

Twin Deficit in Nigeria: A Re-Examination

Lloyd Ahamefule Amaghionyeodiwe
City University of New York (CUNY), USA
lamaghionyeodiwe@york.cuny.edu
lamaghionyeodiwe@yahoo.co.uk

Opeyemi Akinyemi
Covenant University
Ota, Ogun State, Nigeria
opsie88@yahoo.com
opeyemi.akinyemi@covenantuniversity.edu.ng

Abstract: *This study re-examines the long run relationship between the budget and current account deficits in an oil-dependent open economy like Nigeria using a multivariate Granger causality test within the VECM framework. This result confirmed the existence of a long run relationship between the budget and current account deficit in Nigeria, thus supporting the Mudell-Fleming theory and refuting the Ricardian Equivalence Hypothesis (REH). The causality result indicates no causality between budget deficit and current account while the current account deficit causes budget account deficit. This implies that reduction in the current account deficits will help reduce the “twin deficit” dilemma.*

Keywords: *Budget Deficits; Current Account Deficits; Multivariate Granger Causality; Oil-Dependent Open Economy; Nigeria*

JEL Classification: *E62, F32, H6*

Article History

Submitted: 19 December 2014

Resubmitted: 2 September 2015

Accepted: 15 September 2015

<http://dx.doi.org/10.14706/JECOSS15528>

Introduction

In empirical literature, there are two major theories that are used to explain the causal link between budget deficit and current account deficits. These are the Mundell-Fleming Model of Exchange Rate Regime and the Ricardian Equivalence Hypothesis (REH). The traditional Keynesians use the Mundell-Fleming model to explain the twin deficit relationship and they argued that when budget deficit increases, the current account balance will deteriorate as the increases in the budget deficits will drive up domestic interest rates, real exchange rate and rate of capital inflows. On the other hand, while acknowledging the detrimental effects of large fiscal deficits on the economy, the critics of the Mundell-Fleming model have disputed the sequence of causation implied by the model (Harshemzadeh and Wilson, 2006). These groups of researchers used the Ricardian Equivalence Hypothesis (REH) to argue that no relationship exists between the two deficits as budget deficits results mainly from tax cuts which tend to reduce public revenue and public savings. They opined that individuals will perceive these tax cuts as incurring future tax liabilities and thus will increase savings rather than consumption.

Nigeria, experiences over the years have shown that there have been periods of persistent and rising budget deficits as well as periods with current account deficits. As such, it is evident that the Nigerian economy has been experiencing the twin deficit phenomenon. In the same vein, Nigeria as an oil-exporting country where revenue from oil production contributes more than 95% of its foreign exchange, 40 percent of GDP and 80 percent of fiscal revenues makes the economy susceptible to fluctuations in government revenues as a result of volatility in oil revenue (Onafowokan and Owoye, 2006).

In Nigeria, two studies are of prominence in this respect, these are Egwaikhide (1997), Egwaikhide *et al* (2002) and Onafowokan and Owoye (2006). Egwaikhide (1997) examined the effects of budget deficits on the current account balance in Nigeria and concluded that quantitative evidence suggests that budget policy affects the current account balance for Nigeria. Egwaikhide *et al* (2002) in their paper on causality between budget deficit and current account balance for a number of African countries, found a unidirectional causality from the budget deficits to the current account deficits to exist for Benin, Burkina Faso, Ghana, Nigeria and South Africa. Onafowokan and Owoye (2006) examined the relationship between budget and trade deficits. Their findings showed evidence of positive relationship between trade and budget deficits in both the short and long run but that causality is unidirectional running from trade deficits to budget deficits.

Apart from the fact that these studies in Nigeria utilized a bivariate framework commonly used in previous empirical studies which this study tends to improve upon by using a multivariate framework of Granger causality analysis, available data from the last ten years showed that the two deficits have not been moving together as argued by the two studies (Egwaikhide, 1997 and Onafowokan and Owoye, 2006) that were previously done for Nigeria. The most recent study to the best of my knowledge was

carried out in 2006 and between then and now; there could have been some adjustment. Consequently, it becomes imperative to re-visit and re-examine the validity of the twin deficit phenomenon for Nigeria.

As it is believed in open economy macroeconomics that budget deficit leads to deterioration of the current account balance (Jayaraman et al, 2008), it therefore becomes imperative to find out if the resulting current account balance experienced by the Nigerian economy is as a result of the substantial increase in its budget deficit over the years as has been argued by the twin deficit hypothesis or it is the other way round. This thus raises some pertinent questions like – Is the twin deficit hypothesis still valid for Nigeria? Is there a long run relationship between budget deficits and the current account deficits? What are the major channels of transmission through which budget deficits affect current account deficits? What is the direction of causality between the budget deficit and the current account deficit?

In response to the above questions and given the recent fiscal expansion due to the global financial crisis, it becomes relevant and significant for a study like this to revisit the twin deficit phenomenon for Nigeria and examine the direction of causality. Thus, using time series annual (secondary) data covering the period 1970 through to 2010, the study re-examines the long run relationship between the budget and current account deficits in Nigeria.

Following this introductory section, section two reviews the literature while section three examines some stylized facts on budget and current account deficit in Nigeria. Section four contains the methodology and empirical analysis while section five concludes the study.

Literature Review

Theoretical Review

In empirical literature, two major theories are commonly used to explain the causal link between the budget deficit and the current account deficits. They include the Mundell-Fleming model of exchange rate regime and the Ricardian Equivalence Hypothesis approach.

The Mundell-Fleming Model Framework

This model was developed by the works of Robert Mundell (1968) and J. Marcus Fleming (1967) and it offers an exchange rate approach to analyzing how the budget and current account deficits are related. The model presupposes a small open economy with full international capital mobility with the assumption that interest rate is the same in the world economy, except in cases where capital controls exist (Olga, 2000). It posits that a positive relationship exists between the two deficits and that causality is from budget deficit to current account deficit. The model is often used by the conventional Keynesians to argue that an increase in the budget deficits would cause an increase in domestic absorption, increase aggregate demand and put upward pressure

on domestic interest rate above the world rate. This in turn increases imports, reduce export and bring about an appreciation of the exchange rate thereby deteriorating the current account balance.

According to Fleegler (2006), as a government borrows to finance its deficits, it drives up borrowing costs or the interest rates. A higher interest rate makes domestic securities more attractive and leads to an increased demand for the domestic currency causing an appreciation of the domestic currency due to the capital inflows. As the currency appreciates, domestic goods become more expensive relative to foreign goods thereby leading citizens to increase imports thus increasing the trade deficit (Fleegler, 2006). Onafowora et al (2006) also argued that in this framework, an increase in government deficit spending will cause an increase in aggregate demand and the domestic interest rate. If the domestic interest rate is higher than the world interest rate, there will be a net capital inflow from abroad and the domestic currency will appreciate. This results to a rise in imports, a fall in export and the deterioration of the current account balance.

Harshemzadeh and Wilson (2006) also posited that an increase in the fiscal deficit will lead to current account imbalance by driving up domestic interest rates, exchange rate and rate of capital inflows. Chang and Hsu (2009) equally argued that the increase in the budget deficit induces an upward pressure on interest rates which in turn trigger capital inflows and an appreciation of exchange rates ultimately leading to an increase in the current account deficit. Arize and Melinderos (2008) pointed out that even though the Mundell-Fleming suggests a unidirectional causality from budget deficit to current account deficit, there could be a reverse causality from the current account deficit to the budget deficit. This can come about if there is a change in expected inflation. A decrease in expected inflation would lead to currency appreciation and thus decrease net exports and increase the trade deficits.

