africa. On the other hand, the results further provide evidence of the existence of current account targeting scenario for South Africa in the short run. Current account targeting hypothesis posits positive and significant causal relation between budget deficits and currents account deficits with current account balance causing budget balance. This suggests that current account balance may be intended for improvement in fiscal balance, indicating that the use of current account balance to supervise developments in fiscal deficits in South Africa may prove effective in the short-run.
Key words: *Budget Deficits; Current Account Deficits; Co integration;Causality; South Africa*

Introduction

Twin deficits hypothesis asserts that an increase in budget deficit will cause a similar increase in current account deficit. But the results of testing this hypothesis turned out different for different countries, and moreover, the results differ in the case of using different econometric techniques and model specifications for the same country data (Mukhtar, Zakaria and Ahmed, 2007). The close correlation observed between these two deficits does not imply any causal relation between the two. This suggests that, identifying the causal relation between these deficits is essential and would have different policy implications. Theoretically, there are three possible scenarios about the causal link between budget and trade deficits: The first one is called the Twin Deficit Hypothesis, which posits positive and significant causal relation between budget deficit and current account deficit with budget causing current account. The second, which is referred to as current account targeting, just like the Twin Deficit Hypothesis posits positive and significant causal relation between budget deficit and current account imbalance, but this time, with current account balance causing government budget deficit and finally, the Ricardian Equivalent proposition which predicts that the two deficits share no significant causal relationship and therefore are independent.

Studies in favour of the twin deficits hypothesis include those undertaken by Abell (1990); Islam (1998); Zietiz & Pemberton (1990); Bachman (1992); Kasak (1994); Vamvoukas (1999); Aqeel & Nishat (2000); Piersanti (2000); Leachman & Francis (2002); Cavallo (2005); and Erceg, Guerrieri., & Gust (2005). Results of these studies supported the conventional view that the twin deficits share positive association and that causality runs from budget deficit to current account deficit.

Furthermore, Laney (1984); Miller & Rusek (1989); Dewold & Ulan (1990); Enders & Lee (1990); Boucher (1991); Evans (1993); Winner (1993); Kim (1995); Bartlett (1999); Papaioannou, Kei – Mu Yi (2001); and Kaufmann et al., (2002) support the view of Ricardian Equivalent as they failed to identify any stable Long-run relationship between the two deficits.

Some other studies as Anoruo & Ramchander (1998); Khalid & Teo (1999); and Alkswani (2000) support the reverse causuality running from current account to budget deficit, which in Summers terminology is refered to as current account targeting (Summers, 1988).

Inquiries concerning the relations between fiscal policy, the current account, and the exchange rate are of great analytical and empirical interest. From the theoretical point of view, numerous models suggest that a fiscal expansion should lead to a worsening of the current account and an appreciation of the real exchange rate. The prime empirical example of such a relation is usually argued to be the experience of the United States with "twin deficits" in the first half of the 1980s
(Soyoung & Nouriel, 2007). The standard Mundell-Fleming analysis argues that a deficit financed expansionary fiscal policy will lead to an increased trade deficit through either stimulated income growth in a fixed exchange rate scenario or exchange rate appreciation in a flexible exchange rate regime. Increase in disposable resulting from the expansionary fiscal policy, increases the purchasing power of the consumers. This leads to increased consumption expenditure (imports inclusive) and dilutes the trade balance. Just as in the case of flexible exchange rate regime, a deficit financed expansionary fiscal policy will impact the trade balance negatively via increase in interest rate and subsequent appreciation of the domestic currency. This gives rise to twin deficits based on a positive co-movement and thus suggests the possibility of using the budget deficit as a means of influencing the current account position.

But in contrast, a Ricardian equivalence scenario suggests that there is no positive co-movement for the fact that domestic residents may, in their best of judgments, anticipate that government will raise taxes in the future to close the fiscal gap in order to pay back the accumulated debt. To this effect, the additional disposable income resulting from the expansionary fiscal policy is channeled into precautionary savings to provide for the expected future tax increase. This thinking was evident in the works of Evans (1988), Miller & Russek (1989); Dewald & Ulan (1990); Enders & Lee (1990) and Kim (1995).

Of recent, these twin anomalies have remained apparent in the economies of both developed and developing countries, South Africa inclusive. Investigating the trends of the twin deficits for South Africa, we observed that the current account deficit deteriorated from 0.1 percent of GDP in 2000 to 6.4 percent in 2006 and averaging 6.7 percent in the first of half of 2007. The current account deficit in South Africa stems largely from strong domestic demand. With terms of trade unchanged, the current account imbalance reflects the volume of growth in imports outpacing exports and current accounts transfers such as dividend payment to foreigners. The deficit on the trade balance averaged 2.2 per cent of GDP in the first half of 2007, while the net income receipts deficit stood at 2.5 per cent of GDP in the same period. This strong increase in imports has coincided with a strong domestic expenditure as lower interest rates in previous years and broader participation in the economy boosted strong consumer spending. Mineral products, in particular oil, put the most pressure on imports. Crude and refined oil accounted for 16.1 per cent of total imports in 2006. Crude oil grew by about 28.0 per cent between 2005 and 2006 and accelerated to 35 per cent in the first half of 2007 (Tonia, 2007). The current account situation in South Africa does not seem to be a major concern because it is more than financed by capital inflows at the back of strong macroeconomic fundamentals. However, there is the need to underscore the fact that it is important to remain conscious of its magnitude and to monitor the risks associated with running a current account deficit of this nature (Tonia, 2007)

According to Edward, one of the reasons for the high current account deficits in developed countries is that global investors have confidence in countries such as the United States. They can safely seek the highest possible return for their funds in these countries. This has led to a substantial increase in the international demand for United States assets. Some of the factors that lie behind such confidence are political stability; a legal system that effectively protects property rights and enforces commercial contracts; economic policies that promote and strengthen the role of markets; a financial system that efficiently channels resources to their most productive uses; an educational system that produces highly skilled workers; and supports rapid technological development (Edwards, 2005a). He however stress that even though the United States is able to attract large investments, at some point the current account deficit will have to go through a significant adjustment or reversal. The recent dollar depreciation of 20 per cent since 2002 could be part of the adjustment process.

Conventional wisdom has it that a large budget deficit is a source of economic instability and in the same vein, a significant current account deficit, increases the rate of interest, reduces aggregate demand, leading to a reduction in investment and subsequent increase in unemployment, which in all, will hurt the long-term economic growth. Other ills associated with the twin anomalies in the event of persistent large deficits include: increase in national indebtedness by borrowing internally and externally and imposing burden on future generations.

On the above notes, this study intends to investigate the causal relationship between budget deficit and current account imbalance for the period of 1960 - 2013.

This study is structured as follows: The first section is the introduction to the study. In the second section, we review both theoretical and empirical literature relevant to the study. The third section provides the econometric methodology and section four presents the results of the study which include findings and conclusion.

2. Review of Related Literature

2.1 Theoretical Review

The question of the relationship between budget deficit and current account imbalance has two basic theoretical possibilities: the first is the twin deficits hypothesis proposed by Keynes and second is the Ricardian equivalence proposition (REP) propounded by Ricardo.

Twin Deficits Hypothesis

The Feldstein chain's argument, that an increase in the government deficit pushes the interest rates up, which in turn attracts foreign capital and strengthens the domestic currency driving the current account balance into deficits, appears to have been the most important explanation for the controversial twin deficits phenomenon (Feldstein, 1986). There are two approaches to the transmission mechanism behind the twin deficits hypothesis as could simply be explained through the Keynesian income-expenditure approach and the Mundell- Fleming (FM) model founded on open economy and high capital mobility (Mundell, 1963). From the perspective of the income-expenditure approach, an increase in budget deficits will increase domestic absorption (C + I + G) and, therefore the domestic income. The increase in income will induce imports and eventually will reduce the surplus or increase the deficit in the trade balance which is a component of current account and thus makes the public sector and external sector deficits act as twins rather than distant cousins. In Keynesian open economy models with high capital mobility, an additional linkage can explain the deterioration in the trade balance due to higher budget deficits. An increase in the budget deficit will cause an increase in the aggregate demand and domestic real interest rates. The high interest rates will cause net capital inflow from abroad and result in appreciation of the domestic currency. The strong currency will make imports cheap and domestic exportable less competitive in the global market and adversely affect net exports to deteriorate the current account. Though these mechanisms may differ slightly, this conclusion is valid both under fixed and flexible exchange rate regimes (Elif and Gul, 2002). While admitting the harmful economic and social consequences of huge budget deficits, critics of the FM approach are strongly doubtful of the illustrated sequence of causation implied by these models. This has led some researchers to cite the Ricardian equivalence hypothesis to argue that whether fiscal deficit is financed through public debt or with increase in tax , the impact on real interest rates, aggregate demand, private spending, the exchange rate or the external accounts will remain neutral. Proponents of this view point out that while tax cuts have the effect of reducing public saving and enlarging the budget deficit, they increase private saving by an amount equal to the expected increase in the tax burden in the future years (Nozar and Loretta, 2006).

Giancarlo and Müller (2006) in presenting the traditional debate on fiscal transmission and twin deficits, stress two distinct transmission mechanisms: One stresses relative price movements, the other intertemporal (borrowing and lending) decisions. The first transmission mechanism is central to the Mundell- Fleming model. Here, an expansionary fiscal shock raises disposable income and internal demand. Part of the higher consumption demand 'leaks abroad' in the form of higher import demand, deteriorating the trade balance. Moreover, with flexible exchange rates a stronger domestic demand also appreciates the exchange rate, crowding out foreign demand. Because of differences in the multiplier, the impact is stronger for spending hikes than for tax cuts. The increase in the external deficit is somewhat mitigated to the extent that the upsurge in domestic demand raises the domestic interest rate, and thus crowds out domestic investment. Overall, however, the emphasis is on the static transmission mechanism, linking fiscal deficits to excess demand and relative price movements.

Some other studies support the twin anomalies hypothesis, that higher budget deficit lead to higher current account deficits. For instance, based on his assessment of the data from the United States, Normadin (1994) deduced that a tax increase would directly decrease the budget deficit and would indirectly decrease the external deficit, due to reduced imports induced by the decline of private after-tax incomes. Kasa (1994) reports a significant connection between trade deficits and budget deficits for the post war era for the United States, Japan and Germany after controlling for the effects of fiscal expenditures on Gross National Product (GNP). Furthermore, Keynesian economic models assume that a shift from tax to debt financing increases private consumption as private consumption depends on disposable income (income minus taxes). Therefore, fiscal deficits (and lower taxes) increase private consumption and the current account deficit. Similar results reported by Zietiz and Pemberton (1990), Vamvoukas (1999), Miller and Russek (1989) and Islam (1990) are all in favour of twin deficit hypothesis.

Current Account Targeting Hypothesis

Despite the plethora of studies in favour of the conventional twin deficits hypothesis, results of some other studies revealed reversed causation running from current account balance to budget balance, what Poterba & Summers (1986) would refer to as current account targeting. These include studies by Anorua and Ramchander (1998), Ahmed & Teo (1999) and Alkswani (2000). Policy implications of research findings dealing with the subject remain basically ambiguous, time and space dependent and hence appear to be impracticable.

The Ricardian Equivalence Hypothesis

On the other hand, proponents of the Ricardian Equivalence Hypothesis (REH) deny any correspondence between the budget deficit and the current account imbalance. This concept is of the view that since people are rational, they know that the reduction in taxes, resulting from the government expansionary fiscal policy of tax cut, is temporal and so they will save the extra disposable income to pay for the future higher taxes. This suggests that the national savings will not be affected because the decrease in government savings represented by increased fiscal deepening will be equitably compensated by the additional precautionary private savings for expected future increase in taxes.

According to Elif and Gul (2001) this hypothesis suggests that the equilibrium levels of current account, interest rates, investment and consumption will not be affected by the changes in the level of budget deficit. This assertion can be regarded as an extension of the Permanent Income Life-Cycle Hypothesis including government expenditure, taxes and debt, which indicates that a change in the level of budget deficit will not change the lifetime budget constraint and real wealth of the consumer. As a consequence of intertemporal consumption behavior, according to the Ricardian equivalence proposition, temporary changes in the level of government expenditures and marginal tax rates are much more important than the ways of financing it. REH proposes that to explain the balance of payments deficit, interest rate, productivity differentials, and temporary increases in the public sector spending could be considered as alternative explanatory variables besides budget deficits. Furthermore, the "equivalence theory" as articulated by the classical economist, David Ricardo in 1817, suggests that government budget deficits should not alter capital formation and economic growth or the level of aggregate demand including demand for imports due to the fact that far-sighted individuals fully capitalize the implied future taxes associated with budget deficits. Otherwise stated, the theory implies that there is no apparent correlation between the two deficits. Though controversial, Ricardo's neutrality hypothesis suggests that the private sector views budget deficits as public investment and treats public and private investment as perfect substitutes. Thus, fiscal measures designed to influence aggregate demand will prove fruitless as individuals reduce consumption in anticipation of future tax liabilities.

The REP further concludes that a tax cut has no effect on consumption since rational individual, being aware of the intertemporal government budget constraint, base their consumption decision on permanent income and will hence anticipate increase in future tax liability by saving amount equivalent to the tax cut. The theory is based on relatively strongly assumptions such as rational and forward-looking individuals, Lump-Sum taxes, perfect capital market and infinite lives of consumers all of which may render the REP's practical relevance, at least in its perfect form, questionable (Gerhard and Jesus, 2004).

In the same vein, the Ricardian equivalent hypothesis further states that if government expenditure remains constant and there is a tax cut, individuals will anticipate a tax increase some times in the future. Therefore, for this reason, individuals will allocate the increase in disposable income dollar for dollar to savings. The interest earned on this money will cover the interest element of government debt liability, so that there will be no change in the present value of real tax liability. To this effect, national savings will remain constant, because dollar for dollar, the increase in private savings equals the decrease in government savings. Therefore there will be no change in wealth unless government spending changes and, the interest rate and current account balance should remain unperturbed so long as change in private savings equal to the change in government saving (Winner, 1993).

Others results that are in favour of Ricardian equivalence proposition include that evidenced in Laney (1984) which found no "statistically significant linkages for the postwar period between the actual U. S. and most of the larger industrial countries' budget balance and the current account balance. Other studies on the relationship between twin deficits comprise those carried out by Kearney and Monadjemi (1990), Godley and Cripps (1983), Enders and Lee (1990) and Evans (1993). These authors do not detect a stable long-run association between the two deficits using variety of samples. Other proponents of Ricardian equivalent include Evans (1988), Miller and Russek (1989), Dewald and Ulan (1990), Kasa (1994), Kim (1995) and Barlett (1999), Bhattacharya (1977),

Boucher (1991) and Papaioannou and Kei-Mu Yi (2001) who are unable to detect a plausible causal relationship between the two deficits in their investigations and thus subscribed to the Ricardian equivalence.

2.2. Empirical Review

There is surfeit of literature on the factors that may determine current account behavior. For instance, Baharumshah et al., (2006) examine the twin deficit hypothesis in Indonesia, Malaysia, the Philippines and Thailand and found a long run relationship between budget deficit and current account. Their results also showed a unidirectional causality without feedback effect, which runs from budget deficit to current account deficit for Thailand. In Indonesia, current account targeting was detected, whereas in Malaysia and Philippines, the causality was bidirectional. Just as Udah in (2011) employs three methodologies of Granger Causality test, the Co-integration test, the Variance decomposition and impulse response function with the variance decomposition and impulse response function following the Cholesky ordering. Evidence from the results suggests that causality is bidirectional between current account balance and budget deficit. The Granger Causality test also revealed the existence of a unidirectional causality of current account balance with exchange rate and that exchange rate, monetary policy credibility and budget deficit are important macroeconomic variables that influence current account movement. However, the study found no causal link between measures of financial indicator variables and current account balance. The study in conclusion argues that to address the adverse changes in current account movement, policy should tackle the problem from the demand and supply sides.

Neda and Mohammad (2011) using panel data, theoretically studied the two visions (Keynesian theory and Ricardian equivalence) of twin deficits using macro economic variables for 70 countries for the period of 1985 – 2006. This review first classifies the mentioned countries based on World Development Indicators into different income groups of high, middle and low income countries. Then the review of required variables based on the evaluation of budget deficit effect on private consumption, economic growth and current account deficit on all income groups are assessed and estimated by comparative method. A summary of the acquired results would not affirm the relationship between the budget deficit and current account deficit, consumption and economic growth in the period of study in high-income countries. This relationship remains in force in middle and low income countries, in other words Ricardian equivalence is rejected in these countries.

Bluedorn and Leigh (2011) investigate the effect of fiscal consolidation on the current account. They examined contemporaneous policy documents, including Budget Speeches, Budgets, and IMF and OECD reports, to identify changes in fiscal policy motivated primarily by the desire to reduce the budget deficit, and not by a response to the short-term economic outlook or the current account. Estimation results based on this measure of fiscal policy changes suggest that a 1 percent of GDP fiscal consolidation raises the current account balance-to-GDP ratio by about 0.6 percentage point, supporting the twin deficits hypothesis. This effect is substantially larger than that obtained using standard measures of the fiscal policy stance, such as the change in the cyclically adjusted primary balance.

In Nigeria, Egwaikhide (1997) considering the fact that the magnitude of government has increased with amazing rapidity since the early 1980s, examines the effect of budget deficit on the current account balance in Nigeria, covering the period from 1973 to 1993. A macro econometric model that captures the salient interrelationships between government budgetary developments, credit creation and the current account balance is constructed. Evidence from the results suggests that budget policy affects the current account balance in Nigeria. In particular, simulation experiments show that budget deficit, engendered by increased expenditure, leads to a deterioration of the current account, whether it is financed through bank credit or external borrowing. This suggests that budget discipline is necessary for the achievement of external balance in Nigeria.

Furthermore, Ali (2002) revisits the relationship between government budget deficits and interest rates in Greece. Contrary to the results of Vamvoukas (1997) the evidence deduce from system estimations of error-correction models consistently denies any causal impact of the deficits on interest rates. Indeed, the high correlation observed between the two variables appears to the outcome of interest rates causing purposeful changes in the stance of fiscal policy. These findings stand up to numerous sensitivity tests and provide further support to the overwhelming evidence against the crowding-out hypothesis.