Chang and Hsu (2009) also provided another possible explanation reverse causality between the budget deficit and current account deficit by stating that this reversal could occur if deterioration in the current account balance leads to a slower pace of growth and hence an increase in the budget deficit. Kim and Kim (2006) equally argued that out reverse causality could be as a result of excessive trade deficits plunging an economy into a recession and subsequently leading to a financial or solvency crisis in which large injections of public fund may be needed to rehabilitate the struggling financial sector or minimize the severity of a recession. This reverse causality was referred to as “current account targeting” and suggests that external adjustments may be sought through the budget or fiscal policy. Furthermore, Arize and Melinderos (2008) posited that bidirectional causality could also exist between the twin deficits whereby the existence of significant feedbacks causes causality to run in both directions. This was corroborated by Chang and Hsu (2009). Thus, it becomes necessary to complement budget-cut policies with a coherent package, focusing on policies for export promotion, productivity improvement and exchange rate (Arize and Melinderos, 2008).

The Ricardian Equivalence Hypothesis

An alternative explanation for the existence of long run equilibrium relationship between the budget deficit and the current account deficit is based on the Ricardian Equivalence Hypothesis (REH) which is commonly associated with the work of Barro (1989). He stated that the Ricardian equivalence implies that taxpayers do not view government bonds as net wealth; hence its acquisition by individuals does not alter their consumption behaviour. Critics of the Mundell-Fleming framework question the sequence of causation described by the model and thus employed the Ricardian equivalence hypothesis to argue the absence of any relationship between budget deficit and current account deficit. These proponents argue that in a Ricardian world, it is believed that a budget deficit that is financed through a tax cut and bond sales would be perceived by individuals as incurring future tax liabilities to service and retire the increased debt (Onafowora and Owoye, 2006; Yanik, 2006 and Ratha, 2011). The Ricardian Equivalence Hypothesis dispenses entirely with the income-expenditure approach and relied instead on the inter-temporal approach.

They asserted that since a government's means of finance do not alter private agents' inter-temporal budget constraints; the real interest rate, the quantity of investment or current account balance will not be affected. They claimed that budget deficits do not cause any interest and exchange rate changes which thus have no effect on the current account imbalances (Chang and Hsu (2009)). The main assumption of the REH is that changes in budget deficit will have no effects on domestic interest rates, total savings, investment, price level and national income; thus not having effect on current account balance. The argument is that a reduction in taxes which is accompanied by an increase in budget deficit does not affect growth of consumption and hence, does not have any expansionary effect as households tend to increase savings in anticipation of higher taxes in the future which are necessary to redeem the debt (Gadong, 2009).

Furthermore, Mamdouh (2000) posited that a tax cut (leading to a budget deficit) has the effect of reducing public revenues and public savings thus enlarging the budget deficit. This however, increases private savings by an amount equal to the expected increase in the tax burden in future years (Arize and Melinderos, 2008). In other words, savings will respond positively to the changes in budget deficit leaving the trade deficit unaltered. Equally, if the government runs a deficit by borrowing, economic agents being rational will expect that government will raise future taxes to finance the borrowing (budget deficit) and so they will rather increase their savings to meet the future tax burden. Thus, alterations in the composition of public financing will have no impact on real interest rate, aggregate demand, private spending, exchange rate and ultimately, the current account balance (Arize and Melinderos, 2008). However, the Ricardian equivalence theorem argues that either ways of financing the deficit (through reduced taxes or issuance of bonds), the present value wealth of private households is not altered since both temporarily reduced taxes and issuance of bonds represents future tax liabilities (Hakro, 2009).

Methodological and Empirical Review

In analysing the relationship between the budget deficit and the current account deficit, the most commonly used method employed in estimation is the co-integration approach, the Granger causality test, Vector Error Correction (VEC) model and the Vector Autoregressive (VAR) model (Chang and Hsu, 2009; Hashemzadeh and Wilson, 2006). The nature of this relationship is said to vary across countries and periods and different studies arrived at different conclusions as a result of difference in data set used and methodologies (Hashemzadeh and Wilson, 2006). Abbas et al (2010) identified three categories of methodologies broadly used to study the twin deficits relationship. The first category studies the impact of fiscal policy on external balance using causality tests and VARs. The second category analyzes the long term correlation between indicators of fiscal policy and external imbalances using co-integration techniques and single or panel regression techniques. The third category invokes the narrative approach to identify exogenous changes in fiscal policy and uses regression analysis to study the impact on external imbalances.

This study takes a look at a review of some of the methods used in some previous studies carried out on the twin deficit relationship. Arize and Melinderos (2008) employed the conventional fractional co-integration approach and the multivariate Wald test for Granger causality in testing for dynamic linkages and causality between the budget and trade deficits for selected countries in Africa. Their study found a uni-directional causality and thus supported the twin deficit hypothesis. Ganchev (2010) used VAR and VEC model in his analysis for Bulgaria and his results rejected the twin deficit hypothesis in the short run but indicated it might be valid in the long run.

Egwaikhide (1997) did a simulation exercise by constructing a number of behavioural equations using descriptive statistics such as t-values, F-test, DW test, R² and the standard error of the regression. His simulation experiments show that budget deficit, engendered by increased expenditure, leads to a deterioration of the current account. Korsu (2006) performed a similar simulation experiment to that of Egwaikhide (1997) to investigate the effects of fiscal deficits on the external sector performance for Sierra Leone, but he used a 3 Stage Least Squares (3SLS) approach. His study could not directly identify the direction of causality. Shukur and Hatemi (2002) tested the causality direction between the twin deficits in the US using the Rao's multivariate F-test combined with Bootstraps simulation technique which they argued has appealing properties. Their study found that there is a uni-directional causality which runs from current account deficit to budget deficit. Specifically, budget deficit granger causes current account deficit for 1975 to 1989 sub-period, while current account deficit granger causes budget deficit for the 1990 to 1998 sub-period. Afonso and Rault (2009) equally employed the Bootstrap panel Granger causality test to investigate existence of causality between current account balance and budget balance for different EU and OECD countries. Their results showed a causal relation from budget deficits to current account deficits for several EU countries: Bulgaria, Czech Republic, Estonia, Finland, France, Italy, Hungary, Lithuania, Poland, and Slovakia, along the lines of the so-called twin-deficit relationship.

Olga (2000) employed co-integration and Granger-causality test and found the transmission mechanism between the two deficits to be mainly through the exchange rate for Ukraine. The finding showed that budget deficits and current account deficit were co-integrated while uni-directional causality from budget deficit to current account deficit existed. Yanik (2006) employed co-integration, Granger-causality, VEC and impulse response in his methodology while using quarterly data for Turkey. He found that both deficits are counter-cyclical and move together in the long run indicating uni-directional causality, where current account deficit causes budget deficit, but not the reverse. Zamanzadeh and Mehrara (2011) and Celik and Deliz (undated) also used the same techniques of estimation for Iran and a number of emerging economies respectively. Their findings showed that bi-directional relationship existed between the government budget deficit and non-oil current account. Brian (undated) also used quarterly data of Argentina with co-integration, Granger-causality and chow test. He found that there was no determinable Granger-causal relationship between budget data and trade deficit data. Likewise Mukhtar et al (2007) who made use of quarterly time series data for Pakistan employing co-integration technique and Granger-causality test. Their study found that a long run relationship exists between the two deficits and also there was bi-directional causality between the two deficits.