Also for Nigeria, Olopoenia (1986) adopted Morgan's analytical framework to evaluate the implications of fiscal operations in Nigeria's balance of payments developments. On the basis of the theoretical relationships established, the argument was advanced that because the source of financing the domestic budget balance comes mainly from the foreign budget balance, increased aggregate demand enhanced through the monetization of foreign exchange earnings would propagate inflation and create a balance of payments problem. In effect, this

evidence suggests that adequate care must be taken in financing budget deficit through credit creation in order to achieve the macroeconomic objective of price stability with external balance.

Oladipo and Akinbobola (2011) investigate the nature and direction of causality between budget deficit and inflation with a view to providing empirical evidence on budget deficit operation in stimulating economic growth through inflation in Nigeria. Secondary data were used in this study. Data on inflation rate, exchange rate, Gross Domestic Product (GDP) and budget deficit were collected from statistical Bulletin and Annual Report and Statement of Account published by the Central Bank of Nigeria (CBN) and the International Financial Statistics (IFS) published by International Monetary Fund (IMF). Granger Causality pairwise test was conducted to determine the causal relationship among the variables. The results indicate that there was no causal relationship from inflation to budget deficit ($F = 0.9$, $P > 0.05$), while the causal relationship from budget deficit to inflation was significant ($F = 3.6$, $P < 0.05$). This implies that a uni-directional causality from budget deficit to inflation exist in Nigeria. Furthermore, the result showed that budget deficit affects inflation directly and indirectly through fluctuations in exchange rate in the Nigerian economy.

Javid et al., (2011) empirically investigates the effects of fiscal policy or government budget deficit shocks on the current account and the other macroeconomic variable: real output, real interest rate and exchange rate for Pakistan over the period 1960-2009. The structural Vector Autoregressive model is employed; the exogenous fiscal policy shocks are identified after controlling the business cycle effects on fiscal balances. The results suggest that an expansionary fiscal policy shock improves the current account and depreciates the exchange rate. The rise in private saving and the fall in investment contribute to the current account improvement while the exchange rate depreciates. The twin divergence of fiscal deficit and current account deficit is also explained by the output shock which seems to drive the current account movements and its co-movements with the fiscal balance.

In the same manner, Christiane and Isabel (2008) analyze the empirical relationship between fiscal policy and the current account of the balance of payments and consider how Ricardian equivalence changes this relationship. To do so, they estimate a dynamic panel threshold model for 22 industrialized countries in which the relationship between the current account and the government balance is allowed to alter according to the government debt to GDP ratio. The results show that for countries with debt to GDP ratios up to 90% the relationship between the government budget balance and the current account is positive, i.e. an increase in the fiscal deficit leads to a higher current account deficit. For very high debt countries this relationship however turns negative but insignificant, suggesting that a rise in the fiscal deficit does not result in a rise in the current account deficit. Implicitly this result suggests that households in very high debt countries tend to become Ricardian. Estimating the same model for the 11 largest euro area countries shows that the relationship between the government balance and the current account turns statistically insignificant when the debt to GDP ratio exceeds 80%.

Since, the early days of independence Nigeria's fiscal operation and current account position has been characterized by deficits and imbalances. It is on this note, that Olanikpekun (2012) investigates the relationship between budget deficit and current account balance in Nigeria from 1960-2008. Ordinary least square was first explored to determine the effect of budget deficit on current account balance in Nigeria. Various diagnostic tests preceded cointegration analysis. In order to capture the short-run disequilibrium situation among the variables, namely current account balance, budget balance, investment and private savings, an error correction model was estimated as a follow up to cointegration analysis. Estimation of long-run elasticities was done from the computed autoregressive distributed lag. Thereafter Granger causality test was conducted to determine the causal relationship among the variables. Ordinary least square result show that a unit increases in budget deficit will cause 0.71 unit increase in current account balance. Bound cointegration test established a long run relationship among the variables. Evidence from the error correction model shows that 1% change in budget deficit will cause 0.67% change in current account balance. The empirical findings further indicate that there is a bi-directional relationship between budget deficit and current account balance as revealed by the Granger causality test. The findings support the twin deficits hypothesis for Nigeria.

Furthermore, Somia et al., (2011) examine the empirical relationship between budget deficit and current account deficit in case of Pakistan over the period of 1971 to 2008, using autoregressive distributed lag (ARDL) approach in order to test the validity of the Keynesian stance, which, states that there is positive and significant relationship between the said variables. The results show that in case of Pakistan, the long run Coefficients of control variables (GDP, ER and INT) appeared to be significant and the most significant variable is budget deficit. Hence, the Keynesian stance is valid in case of Pakistan. The feedback coefficient is negative and

significant suggesting that about 35% disequilibrium in the previous period is corrected in current year. They find a stable long run relationship between budget deficit and trade deficit as indicated by the CUSUM and CUSUMq stability test.

Kumhof et al., (2012) investigate the empirical and theoretical link between increases in income inequality and increases in current account deficits. Cross-sectional econometric evidence shows that higher top income shares, and also financial liberalization, which is a common policy response to increases in income inequality, are associated with substantially larger external deficits. To study this mechanism they developed a DSGE model that features workers whose income share declines at the expense of investors. Loans to workers from domestic and foreign investors support aggregate demand and result in current account deficits. Financial liberalization helps workers smooth consumption, but at the cost of higher household debt and larger current account deficits. In emerging markets, workers cannot borrow from investors, who instead deploy their surplus funds abroad, leading to current account surpluses instead of deficits.

Eberechukwu & Maxwell (2012) examine the determinants of current accounts balance in Nigeria with emphasis on oil-related variables, using the Johansen-Julius VAR co-integration estimation, the impulse response function and the variance decomposition analysis. The results show that oil price, oil balance and oil revenue are positively related with the current account, with only oil wealth having a significant negative impact in the long-run. They find that the impact of oil price on the current account balance is only significant in the short-run. The variance decomposition analysis indicates that the variance in the current account is better explained by own shocks followed by shocks to oil price, oil wealth balance and fiscal balance

Oladipo et al., (2012) examine the effects of twins' deficits in Nigeria for the period 1970-2008 using Secondary time-series data and econometric techniques. The results show a bidirectional causal relationship between budget deficits and trade deficits in Nigeria. The study concludes that an appropriate policy measures to reduce budget deficits could play an important role in reducing trade deficit and complement this with budget-cut policies via a coherent package that focus on policies for export promotion, productivity improvement and exchange rate, amongst others.

Sophocles et al., (2012) commissioned this study with the aim of studying the main macroeconomic, financial and structural factors that shaped current account developments in Greece over the period from 1960 to 2007 and discuss these developments in relation to the issue of external sustainability. Concerns over Greece's external sustainability have emerged since 1999 when the current account deficit widened substantially and exhibited high persistence. The empirical model used, which theoretically rests on the intertemporal approach, treats the current account as the gap between domestic saving and investment. They examined the behaviour of the current account in the long run and the short run using co-integration analysis and a variety of econometric tests to account for the effect of significant structural changes in the period under review. Results suggest that a stable equilibrium current account model can be derived if the ratio of private sector financing to GDP, as a proxy for financial liberalisation, is included in the specification. Policy options to restore the country's external sustainability are explored based on the estimated equilibrium model.
Nozar and Ernie (n.d), employed structural vector auto regression (VAR) to test the hypothesis that innovations in government budget deficit are positively transmitted to trade deficit for middle Eastern and Northern African Economies of Bahrain, Egypt, Iran, Jordan, Kuwait, Morocco, Oman, Nigeria, Syria, Tunisia, Turkey and Yemen in the Middle East subcontinent. The empirical findings suggest that the incidence of twin deficits appears to be country specific. The observed cross-country variations with regard to the effects of fiscal deficits on current account deficits tend to confirm that the dynamic relationship between the two deficits is subject to change depending on the underlying tax system, trade patterns and barriers, monetary regimes, the exchange rate and a complex host of internal and international forces that shape a country's economic status in the global economy. Their findings further indicate no significant relationship between changes in budget deficits and changes in the current account for Egypt, Iran, Morocco, Syria, Nigeria, Tunisia, and Bahrain. By contrast, a reversed causality is observed running from ΔCAB_t to ΔGBB_t for Egypt, Jordan, Oman, Syria and Yemen. In the case of Yemen, changes in budget deficits in response to changes in the current account are delayed for at least one period since ΔGBB_{t-2} is statistically significant while ΔGBB_{t-1} is not. In Egypt and Syria, changes in budget deficits in response to changes in trade deficits are delayed for at least one period because ΔCAB_{t-2} is statistically significant while CAB_{t-1} is not.

The plethora of empirical literature reviewed above, each has investigated the possible causal correspondence between budget deficit and current account deficit using the five possible scenarios as theoretical foundation. All have employed co integration analysis and granger causality tests for the parameter estimation. Most of the

studies specified bi-variate VAR model, while some others augmented the two variable VAR model with some other critical variables as control to avoid the problem misspecification. Such variables include: real interest rate, real exchange rate, real output and real money supply. In all of the survey, the author is yet unaware of any of the studies that have included trade openness in the model for investigating the causal relationship between government budget balance and the current account imbalance. Bearing in mind the likely influence of this variable on the stance of both budget and current balances, which may be of great consequence, this study, in a bid to remedy this lacuna, incorporates trade openness into the analysis of the co movements in macroeconomic variables of budget deficits, money interest rates, exchange rates and the current account balance in the short and long runs using co integration approach. Furthermore, this model intends to use real GDP annual innovations (growths) rather than the absolute volume as identified in most of the reviewed empirical literature and finally, we employed real market lending interest rate which drives developments in private investment, in place of using prime lending rate/bank discount rate as observed in most of the reviewed studies that employed this variable. These provide enough justification for the study.

3. Data and Methodology

Twin deficit hypothesis mainly states that government budget deficits will cause trade deficits. However; the twin-deficit hypothesis rests on the assumption that the relationship between fiscal deficits and private consumption is a positive one as suggested by the Keynesian model. This is not necessarily true. In theoretical models, the relationship between fiscal policy and private consumption depends largely on whether Ricardian equivalence is assumed. This equivalence theorem states that for a given path of government expenditures, the timing of taxes should not affect the consumption decision made by individuals paying the taxes (Christiane and Isabel, 2008). In concurrence, Barro (1974) asserts that the simple idea behind the theorem is that rational economic agents realize that substituting taxes today for taxes plus interest tomorrow via government debt financing is the same.

3.1 Model Specification

Twin deficit hypothesis mainly states that government budget deficits will cause trade deficits. However, this is not the only theoretically possible relationship between the budget and the trade deficits. The other extreme of Ricardian equivalence hypothesis, holds that it is also possible that the two deficits are not related at all. In the light of the above, this study investigated these hypotheses of twin deficits and twin divergence or Ricardian equivalent for South Africa for the periods 1960 – 2012 using bi-variate and multi-variate (VAR) models based on co–integration analysis and the error correction model (ECM) strategy. This enabled us examine the relationship between internal and external deficits in both long and short-run frameworks.

Higgins & Klitgaard (1998), Nozar & Loretta (2006) amongst others, define gross national product (GNP) as the sum of income derived from producing goods and services for private consumption (C), private investment (I), government purchases of goods and services (G), and exports (X). Consistent with the standard GNP identity, we treat imports (M) as a negative item to avoid double counting of consumption or investment goods purchased at home but produced abroad. To this effect, GNP is represented by:

$$GNP = C + I + G + X – M, \quad (1)$$

Where X - M signifies net exports plus net factor income. A second basic equation in the national income accounts is established on the theory that income received by individuals has four possible uses of being consumed “C”, saved “S” (private saving), paid in taxes “T”, or transferred abroad “Trf”. Because GNP is simply the sum of the income received by all individuals in the economy, we have:

$$GNP = C + S + T + Trf, \quad (2)$$

By equating the two expressions for GNP developed above, canceling out consumption (C) common to both expressions, and rearranging terms, we derive the external and internal balance equation as:

$$X - M - Trf = (S - I) + (T - G), \quad (3)$$

Where, (X - M – Trf) = current account balance (CAB) and [(S - I) + (T - G)] = government budget balance (GBB). In other words, the current account balance is equal to the difference between private saving and investment, and the gap between government tax receipts and government expenditures on goods and services.

At this point, we consider it plausible to follow the framework adopted by Aqeel and Nishat (2000) to define the relationship between budget deficit and current account deficit as:

$$CAB = [(S - I) + (T - G)] \quad (4)$$

Where CAB is the current account balance, (S - I) represents private savings less private investments and (T – G) indicates total government tax receipts minus total government expenditures on goods and services.

In other words, the current account balance is equal to the difference between private saving and investment, and the gap between government tax receipts and government expenditures on goods and services (government budget balance, GBB). Thus, equation 4 expressed in a more clear term would appear as:

$$CAB = GBB \quad (5)$$

We suppose that current account balance (CAB) and government budget balance (GBB) are jointly determined by a two variable VAR with constant as the only exogenous variable. With two lagged values of the endogenous variables, the VAR (2) is expressed as:

$$CAB_t = a_{11}CAB_{t-1} + a_{12}CAB_{t-2} + \beta_{11}GBB_{t-1} + \beta_{12}GBB_{t-2} + c_1 + e_{1t} \quad (6)$$

$$GBB_t = a_{21}CAB_{t-1} + a_{22}CAB_{t-2} + \beta_{21}GBB_{t-1} + \beta_{22}GBB_{t-2} + c_2 + e_{2t} \quad (7)$$

Then for the purpose of investigating the extent to which long-run causal linkage exist from budget deficits to current account deficits and vice versa, equations 6 and 7 are augmented with their respective error correction terms lagged one period denoted by δ. This transform the above VAR (2) models to vector error correction models (VECM).

Where a, β, c are parameter to be estimated and e, stochastic error term.

While equation (5) shows that current account balance is associated with the gap between domestic saving and investment, it does not provide a theory of how the current account balance is determined. In effect, this phase of the investigation is bereaved of any attempt to incorporate the complex theoretical linkages between exchanges rates, domestic interest rates and other contributing factors that could influence the magnitude of savings, investment, export and import flows. Though, since both current account and government budget data are reported in the same frequency, equation (5) may still offer a satisfactory basis for empirical research and trade policy debate, the absence of the critical macroeconomic fundamentals constitutes a significant gap that may impair the results of this study and thus needs to be filled. This suggests the need for multivariate formulation by augmenting equation 5 with real GDP, bank lending rate, exchange rate and trade openness as follows:

$$CAB = f(GBB, RER, LENDRATE, RGDP, OPNESS) \quad (8)$$

The role of exchange rate and interest rate which acts as a source transmission mechanism, are proven to be important in the innovation of twin deficits debate (Evan & Chan, 2003). For the purpose of estimation, the above functional notation is expressed in multivariate linear model with intercept as follows:

$$CAB = a_0 + a_1GBB + a_2RER + a_3LENDRATE + a_4RGDP + a_5OPNESS + \mu \quad (9)$$

For more accurate prediction of the relationship between the explained and the explanatory variables and other usual statistical reasons, equation (9) is further transformed to log-linear model excepting for the real GDP innovations with mixtures of positive and negative values in the time series variables.

$$LCAB = a_0 + a_1LGBB + a_2LRER + a_3LLENDRATE + a_4RGDP + a_5LOPNESS + \mu \quad (10)$$

Where CAB is the current accounts balance, GBB = government budget balance, RER = real exchange rate of the domestic currency to a USD, LENDRATE proxied real domestic lending interest rate, RGDP means real GDP innovations and OPNESS represents ratio of total trade to GDP, a_0 is a constant, $a_{1;}\ldots;a_5$ indicate the explanatory power of the variable or correlation coefficients, and μ is the stochastic error term, while L is the logarithm. One motivation for using the log-linear model for estimations is the ease of output interpretation, because under a log-linear model the rates change at a constant percent per year, when comparing trends across divergent group variables or data where the rates are very different, the advantage of a log-linear model is that the annual percentage change (APC) is a metric which makes sense to compare across widely different scales and again is that log-linear models are flexible. (www.google.com.ng/#q). The above equations (8-10) were

intended just to predict the linear function of the employed variables, but for the purpose of investigating the short and long run causal links between fiscal deficits and current account imbalance, VAR (6), lagged 2 period models are specified and evaluated as indicated from equations (11-16).

$$CAB_t = a_1 + a_{11}CAB_{t-1} + a_{12}CAB_{t-2} + b_{11}GBB_{t-1} + b_{12}GBB_{t-2} + C_{11}RER_{t-1} + c_{11}RER_{t-z} + d_{11}Lendrate_{t-1} + e_{11}RGDP_{t-1} + e_{12}RGDP_{t-2} + f_{11}Opness_{t-1} + f_{12}Opness_{t-2} + \varepsilon_{1t} \quad (11)$$

$$GBBt = a_2 + a_{21}CAB_{t-1} + a_{22}CAB_{t-2} + b_{21}GBB_{t-1} + b_{22}GBB_{t-2} + C_{21}RER_{t-1} + C_{22}RER_{t2} + d_{21}Lendrate_{t-1} + d_{22}Lendrate_{t-2} + e_{21}RGDP_{t-1} + e_{22}RGDP_{t-2} + f_{21}Opness_{t-1} + f_{22}Opness_{t-2} + \varepsilon_{2t} \quad (12)$$

$$RER_t = a_3 + a_{31}CAB_{t-1} + a_{32}CAB_{t-2} + b_{31}GBB_{t1} + b_{32}GBB_{t2} + c_{31}RER_{t-1} + c_{32}RER_{t-2} + d_{31}Lendrate_{t-1} + d_{32}Lendrate_{t-2} + e_{31}RGD_{t-1} + e_{32}RGDP_{t-2} + f_{31}Opness_{t-1} + f_{32}Opness_{t-2} + \varepsilon_{3t} \quad (13)$$

$$Lendrate_t = a_4 + a_{41}CAB_{t-1} + a_{42}CAB_{t-2} + b_{41}GBB_{t-1} + b_{41}GBB_{t-1} + b_{42}GBB_{t-2} + c_{41}RER_{t-1} + c_{42}RER_{t-2} + f_{41}Opness_{t-1} + f_{42}Opness_{t-2} + \varepsilon_{4t} \quad (14)$$

$$RGDP_t = a_5 + a_{51}CAB_{t-1} + a_{52}CAB_{t-2} + b_{51}GBB_{t-1} + b_{52}GBB_{t-2} + c_{51}RER_{t-1} + c_{52}RER_{t-2} + d_51Lendrate_{t-1} + d_{52}Lendrate_{t-2} + e_{51}RGDP_{t-1} + e_{52}RGDP_{t-2} + f_{51}Opness_{t-1} + f_{52}Opness_{t-2} + \varepsilon_{5t} \quad (15)$$

$$Opness_t = a_6 + a_{61}CAB_{t-1} + a_{62}CAB_{t-2} + b_{61}GBB_{t-1} + b_{62}GBB_{t-2} + c_{61}RER_{t-1} + c6RER_{t-2} + d_{61}Lendrate_{t-1} + d_{62}Lendrate_{t-2} + e_{61}RGDP_{t-1} + e_{62}RGDP_{t-2} + f_{61}Opness_{t-1} + f_{62}Opness_{t-2} + \varepsilon_{6t} \quad (16)$$