Zengin (n.d)'s VAR model for Turkey indicated that trade deficit do not directly bring (Granger-causes) about budget deficits but that budget deficit directly affects trade deficits. Ratha (2011) employed the Bounds-testing approach to co-integration and error correction modelling on the monthly and quarterly data of India. He concluded that twin-deficits theory holds in the short-run, but not in the long run for India. Baharumshah, et al (2006) examined the twin deficit hypothesis in Indonesia, Malaysia, the Philippines and Thailand using co-integration, impulse response function and variance decomposition of the VAR model. Their study found long run relationships between budget and current account deficits. Also, for Thailand, there was a unidirectional relationship, which runs from budget deficit to current account deficit. For Indonesia the reverse causation (current account targeting) was detected while the empirical results indicate that a bi-directional pattern of causality exists for Malaysia and the Philippines. Abbas et al (2010) used panel regression and panel VAR for a number of countries ranging from low income countries to emerging economies and then advanced economies in his methodology. They concluded that the association between fiscal policy and the emergence of large external imbalances is limited. Hashemzadeh and Wade (2006) and Evan and Tang (2009) in emphasizing the dynamic relation between the two deficits employed the VAR technique and causality tests in their methodology for Cambodia, a transition economy in South East Asia. Hashemzadeh and Wade (2006) empirical findings suggest that the incidence of twin deficits appears to be country specific. And the observed cross-country variations with respect to the effects of fiscal deficits on current account deficits tend to show 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. Furthermore, their findings indicated that the presence

and the direction of causality between the two deficits is generally country specific and ambiguous in certain cases. For Evan and Tang (2009), their study of Cambodia also supports the twin deficits hypothesis in which the budget deficits do cause external deficits, in the short run while these two variables are moving together in the long run.

Chang and Hsu (2009) and Evan et al. (undated) adopted the Toda and Yamamoto (1995) modified WALD (MWALD) for testing Granger non-causality to evaluate the budget-current account nexus for the regional economy and Malaysia respectively. Chang and Hsu (2009) claimed that budget deficits do not cause any interest and exchange rate changes which thus have no effect on the current account imbalances while Evan *et al* (n.d) did not find a significant effect of the budget deficit on the current account. Flegler (2006) did a cross-country empirical approach by employing the multi co-integration analysis in his methodology. The findings suggest that an economy's susceptibility to the twin deficits may be time-specific and influenced by a variety of factors. And specifically, a country's susceptibility is in part influenced by where the country is in the development process, who it trades with, and what it imports and exports. Rauf and Khah (2011) investigated the relationship between the twin deficit in Pakistan using simple OLS regression technique and Granger causality. They found that increase in the budget deficit is caused by a decrease of trade account deficit (the largest component in the current account) Egwaikhide et al (2002) employed simple regression equation and Granger-causality tests in their own methodology for a number of West African countries which includes Nigeria and found that budget deficit leads to a deterioration of the current account balance. Saleh (2006) employed the Unrestricted Error Correction Model (UECM) and bounds test (co-integration test) in testing the Keynesian proposition for Lebanon and his findings partially supported the Keynesian view of the "twin deficit" hypothesis. Schismita and Sudipta (2011) provided fresh evidence on the twin deficit hypothesis for India within a multi-dimensional system by giving descriptive statistics and analysis. Their study found that there was a reverse causation in the twin deficit hypothesis for India and oil prices helped complete the chain of reverse causation. Also, the direction of causation is unambiguously seen to run from oil prices to the external deficit to the fiscal deficit

Onafowora and Owoye (2006) found a positive relationship between trade and budget deficits in both the short run and long run. Their results supported the conventional Keynesian twin deficits position and refute the Ricardian equivalence hypothesis for Nigeria. Olga (2000) found budget deficit and current account to be co-integrated in which case budget deficit Granger-causes a current account deficit for Ukraine. Ganchev (2010) found the existence of dual causality between fiscal and current account deficits for the Bulgarian economy. Yanik (2006) using quarterly data of Turkey supported the REH or the twin divergence theory, stating that causality runs from current account deficit to budget deficits. Brian (undated) did the twin deficit analysis for Argentina and also did not find any relationship to exist between the two deficits. Zengin (undated) on the other hand supported the twin deficit hypothesis as he found budget deficit to influence trade balance. Ratha (2011) empirical results suggested that the twin deficit theory holds for India in the short run but not in the long-run.

Abbas et al. (2010) found the association between fiscal policy and emergence of large external imbalances to be limited. An improvement in the fiscal balance of 1% of GDP improves the current account balance by 0.2-0.3 percent of GDP upon impact in emerging and low income economies. Hashemzadeh and Wilson (2006) emphasized that the dynamic relationship between the two deficits is subject to change, depending on the underlying tax system, trade patterns and barriers, exchange rate and a host of internal and international forces that help to shape an economy. Chang and Hsu (2009) provided broader evidence on the debate of causal linkage between the budget and current account deficits for five North European countries, four Asian Tigers and the United States, concluding that most of the countries supported the twin deficit hypothesis but the strength varies across countries noting that none of the countries studied supported the REH.

Fleegler (2006) did a cross-country empirical approach of countries at different stages of development to ascertain the validity of the twin deficit theory and found multiple factors contribute to a country's susceptibility to the twin deficit. Such factors include the country's stage in its developmental process and its trading partners. Egwaikhide et al (2002)'s empirical result revealed that for 16 African countries including Nigeria, budget deficit leads to a deterioration of the current account balance. Mukhtar et al (2007) made use of quarterly data in testing the twin deficit theory in Pakistan and found a long run relationship to exist between budget and current account deficit. Their study however put a doubt on the use of single-equation approach to analysing the twin deficit hypothesis. Kulkarni and Erickson (2001) tested the twin deficit hypothesis with the annual data of India, Pakistan and Mexico. They found no evidence of twin deficits and causality in Mexico, strong evidence for India and Pakistan. However, causality for Pakistan was in opposite direction, that is, a reverse causality.

Zamanzadeh and Mehrara (2011) found support for the twin deficit hypothesis in Iran, likewise the study of Jayaraman and Choong (2008) in Vanuatu, a small open Island economy in South Pacific. Celik and Deniz (undated) analyzed the Keynesian well-known twin deficit hypothesis for a group of emerging countries using quarterly data, they found support for the twin deficit theory. Saleh (2006) observed that in the case of Lebanon, causality runs from trade deficit to budget deficit, supporting the Keynesian view that there is a linkage between the two deficits. Shukur and Hatemi (2002) employed the Rao's multivariate F-test combined with bootstraps simulation technique in testing for the twin deficit phenomenon in the US. They found structural breaks to be of paramount importance when causality test was conducted as both budget deficit and current account did not granger cause each other using the whole sample. After splitting the sample into two sub periods, results showed that budget deficit causes current account deficits in the first period while the opposite occurred for the second period. Mukhtar et al (2007) found a long run relationship between the deficits and bi-directional causality using quarterly time series data for Pakistan. Rauf and Khan (2011) using annual data found reverse causality to be strong in Pakistan.