The motivation for using multi-variate VAR models stem from the fact that Vamvoukas (1997), in his investigation of twin deficits for Greece, estimated bi-variate model and found no existence of co-integration between the two deficits, but when he augmented the model with GDP as the third variable, he found strong and stable co-integration between the two deficits. Furthermore, in testing for causality between budget and trade deficits, it is most appropriate to employ a multivariate rather than a bivariate framework in order to avoid distorting the causality inferences due to the omission of relevant variables, and research into the twin deficits story requires explicit examination of the entire gamut of variables that may relate meaningfully to trade and government deficits behavior (Tallman and Rosensweig, 1991). Akaike's information criterion (AIC) was employed in the selection of the VAR lag length being guided by the lag length which yields the smallest value for our information criterion.

Decision Rules:

Abstracting from Koop (2005), the following conditions govern the findings of this study:

(1) If equation 11 is evaluated and $b_{11} = b_{12} = 0$, it suggests that budget balance position does not significantly cause current account balance, which suggests that twin deficit hypothesis is violated.

(2) For equation 12, if $a_{21} = a_{22} = 0$, it indicates that current account deficits do not significantly cause Budget deficits, which will mean that current account targeting scenario is equally violated.

(3) And if $b_{11} = b_{12} = 0$ and $a_{21} = a_{22} = 0$, provides evidence of no bi-directional relationship between current account balance and government budget balance in Nigeria.

(4) If any cointegrating equation is identified among the variables, which suggests evidence of long-run steady state equilibrium relationship among the variables, then the models are best specified in VECM (Engle-Granger, 1987). In this instance, equations 11 – 15 are retained but each is augmented with an additional regressor of its error term lagged one period designate by $e_{1t-1},\ldots,e_{6t-1,}$ with their coefficients of $\lambda_{1,\ldots,}\lambda_{6,}$ for equations 11 – 15 respectively. This transforms the VAR (2) models to VEC (2) models to enable us test for the existence of long run causal link between fiscal deficit and current account imbalance.

(5) Equations 11 and 12 as adjusted with inclusion of $\lambda_1 e_{1t-1}$ and $\lambda_2 e_{2t-1}$ respectively are evaluated for flow of long run causality from budget deficits to current account deficits and vice – versa. If equation 11 as adjusted is evaluated and $b_{11} = b_{12} = \lambda_1 = 0$ indicates no long-run causal link from budget deficits to current account deficits and if for equation 15 as adjusted $a_{21} = a_{22} = \lambda_2 = 0$ suggests no significant long run causal association from current account balance to budget deficit.

3. 3 Data Discussion

The six variables employed in this study are discussed below.

The Current Account Balance (CAB): By current account balance we mean net trade in goods and services, plus net earnings from rents, interests, profits, dividends and net transfer payments (such as pension funds and salaries). Trade balance, analogous to current account balance (CAB), in most instances is stated as the value of

net exports (X – M). In this study we measure current account balance as the ratio of the values of total credits in current accounts to the total debits in the current accounts. The x/m ratio has been employed in many empirical analyses to determine trade balance exchange rate relationship (Rincon, 1998; Bahmani-Oskooee and Brooks, 1999 and, Gupta-Kapoor and Ramakrishnan, 1999). One reason adduced for its use according to Bahmani-Oskooee, (1991) is that this ratio is not sensitive to the unit of measurement and can be interpreted as nominal or real trade balance. Furthermore, this ratio in a logarithmic model yields the exact point elasticity rather than approximation (Boyd et al, 2001).

Government Budget Balance (GBB): In the same vein, government budget balance, for the same reasons adduced above, will be proxied as the ratio of total revenue accruing to federal government to total expenditure of the federal government on goods and services. Further motivation for preferring this unit of measurement is that it saves us the quagmire of taking negative values to logarithm in the process of generating log-linear model. Such transformation is required for more robust estimation results.

Real exchange rate (RER): A real exchange rate between two currencies is calculated as the product of the nominal exchange rate and relative price levels in each country. To this effect, the real exchange rate variable will be derived by multiplying the world price (Pw) by the nominal exchange rate and dividing the product by the domestic price index (NER*Pw/DCPI) to transform the data into index form.

Real Bank Lending Rate (LENDRATE): This refers to nominal interest rate as adjusted for inflation. The relationship between the inflation rate and the nominal and real interest rates is given by the expression: (1+r) = (1+n)/ (1+i). However for low levels of inflation we can use the much simpler Fisher Equation to calculate the real interest rate as: r = n – i. where r, n and i represent real interest rate, nominal interest rate and inflation rate respectively.

Real Gross Domestic Product Growth: RGDP will be proxied by the nominal gross domestic product deflected with the GDP deflector to control for inflationary trend. Then the annual innovations in the real GDP provide approximation for real GDP growth.

Openness (OPNESS): Openness refers to the degree of exposure of the domestic economy to the external economic environment and can be proxied by the ratio of total trade (exports + imports) to the gross domestic product (GDP).

3.4 Data Source

The analysis covers time series data spanning across 1961-2012, and sourced primarily from the IMF International Financial Statistics on-line, the Central Bank of Nigeria (CBN) statistical bulletin (2010), the IMF International Financial Statistics On-line, 2012.The IMF Direction of Trade (DOT) and Government Financial Data (GFD) on-line, 2012.

3.5 Econometric Procedure

Economic theory provides ample explanations of the possible interrelationships between current account and budget balances. However, their validity appears to be an empirical issue. Abstracting from recent literature we investigate the twin deficits hypothesis by employing cointegration analysis.

Unit Root Test

The first step in a cointegration analysis is to examine the stationary status of each of the univariate series to avoid the problem of spurious regression. The Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP) unit root tests are employed to test this integration level and the possible co-integration among the variables, (Dickey and Fuller, 1981; Phillips and Perron, (1988). A test of stationary that has become widely popular over the past several years is the unit root test. The Augmented Dickey–Fuller (ADF) and Phillip Peron (PP) tests are among the famous unit root tests to check the stationarity of economic variables and these will be employed in this study. If the data set indicates integration property of the order 1(1) for the employed variables, then we proceed to test for cointegration among the variables employing Johansen (1991), Johansen and Juselius (1994) test techniques.

Cointegration Test

An informal method could be used; by looking at a time plot of the variable and checking if there is any obvious trend in the data. Co-integration means that despite being individually non-stationary, a linear combination of two or more time series can be stationary. There are three main approaches to testing for co-integration: The

Engle-Granger two-step method, the Johansen procedure, and the Phillips-Ouliaris Co-integration approach. According to Alkswani (2000), the Maximum Likelihood procedure suggested by Johansen (1988 and 1991) and Johansen and Juselius (1990), is favored when the number of variables in the study exceeds two variables due to the possibility of existence of multiple co-integrating vectors. Gonzalo (1994), in the same vein is still of the view that the advantage of Johansen's test is not only limited to multivariate case, but it is preferable than Engle-Granger approach even with a two-variable model. Two statistic tests are employed in determining the number of co-integrating vectors; the Trace test and the Maximal eigenvalue test. The first one tests the null hypothesis that the number of co-integrating vectors equals or less than (r), where r is the number of variables.

Vector Error Correction Model

If co-integration is accepted, it suggests that the model is best specified in the first difference of its variables with one period lag of the residual [ECM (-1)] as an additional regressor. To this effect we will run the regressions in their first differences. However by taking the first differences, we lose the long-run relationship stored in the data which suggests that we have to use the variables at both their levels and first differences. The advantage of using error correction models (ECM) is that it incorporate the variables at both their levels and first differences and by so doing, ECM captures the short-run disequilibrium situations as well as the long-run equilibrium adjustments between variables (Mukhtar et al., 2007).

Let us consider variables GBB_t and CAB_t, where GBB_t is the actual budget deficit in real terms, CAB_t, is the current account balance in real terms, and t stands for time trend. If *GBB* and *CAB* are considered to be stochastic trends and if they follow a common long-run equilibrium relationship, then *GBB* and *CAB* should be cointegrated. Cointegration is a test for equilibrium between non-stationary variables integrated of same order. According to Engle and Granger (1987), cointegrated variables must have an ECM representation. The main reason for the popularity of cointegration analysis is that it provides a formal background for testing and estimating short and long-run relationships among economic variables. Furthermore, the ECM strategy provides an answer to the problem of spurious correlations. If *GBB* and *CAB* variables are co integrated, the corresponding error correction representations must be included in the system so that by so doing, one can avoid misspecification and omission of the important constraints, but on the other hand, if the variables are not integrated of the same order or are not cointegrated, the VECM cannot be applied either (Granger, 1988). According to Granger, in a co-integrated system of two series expressed by an ECM representation, causality must run in at least one direction. In estimating the models, we will therefore rely on the developments in the co-integration theory otherwise referred to as the "error correction mechanism" (*ECM*). This was developed to overcome the problems of spurious regression often associated with the non-stationary times series and to generate valuable long-run relationship simultaneously (Engle and Granger 1987; Hendry, 1986). The decision rules within the ECM representation of Equations 12 and 13 are that: CAB_t does not Granger cause *GBB* if all $a_{3i} = 0$ and $a_1 = 0$ and equivalently, GBB_t, does not Granger cause CAB_t if all $b_{2i} = 0$ and $b_1 = 0$.

Granger Causality Test

Abstracting from Mukhtar et al., (2007), if a pair of data series is co-integrated, and then there must be Granger Causality in at least one direction, which reflects the direction of influence between the series. Theoretically, If the current and lagged term of a time series variable, say $X_{t,}$ determine another time series variable, say $Y_{t,}$, then there exist granger causality relationship between X_t and Y_t , in which Y_t is granger caused by X_t. From the above analysis, the model is specified as follows:

$$\Delta Y_t = \beta_{11}\Delta Y_{t-1} + \ldots + \beta_{1n}\Delta Y_{t-n} + \beta_{21}\Delta Y_{t-1} + \ldots + \beta_{1n}\Delta Y_{t-n} - \gamma\,(Y_{t-1} - \alpha X_{t-1} - \delta) + \varepsilon_{1t} \quad (25)$$

$$\Delta X_t = \beta_{31}\Delta Y_{t-1} + \ldots + \beta_{3n}\Delta Y_{t-n} + \beta_{41}\Delta Y_{t-1} + \ldots + \beta_{4n}\Delta Y_{t-n} - \gamma\,(Y_{t-1} - \alpha X_{t-1} - \delta) + \varepsilon_{1t} \quad (26)$$

The above two equations are used to test the null hypothesis that causality runs neither from X to Y nor from Y to X.

4. Empirical Results

Data analysis and interpretation is intended to transform the data collected into credible evidence about the development of the intervention. Data analysis involves working to uncover patterns and trends in data sets while interpretation involves explaining those patterns and trends. Data analysis is considered an important step and heart of the research in any research work. When data has been collected with the assistance of relevant tools and methods, the next logical step, is to analyze and interpret the data with a view to arriving at empirical solution to the problem. For this study, we employ descriptive statistical techniques like mean, standard deviation, coefficient of variation, and co-integration analysis.

4.1 Summary Statistic of Variables used for South Africa

This is intended to provide the preliminary test on the observed economic variables to enable us express opinion on the nature of innovations in each of the employed data series. The data on LCAB, LGBB, LRER, LLENDRATE RGDP and LOPNESS for the period of 1960– 2012 for South Africa are presented in tables 1 as their means, standard deviations (SD) and coefficient of variations (CV).

Table 1: Summary Statistics of Variables Used for South Africa

Variables	Details	Mean	SD	CV
Lcab	Current Account Balance	0.740	0.121	0.164
Lgbb	Government Budget Balance	0.868	0.071	0.082
Lrer	Real Exchange Rate	5.644	1.674	0.292
Llendrate	Real Lending Rate	13.164	4.810	0.365
Rgdp	Real Gross Domestic Product	0.046	0.038	0.826
Lopness	Opness	0.542	0.072	0.133

Source: Author's calculation based on data from IMF-IFS, and CBN Statistical Bulletin,2012.

Coefficient of Variation (CV) is the percentage variation in mean, standard deviation being considered as the total variation in the mean. Coefficient of Variation can be used to compare the unpredictability of two or more series. The series of data for which the coefficient of variation is large indicates that the group is more erratic and thus less stable or less uniform and vice versa. To this effect, we analyze the coefficient of variations of South Africa as presented in tables 1 above with a view to establishing the degree of variability or stability of the macroeconomic variables. For South Africa as shown in table1, the observed variables indicate 16.4%, 8.2%, 29.2%, 36.5%, 82.6% and13.3% in that order. Variables of particular interest is the (CV) of RGDP innovations of 82.6% for South Africa. This high percentage indicates that South Africa may not have experienced stable and sustainable growth in her real gross domestic product within the period under review. In the same vein, the low percentages of 16.4% and 8.2% for current account and government budget balances suggests that within the period under review, South Africa was running sustainable internal and external balances.

4.2 Unit Root Test

An implicit assumptions that underlie regression analysis involving time series data is that such a data series is stationary (Gujarati, 1995). In this context, testing for stationary or otherwise of the employed data sets becomes of essence in this analysis. Hatemi-J, (2001) states that a stochastic process generating data is said to be stationary or 1(0), ie integrated of the order zero, when the following assumptions are not violated: (1) $E(y_t) = \mu$, the mean value of y_t is constant and independent of time trend, (2) Var $(y_t) = \sigma^{2,}$ the variance of y_t is constant across time trend and (3) Cov $(y_t, y_{t-s}) = \gamma$ s, the covariance is dependent only on the distance between the observation and independent of time *t.* Hence, on the above note, Stationary means that the marginal distribution of the process does not change with time. Otherwise stated, implies that the mean and the variance of the time series data, stay the same over time. So anything that violates it will be deemed non-stationary. It is common for time series variables to demonstrate signs of non-stationary. This typically suggests that both the conditional means and variances of macroeconomic variables trend upwards over time (Rose, 1990). On this note we explicitly test for presence of non-stationary, both as a first step in exploring the characteristics of the employed data, and for the fact that the manifestation of such non-stationarity often has significant econometric implications. A test of stationarity that has become widely popular over the past several years is the unit root test. According to Ebrahim, Alawin & Bashayreh (2012), Augmented Dickey–Fuller (ADF) test is one of the famous unit root tests to check the stationarity of economic variables. Many economic time series may be non-stationary and need to be differenced (d) times until reaching stationary. Then, a time series (like X) is said to be integrated of order (d), denoted by X~I (d). To carry out a prescribed test for stationary, the Augmented Dickey Fuller (ADF) test is employed by estimating the following regression equation. The testing procedure for the ADF test is the same as for the Dickey–Fuller test but it is applied to the model.

$$\Delta y_t = \alpha + \beta t + \gamma y_{t-1} + \delta_1 \Delta y_{t-1} + \cdots + \delta_{p-1} \Delta y_{t-p+1} + \varepsilon_t,$$

where $\alpha$is a constant, $\beta$the coefficient on a time trend and $p$the lag order of the autoregressive process. Imposing the constraints $\alpha = 0$and $\beta = 0$corresponds to modeling a random walk and using the constraint $\beta = 0$corresponds to modeling a random walk with a drift,where y_t is a macroeconomic variable at time *t*, ε_t is the stochastic error term that is generated from a white noise process and understood to be independently and identically distributed with zero mean and constant variance. In other words, the first difference of y_t *is* regressed

against a constant, a time trend (t = 1, 2 , ..., T), the first lag of y_t and, if necessary, lags of Δy_t. Sufficient lags of Δy_t must be included to ensure no autocorrelation in the error term. If a unit root (non-stationarity) exists, then γ would not be statistically different from zero. The test for a unit root is based on the t-statistics on the coefficient of the lagged dependent variable. This has to be compared with specific calculated critical values and in event of the calculated value being greater than the critical value, then the null hypothesis of a unit root is rejected, and the variable is taken to be stationary. The Augmented Dickey-Fuller test though frequently and widely used because of its ability to take into consideration the autocorrelation adjustments, it has the lapses of arbitrary choice of the proper order of autocorrelation. It is in recognition of this that we further employ the Phillip-Peron (1988) method which is robust to any form of autocorrelation (Song, 1997). One advantage of the PP tests over the ADF tests is that the PP tests are robust to general forms of heteroskedasticity in the error term u_t. Another advantage is that the user does not have to specify a lag length for the test regression. The results of *ADF* and *PP* as presented in tables 2 below for South Africa show that in all cases, all the employed variables become stationary at least in their first difference.