Ratha (2011) employed the bounds-testing approach to co-integration and error correction modelling on monthly and quarterly data for India and concluded that the

twin deficit theory holds in the short run while the Ricardian Equivalence Hypothesis is what holds in the long run. The findings of Suchsmita and Sudiptal (2011) supported reverse causality for India. Zengin (n.d) found support for the twin deficit hypothesis in Turkey using a VAR model and posterior probability bounds test. On the other hand, Yanik (2006), using Turkish quarterly data and the method of Granger-non-causality tests and VAR, found both budget deficit and current account to be counter-cyclical and supported the “twin divergence” or ricardian equivalence hypothesis for Turkey. Momdouth (2002) found that neither the twin deficit hypothesis nor the ricardian equivalence hypothesis was valid for Saudi Arabia as a petroleum economy. Zamanzadeh and Mehrara (2011) found support for the twin deficit hypothesis for Iran rather than the ricardian equivalence hypothesis. Neaime (2008)’s empirical results for Lebanon showed support for the existence of uni-directional causal relationship in the short run from budget deficit to current account deficit. Celik and Deniz (n.d) analysed the twin deficit phenomenon for 6 emerging economies and found support for the twin deficit hypothesis using advanced econometric techniques for the panel data. Arize and Melinderos (2008) using a panel of 10 African countries revealed that a positive long run relation exists however, weak link between the two deficits was found in the short run and that budget deficits causes current account deficits.

Below is a summary of empirical studies, their type of data set, the methodology they employed and their results in tabular form.

Table 1. Synopsis of Empirical Studies from the Literature

S/N	Author	Methodology	Transmission Mechanism	Direction of Causality	Findings/Results
1.	Onafowora and Owoye (2006)	Nigeria, annual data, 1970-2001, co-integration, Granger-causality and VEC model.	Interest rate was found to be strongly exogenous.	Uni-directional Causality from trade deficit to budget deficit.	A positive long run relationship exists between trade deficits and budget deficits. Supports conventional “twin deficit” hypothesis
2.	Olga (2000)	Ukraine, quarterly data, 1995:1 to 1999:4, co-integration and Granger-causality.	Transmission works mainly through the exchange rate.	Uni-directional Causality from budget deficit to current account deficit.	Budget deficits and current account deficit were found to be co-integrated.
3.	Ganchev (2010)	Bulgaria, annual data, 2000-2010, Granger-causality, VAR and VEC model.		Dual causality between fiscal and current account deficits.	Findings reject the “twin deficit” hypothesis in the short-run, but indicate that it might be valid in the long run.

4.	Yanik (2006)	Turkey, quarterly data, 1988:1 to 2005:2, co-integration, Granger non-causality, VAR and impulse-response analysis.	Short-run impacts of budget deficit on current account deficit are through the real exchange rate and real interest rate channels.	Uni-directional causality, current account deficit causes budget deficit, but not the reverse.	Both deficits (CAD and BD) are counter-cyclical and move together in the long run. Supports "twin divergence" or the Ricardian Equivalence Hypothesis.
5.	Arize and Melinderos (2008)	10 African countries, quarterly period 1973:2 to 2005:4. Fractional co-integration approach and error correction mechanism.		Uni-directional causality	Supports twin deficit hypothesis.
6.	Zengin (undated)	Turkey, quarterly data, 1987:1 to 1998:1, Granger-causality and VAR model.	Transmission is through interest rate and exchange rate.	Direct causal relation exists from budget deficit to trade deficit.	Supports the conventional "twin deficit" hypothesis.
7.	Ratha (2011)	India, monthly and quarterly data, 1998-2009, bounds-testing approach to co-integration and error-correction modelling.			Twin-deficits theory holds in the short-run, but not in the long run.
8.	Abbas et al. (2010)	124 countries, annual data, 1985-2007, panel VAR.		Association between fiscal policy and the emergence of large external imbalances is limited.	The impact is longer-lasting in emerging countries than in advanced countries.
9.	Hashemzadeh and Wade (2006)	Egypt, Iran, Jordan, Kuwait, Syria, Oman, Morocco, Turkey and Yemen. Annual data, 1970-1990. Causality test and VAR.		Correlation between the two deficits is both complex and ambiguous.	Dynamic relationship between the two deficits is subject to change depending on some underlying factors.

10.	Chang and Hsu (2009)	5 North European countries, 4 Asian Tigers and the United States. Annual and quarterly data, 1980 to 2007 Modified WALD test and Granger non-causality procedure.	Transmission mechanism varies across different countries. For some, interest rate, for others, exchange rate.	Direction of causality varies across the different countries.	Shows support for “twin deficit” hypothesis, though the strength varies across countries.
11.	Fleegler (2006)	US, South Korea, Mexico, Peru and Costa Rica, annual data, 1970-2004. Multi co-integration analysis.		Significant positive correlation exist between the twin deficits for most of the economies.	An economy’s susceptibility to the twin deficits may be time-specific and influenced by a variety of factors.
12.	Egwaikhide et al. (2002)	16 African countries, annual data, 1970-1999, OLS and Granger-causality test.		In group, causality runs from current account to budget deficit.	Budget deficit leads to a deterioration of the current account balance
13.	Mukhtar et al. (2007)	Pakistan, quarterly time series data, 1975-2005, co-integration, Granger-causality and simultaneous equation model.		Bi-directional causality runs between the two deficits.	A long run relationship exists between the two deficits.
14.	Saleh (2006)	Lebanon, annual data, 1975-2003, co-integration (bounds test), Granger-causality and Unrestricted Error Correction Model (UECM)		Causality runs from trade deficit to budget deficit.	Results partially support the Keynesian view of the “twin deficit” hypothesis.
15	Zamanzadeh and Mehrara (2011)	Iran, annual data, 1959-2007, co-integration technique and Vector Error Correction Model (VECM).		Bi-directional relationship exists between the government budget deficit and non-oil current account.	Supports the twin deficit hypothesis.

16	Celik and Deniz (undated)	Brazil, Czech Republic, South Africa, Colombia, Mexico and Turkey, quarterly data, 1996Q1 to 2006Q4, panel co-integration technique.			Twin deficit hypothesis is supported using advanced econometric techniques for the panel data.
17.	Jayaraman and Choong (2008)	Vanuatu, annual data, 1983-2005			Evidence support twin deficit hypothesis.

Source: Compiled by the Authors

In some of the studies where evidence has been inconclusive, many reasons can be adduced to this. One important factor is the differences in data set used and methodologies (Hashemzadeh and Wade, 2006). Another reason include the possibility of excessive trade deficits plunging an economy into a recession and subsequently leading to a financial or solvency crisis in which large injections of public fund may be needed to rehabilitate the struggling financial sector or minimize the severity of a recession, Kim and Kim (2006).