Table2: Unit Root Test Results for South Africa

		ADF		PP		Conclusion
Variables	**Level/First Diff.**	**Intercept**	**Trend/ Intercept**	**Intercept**	**Trend/ Intercept**	
LCAB	Level	-2.603	-2.904	-2.127	-3.262	1(1)
	First Diff.	-80661	-8.721	-8.673	-8.905	1(0)
LGBB	Level	-30367	-3.802	-3.367	-3.802	1(0)
	First Diff.	-7.793	-7.707	-9.428	-9.261	1(0)
LRER	Level	-2.916	-3.733	-2.862	-3.641	1(0)
	First Diff.	-6.648	-6.576	-10.645	-10.418	1(0)
LLendrat	Level	-2.330	-1.566	-1.856	-1.391	1(1)
	First Diff.	-6.407	-6.082	-5.695	-9.013	1(0)
RGDP	Level	-2.449	-0.782	-2.029	-0.489	1(1)
	First Diff.	-4.877	-5.221	-4.854	-5.215	1(0)
LOPNES	Level	-2.376	-2.452	-2.391	-2.430	1(1)
	First Diff.	-6.672	-6.615	-7.785	-8.427	1(0)

Notes: (i) Unit root tests performed using Eview 6.0
(ii) 95% critical value ADF/PP statistic (with trend) = -2.923
(iii) 95% critical value ADF/PP statistic (with trend & intercept) =3.504

The results of *ADF* and *PP* as presented in tables 2 above shows that at 95% level of significance, only LGBB and LRER are found to be stationary at level, while the rest of the employed variables in the study assume stationarity in their first difference. This suggests that all the employed variables for estimation of the equations are quiet suitable for purposes intended after at least one period lag.

4.3 Tests for Cointegration

With the establishment that the variables employed are 1 (1), we test the null hypothesis that, there is no stable long-run relationship existing between Fiscal balance innovations and developments in current account balance in South Africa. We employ Johansen and Juselius Trace test for co-integrating vectors between the explained and the explanatory variables in equation 8 with a view to determining the number of co-integrating equations. The concept of co-integration was first instigated by Granger (1981) and modified by Engle and Granger (1987), Johansen (1988) and Johansen and Juselius (1990), amongst others. For this study, we employ the Johansen and Juselius (1990) Trace test procedure. Therefore, with the manifestation of unit root 1(1) by variables of interest, which is a precondition for the existence of a stable linear steady-state relationship, we employ the trace test, which is based on the comparison of *Ho (r = o)* against the alternative H_1 $(r \neq o)$, where r indicates the number of co integrating vectors. The co integration test provides an analytical statistical framework for ascertaining the long run relationship between economic variables and the result of the trace test depends on the lag length of the vector error correction model (Maylene and Agbola, n.d.). Equation 10 is evaluated for co integration employing data for South Africa using trace test estimation methodology for co integration. The results of the co integration test are as scheduled in table 3 below:

Table 3: Cointegration Test for South Africa

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical value	Prob**
None	0.4974	92.191	95.753	0.085
At most 1	0.4441	58.475	69.818	0.285
At most 2	0.2675	29.699	47.856	0.734
At most 3	0.1315	14.440	29.797	0.815
At most 4	0.0898	7.527	15.494	0.517
At most 5	0.0577	2.913	3.841	0.087

Notes: (i) Cointegration tests performed using Eview 6.0
(ii) Trace test indicates no cointegrating equations at the 0.05 level
(iii) * denotes rejection of the null hypothesis at the 0.05 level

The results of the co integration test (Trace) among data set for South Africa suggest that the null hypothesis of no co integration *Ho (r= o)* cannot be rejected for the economy, as they indicate no co integrating equation among the variables of the model. This suggests that for South Africa, there is no long run steady-state relationship between the dependent and explanatory variables in the expressed equation 10. This implies that though the data sets for South Africa may be trending together (correlated), equilibrium relationships among them are not identified. This is clearly evident in the lack of significant causality from fiscal deficit to current account stance in the short-run as observed in table 4.

4.4 Tests for Granger Non Causality

Based on the outcome of the cointegration test which suggests that the null hypothesis of no cointegration cannot be rejected, we evaluate equation 11 to test for only short-run granger non causalities. The results of the VAR estimation to investigate the extent to which fiscal deficits cause current account deficits in the short run are as presented in table 4 below:

Table 4: Causality Test for Current Account Targeting for South Africa.
Vector Autoregressive Estimates (Equation 11)

Regressors	Parameter Estimate	T-Ratio	P-Values
Intercept	0.066	0.349	0.727
$LCAB_{-1}$	0.068	0.276	0.782
$LCAB_{-2}$	0.028	0.107	0.914
$LGBB_{-1}$	**0.011**	**0.998**	**0.319**
$LGBB_{-2}$	**0.005**	**0.446**	**0.655**
$LRER_{-1}$	0.000	0.142	0.886
$LRER_{-2}$	-0.000	-0.024	0.980
$RGDP_{-1}$	1.004	1.888	0.060
$RGDP_{-2}$	-0.269	-0630	0.529
LLendrate $_{-1}$	-0.832	-2.310	0.021
LLendrate $_{-2}$	0.705	2.046	0.041
$Lopness_{-1}$	0.641	4.171	0.000
$Lopness_{-2}$	0.063	0.429	0.667

Notes: $R^2 = 0.67$, DW. Statistic = 1.93

For equation 11 (VAR), the Results of the estimation as shown in table 4 indicate that $b_{11} = b_{12} = 0$. The values of the parameter estimates (coefficients) of b_{11}, and b_{12} are 0.011 (0.319) and 0.005 (0.655) respectively with the figures in brackets indicating their respective P-Values. These results indicate that the value of the coefficient of b_{11} and b_{12} of 0.011 and 0.005 are both not statistically different from zero even at 10% level of significance judging from their respective P-Values. These results suggest non existence of a significant causal link from government budget deficits to current account imbalance in the short run, indicating that twin deficits hypothesis is violated for South Africa in the short run. In effect, the null hypothesis that, $b_{11} = b_{12} = 0$ cannot be rejected for South Africa in the short run.

Furthermore, we test the null hypothesis that, developments in current account imbalance do not significantly cause innovations in fiscal deficit in South Africa. Here we test the second scenario which is referred to as current account targeting. This, just like the Twin Deficit Hypothesis, posits positive and significant causal relation between budget deficit and current account imbalance, but this time, with innovations in current account balance causing developments in government budget deficit.

Table 5: Granger Non Causality Test Results for South Africa.
Vector Autoregressive Estimates (Equation 12)

Regressors	Parameter Estimates	T-Ratio	P-Values
Intercept	0.438	1.714	0.087
$LCAB_{-1}$	**-0.187**	**-1.544**	**0.124**
$LCAB_{-2}$	**-0.026**	**-0.201**	**0.840**
$LGBB_{-1}$	0.695	5.250	0.000
$LGBB_{-2}$	0.071	0.547	0.584
$LRER_{-1}$	0.001	0.545	0.584
$LRER_{-2}$	0.000	0.116	0.586
$RGDP_{-1}$	-0.049	-0.934	0.351
$RGDP_{-2}$	0.005	0.102	0.918
$LLendrate_{-1}$	-0.029	-1.451	0.148
$LLendrate_{-2}$	0.023	1.369	0.172
$Lopness_{-1}$	-0.169	-0.357	0.720
$Lopness_{-2}$	0.195	0.408	0.683

Notes: $R^2 = 0.83$, DW. Statistic = 2.28

For equation 12 (VAR), the Results of the estimation as shown in table 5 indicate that $a_{11} = a_{12} = 0$. The values of the parameter estimates (coefficients) of a_{11} and a_{12} are -0.187 (0.124) and -0.026 (0.840) respectively with the figures in brackets indicating their respective P-Values. This suggests the non existence of a significant causal link from current account imbalance to government budget deficits in the short run. The results indicate that the current account targeting preposition is not established for South Africa in the short run. In effect, the null hypothesis that $a_{11} = a_{12} = 0$ cannot be rejected for South Africa in the short run. Therefore, for South Africa, the above results suggest that in short-run; evidence of current account targeting is not verified as in time frame no significant causal link flowing from current account deficits to fiscal imbalance is not detected. This suggests that there exists no significant causal relationship between budget balance innovations and developments in current account balance. This concept is of the view that since people are rational, they know that the reduction in taxes, resulting from the government expansionary fiscal policy of tax cut, is temporal and so they will save the extra disposable income to pay for the future higher taxes. By implication, this suggests that the national savings will not be affected because the decrease in government savings represented by increased fiscal deepening will be equitably compensated by the additional precautionary private savings for expected future increase in taxes. In effect, the results suggest that in the short-run, government budget balance is not a reliable instrument for the prediction of current account position in South Africa. However, this result contradicts the findings of Sadullah and Pinar (n.d) who with panel data analysis identifies the presence of twin deficits hypothesis for six emerging economies of Czech Republic, Brazil, Mexico, Colombia, Republic of South Africa and Turkey.

The above results provide evidence that in South Africa, consumers appear to be Ricardians in the short-run. This suggests that short term fiscal measures designed to stimulate aggregate demand may prove ineffective as consumers may reduce their consumption in order to save in anticipation of future tax increase. The results suggest that Ricardian equivalence hypothesis holds for South Africa in the short-run. This proposition, articulated by a classical economist, David Ricardo (1817) and popularized by Barro (1974), is of the view that policy shifts in the composition of public financing, (that is whether through debt or tax cuts) has no significant impact on real interest rates, aggregate demand, private spending, the exchange rate or the external accounts. Proponents of this view point out that while tax cuts have the effect of reducing public saving and enlarging the budget deficit, they increase private saving by an amount equivalent to the expected increase in the tax burden in the future years. This suggests that government budget deficits may not alter aggregate domestic savings and economic growth or the level of aggregate demand including demand for imports for the fact that far-sighted individuals fully capitalize the implied increase in future taxes associated with current tax cut. Otherwise stated, the theory implies that there is no visible correlation between the two anomalies. This has very serious implications for fiscal policy decisions for South Africa, because if this assertion is right, it may render fiscal policy impotent in the short-run.

Furthermore, we test for the current account targeting proposition, which just like the Twin Deficit Hypothesis posits positive and significant causal relation between budget deficit and current account imbalance, but this time, with current account balance causing government budget deficit. The results of the estimation are as presented in table 6 below:

Table 6: Vector Autoregressive Estimates (Equation 12)

Regressors	Parameter Estimates	T-Ratio	P-Values
Intercept	0.331	2.387	0.082
$LCAB_{-1}$	**0.663**	**3.618**	**0.000**
$LCAB_{-2}$	**-0.196**	**-1.004**	**0.316**
$LGBB_{-1}$	0.012	1.479	0.140
$LGBB_{-2}$	-0.003	-0.452	0.651
$LRER_{-1}$	-.0.002	-0.672	0.501
$LRER_{-2}$	0.002	0.405	0.682
$RGDP_{-1}$	0.243	0.620	0.535
$RGDP_{-2}$	-0.252	-0.726	0.468
$LLendrate_{-1}$	-0.199	-0.752	0.452
$LLendrate_{-2}$	0.0267	1.052	0.293
$Lopness_{-1}$	-0.051	-0.455	0.649
$Lopness_{-2}$	0.117	1.080	0.281

Notes: $R^2 = 0.50$, DW. Statistic = 2.13

For equation 12 (VAR) for South Africa, the Results of the estimation as shown in table 6 above indicate that $a_{11} = a_{12} \neq 0$. The values of the parameter estimates (coefficients) of a_{11} and a_{12} are 0.663 (0.000) and -0.196 (0.316) respectively with the figures in brackets indicating their respective P-Values. These results indicate that the value of the coefficient of a_{11} of 0.663 is statistically different from even at 1% level of significance. This suggests that the null hypothesis that, $a_{11} = a_{12} = 0$ is violated. The results suggest the existence of a significant causal link from current account imbalance to government budget deficits, in the short run. In effect, for South Africa, the current account targeting preposition is identified in the short run. This by implication suggests that for South Africa, the current account balance may prove to be a veritable policy instrument for predicting fiscal balance position, meaning that prudent current account management may provide the panacea for fiscal consolidation for South Africa at least in a short term.

4.5 Stability Test

To test for structural stability of the estimated coefficients and functional misspecification, we also plot the cumulative sum (CUSUM) using the information contained in the estimated residuals. According to the CUSUM (fig.1) test results in the appendix, the recursive residuals wandered within the critical 5% significant lines, which indicate the absence of structural change or misspecification in the estimated model and suggest that the stability of the parameter estimates is verified.

4.6. Summary of Findings

This study investigates the relationship between budget and current account balances and most importantly to identify which one to target in order to effect adjustment in the other. To achieve these fits, we opt to deploy the relevant variables with current account deficit (CAB) as the explained variable, and budget deficit (GBB) as explanatory variables, and augmented with real exchange rate (RER), real gross domestic product (RGDP), real interest rate (RIR), real trade openness (OPNESS)) as control variables. To gauge the suitability of these variables for purposes intended, we employ the ADF and PP test procedures. The results show that in all cases, the variables become stationary at most in their first difference at 1% level of significance for all the employed data series. This suggests that all the employed variables for estimation of specified equations are quiet fit for purposes intended. The twin deficits hypothesis has expressed a much professed tie between domestic budget deficit and current account imbalance. This has engendered extensive academic debate and empirical testing in the 1980's and the early 1990. According to Nozar & Loretta (2006) the causal relationship of the twin deficits provides five competing scenarios as: that budget deficits cause current account deficits; budget deficits and current account deficits are not casually related (Rcardian equivalence); there is bi-directional causality between the two macroeconomic variables; current account deficits cause budget deficits (current account targeting) and finally the scenario which suggests that the twin anomalies trend apart (twin divergence). These provides the theoretical foundation for this study. The objective of this study in general term is to empirically determine the positions of South Africa in the context of the above scenarios. To this end, short-run (VAR) Granger Non Causality Tests are performed on the time series macroeconomic variables of interest for South Africa and the results obtained elucidate the following findings.

1. The result of the co integration test (Trace) between variables of equation 5 suggests that the null hypothesis of no co integration cannot be rejected for South Africa, as they indicate no co integration among the variables of the model. This suggests that for South Africa, there is no long run steady-state relationship between the dependent and explanatory variables in the expressed equation.

2. The results provide empirical evidence that twin deficits hypothesis does not hold in the case of South Africa even in the short-run as the null hypothesis that developments in government budget deficits do not significantly influence innovations in current account imbalance in the economy under consideration cannot be rejected.
3. In the same vein, the results as further provide by empirical evidence suggests that for South Africa, the null hypothesis that developments in current account balance do not significantly cause innovations in fiscal deficits can outrightly be rejected in the short-run, even at 1% level of significance. Current account targeting scenario posits positive and significant causal relation between budget deficits and currents account deficits with current account balance causing budget balance.
4. The results further reveal that in the short-run, economy of South Africa is characterized by Ricardian equivalence hypothesis as it provides compelling evidence that the null hypothesis that innovations in fiscal deficits do not significantly cause developments in current account imbalance is true. Ricardian equivalence proposition (REP) predicts that the two deficits share no significant causal relationship and therefore are independent.

4.7 Conclusion and Policy Implications.

This study examines the empirical relationship between fiscal deficit and current account imbalance employing data for South Africa for the period of 1960 to 2012. We employ co-integration analysis and VAR granger non causality process to investigate the existence of short term causalities for the economy under consideration as no long run steady-state relationship was established among economic variables of interest. The results indicate no evidence of twin deficits hypothesis for South Africa in the short-run. The absence of evidence of the twin deficits phenomenon for South Africa in the short-run time frame, suggests that the Ricardian equivalence proposition (REP) holds for the economy under consideration within such time horizon. This concept is of the view that since people are rational, they know that the reduction in taxes, resulting from the government expansionary fiscal policy of tax cut or increase in public debt, is temporal and will save the extra disposable income to pay for the future higher taxes. This by implication suggests that the national savings position will be sustained because the decrease in government savings represented by increased fiscal deepening will be adequately compensated by the additional precautionary private savings for expected future increase in taxes. This indicates lack of responsiveness of private consumption to fiscal impulse and thus casts doubts on the efficacy of the use of fiscal policy in the management of external balance. In effect, this suggests that fiscal policy should not be intended for improvement in current account balance or in the least should not be used in isolation to supervise developments in current account stance in the short-run for South Africa. On the other hand, the results further provide evidence of the existence of current account targeting scenario for South Africa in the short run. Current account targeting hypothesis posits positive and significant causal relation between budget deficits and currents account deficits with current account balance causing budget balance. This suggests that current account balance may be intended for improvement in fiscal balance, indicating that the use of current account balance to supervise developments in fiscal balance in South Africa may prove effective in the short-run.

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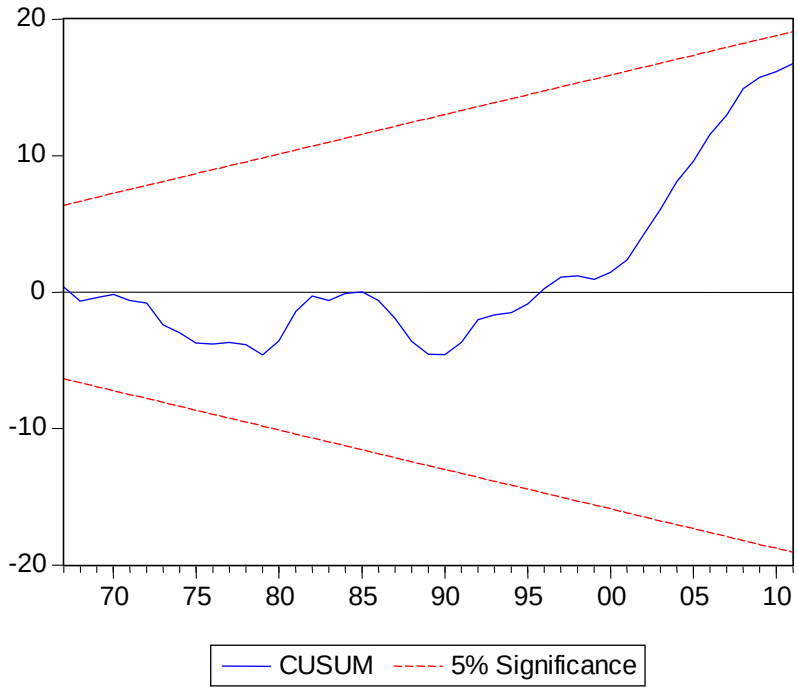
FIGURE 1: Cusum Test for Equation Stability for South Africa



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