Some Stylized Facts on the Twin Deficits in Nigeria

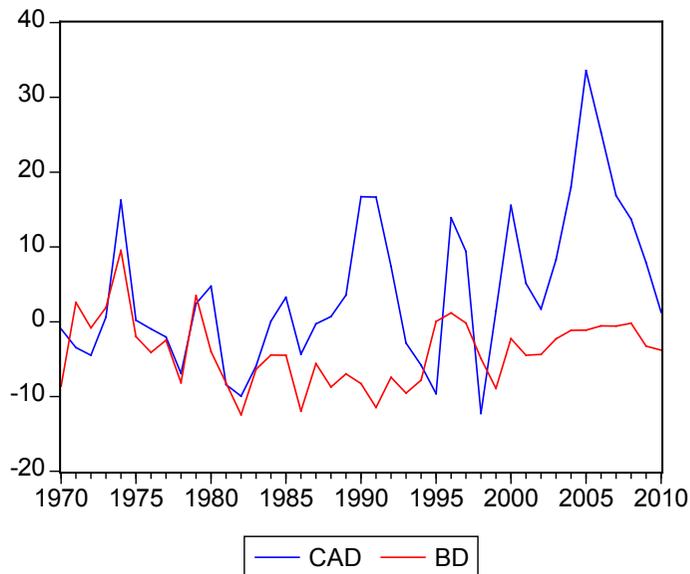
Nigeria is an oil-exporting country where the revenues from oil production contribute more than 95% of its foreign exchange earnings, 40% of Gross Domestic Product (GDP) and 80% of its fiscal revenues (Onafowokan and Owoye, 2006). The economy therefore provides a good study to test if the theory of the twin deficit on the direction of causality is valid as this dependency exposes the country to oil price shock and volatility, thereby causing fluctuations in government revenues leading to erratic patterns in public expenditure. A striking feature of Nigeria's fiscal operations since the second half of the 1970s is persistent and rising budget deficits (Egwaikhide, 1997). These rising budget deficits were according to Gadong (2009) as a result of the oil boom of the early 1970s, in which case the discovery and exploration of oil in commercial quantity led to an escalation in the government budget. In 1975, with the oil glut, fiscal deficits emerged in the economy. This trend continued until 1994 with the exception of 1979 and later in 1997, the trend started again.

Nigeria was one of the many developing countries that adopted the Structural Adjustment Programme (SAP) during the mid-1980s in the attempt to reduce the role of the public sector in the economy, reduce the share of fiscal deficit in the GDP, restore balance of payment equilibrium and maintain a stable price level (Onafowokan and Owoye, 2006). But as argued by Gadong (2009), the growth of government bureaucracy permitted by the oil boom, as well as the establishment of public corporations that had to be maintained even after government revenue (mainly from oil) had declined made government expenditures to remain high. Table 2 shows the budget and current

account deficit of Nigeria from 1982 to 2010. From the table, it can be observed that over the periods when fiscal deficits were sustained, these deficits as proportions of GDP went as high as 12.44 percent in 1982, 11.94 percent in 1986, 11.45 percent in 1991, 9.53 percent in 1993 and 8.93 percent in 1999. This aggravated the economy's debt profile from both domestic and foreign source prior to the debt cancellation the country received in 2005. Notice that fiscal deficits for the years between 1982 and 1994 all exceeded 4 percent of GDP.

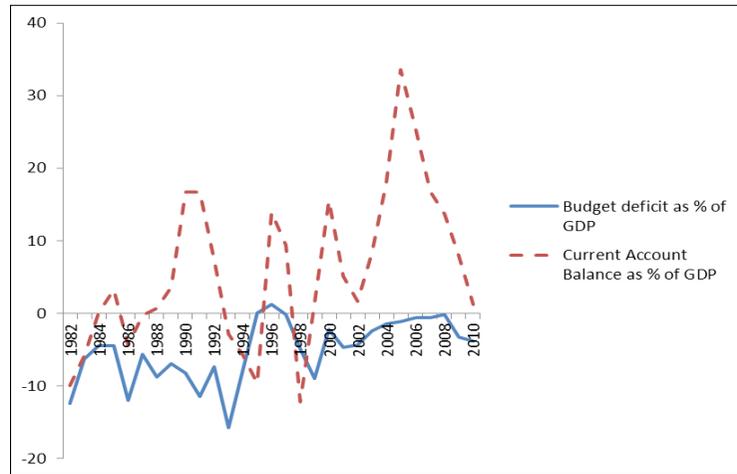
Also, developments in the external sector revealed that periodic deficits in the current account have characterized Nigeria's balance of payment profile. Egwaikhide (1997) stated that the current account deficit deteriorated from ₦259 million in 1976 to ₦5.2 billion in 1982, though relatively large surpluses were recorded in the last 12 years. A close inspection of available data from figure 1a and 1b show some degree of association between budget deficit and the current account deficit for most of the years. Budget deficit was recorded for most of the years, though some years experienced a current account surplus.

Figure 1a. Graph of Budget and Current Account Deficits for Nigeria, 1970 to 2010



Source: CBN Statistical Bulletin (2010)

Figure 1b. Graph of Budget and Current Account Deficits for Nigeria (1970 – 2010)



Source: CBN Statistical Bulletin (2010)

From the graph above, it can be observed in the earlier periods, both deficits move together even as they fluctuate. From the 1990s to recent periods, the current account balance has been more of a surplus than a deficit while the budget balance continues to be in deficit. This brings to mind the issue of the validity of the twin deficit hypothesis for the Nigerian economy being an oil-dependent economy. In other words, if the hypothesis holds for Nigeria, does causality still run from budget deficit to current account deficit? According to Mamdouh (2002), the Keynesian approach which implies the existence of a direct relationship from the budget deficit towards the trade deficit may not be applicable to an oil-based economy. This is because the basic source of income in an oil-based economy like Nigeria is revenue from oil export and these revenues affect government revenue and export of goods and services. It thus becomes imperative to ascertain if the direction of causality will flow from current account deficit to budget deficit.

Model Specification

Following the theoretical literature and methodology of previous empirical studies, a model can thus be specified for this study that current account deficits of Nigeria depends on government budget deficits, domestic income (real GDP), money supply, domestic interest rates and real exchange rate. Theoretically, the relationship between the twin deficits can be presented in an implicit form to give this equation:

$$CAD_t = f(BD_t, MON_t, RGDP_t, INT_t, RER_t) \quad (1)$$

The explicit form of the model showing the linear relationship between current account deficit and budget deficit is given as follows:

$$CAD_t = \alpha_0 + \alpha_1 BD_t + \alpha_2 MON_t + \alpha_3 RGDP_t + \alpha_4 INT_t + \alpha_5 RER_t + e_t \quad (2)$$

Where CAB_t is current account balance as a percentage of GDP; BD_t is budget balance as a percentage GDP; MON_t is broad money supply as a percentage of GDP; $RGDP_t$ is real GDP (proxy for domestic income); INT_t is the prime lending rate; RER_t is the real exchange rate and e_t is a white noise disturbance. α_1 , α_2 , α_3 , α_4 and α_5 are the unknown parameters.

Technique of Estimation

The econometric analysis of the relationship between the fiscal and current account deficits usually involves the application of Granger causality (Chang and Hsu, 2006, Ganchev, 2010) and Vector Autoregressive Models (Hashemzadeh and Wilson, 2006). Thus, in line with most empirical work on twin deficit hypothesis, this study tests for the long run equilibrium relationship and direction of causality between budget and current account deficit. In doing this, the study will carry out a stationarity test, co-integration test and multivariate Granger causality test. The stationarity test helped determine if the time series are stationary or not as empirical literature has argued that estimation of time series data that have unit root will produce a spurious result. Also, the co-integration procedure will help explore the possible long run relationships among the variables in the model and interpret the evidence of this relationship as the interdependence between the variables. The Granger causality test will be carried out within the multivariate framework as against the bivariate framework that is commonly used. This will help to determine the direction of causality and feedback among the variables.

The Granger causality test thus helps to determine the direction of causality between the current account deficits and the budget deficit. This study however employs an alternative methodology for testing the causality direction between the twin deficits for Nigeria, which is the multivariate Granger-causality rather than the bivariate framework. The results of the multivariate framework are said to be more informative and reliable than the results of the bivariate framework, (Tang, 2010). Also, the Granger causality tests with the bivariate framework are likely to be biased owing to the omission of relevant variables that affects the relationship between the two deficits and their interacting variables.

The basic idea of the Granger causality is that one variable or time series can be called “causal” to another if the ability to predict the second variable is improved by incorporating information about the first, (Barret et al, 2010; Onafowokan et al, 2006). In other words, variable Y granger-causes X if in a statistically suitable manner, Y assists in predicting the future of X beyond the degree to which X already predicts its own future. According to Barret et al (2010), the Granger causality idea can be extended to the conditional case as well where Y is said to Granger cause Y conditional on Z if Y assists in predicting the future of X beyond the degree to which X and Z together already predict the future of X. This conditional Granger causality is what is termed multivariate Granger causality (Barret et al, 2010).

The Granger causality test will be performed with annual data of budget, current account deficit data and the interacting variables between the two deficits. The Augmented form of the Granger causality test involving the ECM is formulated in a multivariate p^{th} order Vector Error Correction (VEC) model and is given below:

$$\Delta Y_t = C_i + \Sigma \Pi_t \Delta Y_{t-k} + \lambda_i + ECM_{t-1} - 1 + \varepsilon_{it} \quad (3)$$

Where:

$\Delta Y_t = 6 \times 1$ vector matrix of variables.

$\Pi_t = 6 \times 6$ square matrix of β it

$\Delta Y_{t-k} = 6 \times 1$ vector matrix of lagged values of variables.

$ECM_{t-1} = 6 \times 1$ vector matrix of the error correction model.

$\varepsilon_{it} = 6 \times 1$ vector matrix of the error terms.

The above matrix equations can also be written in the following form:

$$\Delta CAD_t = \alpha_1 + \Sigma \beta_1 \Delta CAD_{t-i} + \Sigma \theta_1 \Delta BD_{t-i} + \Sigma \delta_1 \Delta MON_{t-i} + \Sigma \gamma_1 \Delta RGDP_{t-i} + \Sigma \lambda_1 \Delta INT_{t-i} + \Sigma \rho_1 \Delta RER_{t-1} + \Pi ECM_{t-1} + \varepsilon_t \quad (4)$$

$$\Delta BD_t = \alpha_2 + \Sigma \beta_2 \Delta BD_{t-i} + \Sigma \theta_2 \Delta CAD_{t-i} + \Sigma \delta_2 \Delta MON_{t-i} + \Sigma \gamma_2 \Delta RGDP_{t-i} + \Sigma \lambda_2 \Delta INT_{t-i} + \Sigma \rho_2 \Delta RER_{t-1} + \Pi ECM_{t-1} + \varepsilon_t \quad (5)$$

$$\Delta MON_t = \alpha_3 + \Sigma \beta_3 \Delta CAD_{t-i} + \Sigma \theta_3 \Delta BD_{t-i} + \Sigma \delta_3 \Delta MON_{t-i} + \Sigma \gamma_3 \Delta RGDP_{t-i} + \Sigma \lambda_3 \Delta INT_{t-i} + \Sigma \rho_3 \Delta RER_{t-1} + \Pi ECM_{t-1} + \varepsilon_t \quad (6)$$

$$\Delta RGDP_t = \alpha_4 + \Sigma \beta_4 \Delta CAD_{t-i} + \Sigma \theta_4 \Delta BD_{t-i} + \Sigma \delta_4 \Delta MON_{t-i} + \Sigma \gamma_4 \Delta RGDP_{t-i} + \Sigma \lambda_4 \Delta INT_{t-i} + \Sigma \rho_4 \Delta RER_{t-1} + \Pi ECM_{t-1} + \varepsilon_t \quad (7)$$

$$\Delta INT_t = \alpha_5 + \Sigma \beta_5 \Delta CAD_{t-i} + \Sigma \theta_5 \Delta BD_{t-i} + \Sigma \delta_5 \Delta MON_{t-i} + \Sigma \gamma_5 \Delta RGDP_{t-i} + \Sigma \lambda_5 \Delta INT_{t-i} + \Sigma \rho_5 \Delta RER_{t-1} + \Pi ECM_{t-1} + \varepsilon_t \quad (8)$$

$$\Delta RER_t = \alpha_6 + \Sigma \beta_6 \Delta CAD_{t-i} + \Sigma \theta_6 \Delta BD_{t-i} + \Sigma \delta_6 \Delta MON_{t-i} + \Sigma \gamma_6 \Delta RGDP_{t-i} + \Sigma \lambda_6 \Delta INT_{t-i} + \Sigma \rho_6 \Delta RER_{t-1} + \Pi ECM_{t-1} + \varepsilon_t \quad (9)$$

The choice of the test is in line with the Mudell-Fleming theory. Many studies have been done using the Ricardian Equivalence Hypothesis (REH) especially in Nigeria as such this study tries to extend this by using the Mudell-Fleming theory.

Description of Variables and A priori Expectations

Current Account Deficit as a percentage of GDP (CAD): This represents the sum of the difference between imports of goods and services, exports of goods and services plus net income from abroad and is measured as percentage of GDP. It is the dependent variable in the model of the twin deficit.

Budget Deficit as a percentage of GDP (BD): This represents the excess of government expenditure over revenues for different years measured as percentage of GDP. It is expected to have a positive sign as increases in government budget deficit will lead to a deterioration of the current account balance while reduction in budget deficit will improve the current account balance.

Money Supply as percentage of GDP (MON): This is simply defined as M2 which is broad money calculated as a percentage of GDP. It consists of narrow money in addition to savings and time deposits with banks including foreign denominated deposits. It is expected to have a positive sign as increases in money supply will improve the current account balance, that is reduce the current account deficit in the long run.

Real Gross Domestic Income (RGDP): This is used as a proxy for domestic income. It is the Gross Domestic Product at constant basic prices and is expected to be negatively signed as increases in domestic income have the effect of worsening (enlarging) the current account deficits in the long run.

Interest Rate (INT): This is the Prime lending rate which is the interest rate charged by banks to customers for loanable funds which is to be used for investment purposes. This is expected to be negatively signed as increases in domestic interest rate which is as a result of increases in aggregate demand will increase imports and worsen the current account balance in the long run.

Real Exchange Rate (RER): This is the official exchange rate at which the local currency which is the naira exchanges for a dollar. It is expected to have a negative sign as the appreciation of the domestic currency will worsen the current account balance in the long run and vice versa.

Data Sources and Measurement

This study made use of annual data for Nigeria for the period 1970 to 2010 (40 years). The current account balance, budget balance and the money supply (M2) were calculated as percentage of GDP and is represented by CAB_t, BB_t and MON_t respectively. Also, to account for different channels of interaction between the current account balance and the budget balance, other variables were included in the analysis. They include Real GDP (as a proxy for domestic income) represented as RGDP, treasury bills rate (used as a proxy for interest rate) and represented as TBR and real interest rate represented as RER. All the variables are in percentage in exception of Real GDP which is in naira, the interest rate which is in rate and the exchange rate which represents the rate at which the naira exchanges for a dollar. The data for the study was

sourced from the 2010 edition of the CBN Statistical Bulletin and the World Bank Development Indicators (WDI).

Presentation and Discussion of Results

Correlation Matrix

The correlation matrix helps to identify the level of correlation that exists among the independent variables. From Table 2, it can be observed that budget deficit has a 44 percent positive correlation with the current account deficit while real exchange rate has a strong positive correlation with the current account deficit with 58 percent. This implies that budget deficit is averagely correlated with the current account deficit. Also, only money supply has a negative and weak correlation of about 26 percent with current account deficit. In the same vein, the RGDP and the interest rate has a positive correlation of 50 percent and 29 percent respectively.

Table 2. Correlation Matrix

	CAD	BD	MON	RGDP	INT	RER
CAD	1.000					
BD	0.434	1.000				
MON	-0.266	-0.554	1.000			
RGDP	0.501	0.010	0.235	1.000		
INT	0.293	-0.243	-0.188	0.606	1.000	
RER	0.579	0.184	0.027	0.886	0.462	1.000

Source: Author's computation with E-Views

Where CAD is current account deficit as a percentage of GDP, BD is budget deficit as percentage of GDP, MON is money supply as percentage of GDP, RGDP is real GDP, INT is prime interest rate and RER is official exchange rate.

Unit Root Test

The next step is the determination of the time series properties of each variable based on unit root tests. This is used to determine if the time series variables under observation are stationary or not. This is because most time series data sets are often found not to be stationary and estimation with such data produces a spurious result. Various methods are often used to test for stationarity of variables, they include Dickey-Fuller (1979 & 1981), Augmented Dickey-Fuller (1979), GLS Detrended Dickey-Fuller (GLS-DF, 1996), Phillips-Perron (1998), Kwiatkowski-Phillips-Schmidt-Shin (KPSS, 1992), Ng-Perron (2001) among others. However, this study employed the Augmented Dickey-Fuller (ADF) unit root test to test for non-stationarity or otherwise of the variables. Table 3 below presents the results of the stationarity test for each of the variables.

Table 3. Augmented Dickey-Fuller (ADF) Unit Root Test

SERIES	ADF at Levels	ADF at First Difference	Order of Integration
CAD	-3.499651**	-6.782101	I (0)
BD	-4.013597*	-9.203227	I (0)
MON	-1.621164	-5.885483*	I (1)
RGDP	1.975411	-5.303351*	I (1)
INR	-1.472475	-9.781999*	I (1)
RER	0.571636	-5.795255*	I (1)

Source: Author's computation with E-views

Note: A variable is stationary when the ADF t-stat is greater than the critical values at a given level of significance. * and ** indicates stationarity at 1 percent and 5 percent level of significance.

From the table 3 above, it can be observed that only the budget deficit and current account were stationary at levels at 1 percent and 5 percent level of significance respectively, the others were found not to be stationary at levels. However, all the variables became stationary after the first differencing; in other words, all the variables were integrated of order 1 that is I(1). Thus, the null hypothesis of the presence of a unit root is rejected at first difference as the absolute values of the ADF statistics were greater than the critical values at 1 percent level of significance.

Co-integration Test

Having ascertained the order of co-integration, the next step is to test for the existence of a long run relationship between budget deficit and current account deficit together with their interacting variables. The purpose of the co-integration test is to determine whether a group of non-stationary series is co-integrated or not. Engle and Granger (1987) pointed out that if the linear combination of non-stationary series exists, then the non-stationary time series are said to be co-integrated. The stationary linear combination is called the co-integrating equation and may be interpreted as a long run equilibrium relationship among the variables. In the study, the multivariate Johansen co-integration test will be used as against the Engle and Granger two-step procedure.

According to Tang (2010), the major advantage of using the multivariate co-integration approach is that it has superior properties in particular for two or more variables in a system as it is not sensitive to the choice of dependent variables as it assumes all variables to be endogenous. Also, the Johansen test is preferred to the Engle and Granger two step procedure as the latter first estimates the regression equation and test for stationarity of the residual, this can bring about the transmission of errors. In addition, the Johansen method shows the number of co-integrating equations as well as the estimation of the long run equation which is not possible with the Engle and Granger two step procedures (Arize and Melinderos, 2008).

Johansen proposes two different likelihood ratio tests of significance of these economical correlations. These are the trace tests and the maximum eigen value tests. The trace test statistics tests the null hypothesis “there are at most r co integrating relations” against the alternative hypothesis of “ m co integrating relations” (that is, the series are stationary), $r = 0, 1, 2, \dots, m-1$. The maximum eigen value on the other hand test the null hypothesis “there are co-integrating relations” against the alternative hypothesis “there are $r + 1$ co-integrating relations”. The co-integration rank test which is to test the number of co- integrating vectors was done under the assumption that the series have no deterministic trend and have intercept. This is because a number of the variables were found to have intercepts when the line graph was constructed. The results of the Johansen co-integration test is presented in table 4 and 5.

Table 4. Johansen Co-integration Test (For Trace Stat.)

Hypothesized		Trace	0.05	
No. of CE(s)	Eigen value	Statistic	Critical Value	Prob.**
None *	0.683006	130.3979	103.8473	0.0003
At most 1 *	0.589095	85.59187	76.97277	0.0095
At most 2	0.463455	50.90557	54.07904	0.0932
At most 3	0.350045	26.62396	35.19275	0.3082
At most 4	0.158355	9.820732	20.26184	0.6574
At most 5	0.076345	3.097264	9.164546	0.5627

Source: Author's computation with E-views.

Trace indicates 2 co-integrating equations at 0.05 level.

* denotes rejection of hypothesis at 0.05 level.

Table 5. Johansen Co-integration Test (Max-Eigen value Stat.)

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigen value	Statistic	Critical Value	Prob.**
None *	0.683006	44.80599	40.95680	0.0176
At most 1	0.589095	34.68630	34.80587	0.0517
At most 2	0.463455	24.28162	28.58808	0.1613
At most 3	0.350045	16.80322	22.29962	0.2450
At most 4	0.158355	6.723468	15.89210	0.7031
At most 5	0.076345	3.097264	9.164546	0.5627

Source: Author's computation with E-views.

Max-Eigen stats indicate 1 co-integrating equation at 0.05 level.

* denotes rejection of hypothesis at 0.05 level.

The result of the trace and maximum Eigen value summarized in Table 4 and 5

indicates the possibility of rejecting the null hypothesis that says there are no co-integrating vectors at 5 percent level of significance. This confirms the existence of long run equilibrium relationship between budget deficit and the current account deficit as the trace statistics indicates 2 co-integrating relationship while the maximum Eigen value indicates 1 co-integrating relationship, which means that they do not diverge away from each other in the long run. However, in this study, the indication of the maximum Eigen value test is followed. This is because the maximum Eigen value test is more likely to give normal result as regards the number of equations in the model that would converge towards the long run equilibrium path.

Table 6. Normalized Co-integrating Coefficients (Standard Error in Parenthesis)

CAD	BD	MON	LRGDP	INT	RER	C
1.000000	0.275883	0.443051	-4.24E-06	-0.385598	-0.165482	-5.985680
	(0.42769)	(0.20966)	(1.4E-05)	(0.29101)	(0.04313)	(5.75258)

Source: Author's computation with E-views

Max-Eigen stats indicate 1 co-integrating equation at 0.05 level.

* denotes rejection of hypothesis at 0.05 level.

Furthermore, the estimates of the normalized co-integrating vector generated by the co-integration test is reported at the bottom of table 6 showing long run effect of budget deficit (BD) and the other interacting variables. The related t-statistics are reported in parenthesis below each coefficient. The existence of a unique co-integrating vector here implies that equilibrium relationship exists among the co-integrating variables and that no matter the fluctuation in the short run; these variables have a tendency to return to this equilibrium path in the long run. In other words, given an initial disequilibrium, the co-integrating variables will not wander away from one another endlessly but will eventually return to its established equilibrium path.

From the normalized co-integrating coefficients above, it can be observed that only money supply and exchange rates were found to be statistically significant given their t-statistics. Also, the budget deficit and money supply were negatively signed while the RGDP, interest rate and exchange rate were positively signed. In other words, in the long run, a 1 percent change in BD will lead to approximately a 28 percent decrease in the current account deficit but it is not significant. Also, a 1 percent change in money supply will result to about 44 percent decrease in the current account.

Multivariate Granger Causality Test

Given that the variables are not co-integrated, the ECM (using the Johansen) cannot be applied as such, we proceeded to carry out the causality test. The Granger causality test thus, helps to test the existence of causality and determine its direction. In most studies on the relationship between the budget deficit and the current account deficit, the most commonly used type of Granger causality is the bivariate framework. The Granger causality tests with the bivariate framework are said to be biased owing to the

omission of relevant variable(s) that affects the relationship between the twin deficits (Tang, 2010).

Also, the multivariate Granger causality shows how the other variables individually and jointly Granger causes the dependent variable. This is a remarkable improvement over the bivariate framework. This study employs the Vector Error Correction (VEC) Granger causality/Block Exogeneity Wald test to test for the multivariate Granger causality which shows causality among the variables of interest. The multivariate Granger causality can be performed in various ways but this study will use the Granger causality Block Wald test within the VEC model framework. The result is presented in table 7 through 12 below.

VEC Granger Causality/Block Exogeneity Wald test

Table 7. Dependent Variable; D (CAD)

Excluded	Chi-Square	df	Prob
D(BD)	1.381567	2	0.5012
D(MON)	5.089605	2	0.0785
D(RGDP)	2.220917	2	0.3294
D(INT)	1.524860	2	0.4665
D(RER)	1.117600	2	0.5719
ALL	12.78470	10	0.2360

Source: Author's computation with E-views

Table 8. Dependent Variable; D (BD)

Excluded	Chi-Square	df	Prob
D(CAD)	5.088710	2	0.0785
D(MON)	2.399733	2	0.3012
D(RGDP)	8.187262	2	0.0167
D(INT)	3.559773	2	0.1687
D(RER)	2.178612	2	0.3364
ALL	17.59277	10	0.0622

Source: Author's computation with E-views

Table 9. Dependent Variable; D (MON)

Excluded	Chi-Square	df	Prob
D(CAD)	1.662903	2	0.4354
D(BD)	3.195489	2	0.2024
D(RGDP)	5.180465	2	0.0750

D(INT)	1.613148	2	0.4464
D(RER)	2.191019	2	0.3344
ALL	9.580632	10	0.4780

Source: Author's computation with E-views

Table 10. Dependent Variable; D (RGDP)

Excluded	Chi-Square	df	Prob
D(CAD)	8.221225	2	0.0164
D(BD)	6.546916	2	0.0379
D(MON)	13.92505	2	0.0009
D(INT)	3.758688	2	0.1527
D(RER)	2.749333	2	0.2529
ALL	31.79899	10	0.0004

Source: Author's computation with E-views

Table 11. Dependent Variable; D (INT)

Excluded	Chi-Square	df	Prob
D(CAD)	8.401906	2	0.0150
D(BD)	0.773984	2	0.6791
D(MON)	0.626852	2	0.7309
D(RGDP)	0.984094	2	0.6114
RER	0.345336	2	0.8414
ALL	16.02099	10	0.0990

Source: Author's computation with E-views

Table 12. Dependent Variable; D (RER)

Excluded	Chi-Square	df	Prob
D(CAD)	0.161862	2	0.9223
D(BD)	0.411191	2	0.8142
D(MON)	4.550628	2	0.1028
D(RGDP)	0.611457	2	0.7366
D(INT)	2.117522	2	0.3469
ALL	7.449806	10	0.6824

Source: Author's computation with E-views

Applying the WALD test, the results from table 8 shows that the causality between budget deficit and current account deficit does not exist, but rather from current account deficit to budget deficit. The value 0.5012 is not statistically significant showing that budget deficit does not granger cause current account deficit. Only

money supply was found to granger cause the current account deficit at 5 percent level of significance even though their joint p-value was found not to be significant (0.2360). However, Table 9, the probability value of current account deficit which is 0.0785 shows that current account deficit significantly granger cause the budget deficit at 5 percent level of significance when budget deficit is the dependent variable. This result implies that only a unit-directional causality exists between the twin deficit and it flows from current account deficit to budget deficit as against the proposition of the Keynesians that the flow is from budget deficit to current account deficit. In other words, for the Nigerian economy, reverse causality is what is evident.

A possible reason for this reverse relationship is that budget policies in Nigeria have been accompanied by substantial external trade deterioration. And given that increase in government spending is mostly transitory, it has little or no effect on the permanent income and consequently consumption plans of domestic households. Thus, when the government uses debt to finances increases in its spending, it leads to a near static increase in domestic private savings while the budget deficit incurred will have a near proportional effect on the current account. Basically, the budget deficit will lead to higher interest rates and this higher interest rates lead to the appreciation of the exchange rate and this leads to the widening of current account deficit. The results obtained though consistent with many other results may not be generalizable given that the Nigerian economy, being an oil rich country that relies much on oil revenue, may be affected by occurrences that affects the oil market and subsequently the price of oil internationally.

The result of this study confirms the earlier result from Egwaikhide, et al (2002) for Nigeria. Furthermore, it supports the findings of Kulkarmi and Erickson (2001) for Pakistan; Neaime (2008) for Lebanon; Arize and Melinderos (2008) for selected 10 African countries including Nigeria; Suchismita and Sudiptal (2011) for India and Rauf and Khan (2011) for Pakistan, among others.

Summary of Findings, Policy Implications of Result and Conclusion.

This study investigates the twin deficit relationship in an oil-dependent open economy like Nigeria where exports, government revenue and income are closely linked with oil revenue. The study attempted to prove that even in a petroleum economy, the Keynesian proposition of a long run equilibrium relationship exists between the twin deficits, but the direction of causality is reversed. The study showed that the twin deficits hypothesis was valid for the Nigerian economy as the result from the co-integration test showed the existence of long run equilibrium relationship between the budget deficit and the current account deficit. Also, the study found strong support for reverse causation also known as “current account targeting” for Nigeria. This implies that even the Mundell-Fleming model was valid for Nigeria; the direction of causality was not from budget deficit to current account deficit but rather from current account deficit to budget deficit. This can be attributed to the nature of the Nigerian economy being an oil-based and oil-dependent economy.

The economic implication of this phenomenon is very important for the Nigerian economy. The reverse causality that was found to exist for Nigeria implies that if the Nigerian government intends to reduce the “twin deficit” phenomenon in Nigeria, it must begin by reducing the current account deficits. In other words, policies should be geared towards controlling the deficit in the current account most especially by diversifying the export base of the economy by promoting non-oil exports. Since the current account balance of Nigeria depends on oil prices, the government should endeavour to diversify the sources of the National income by encouraging exports of non-oil products and reducing imports.

The multivariate Granger causality test which was done using the Wald/exogeneity test within the VECM framework showed a uni-directional causality flowing from the current account deficits to the budget deficits in Nigeria for the period of review by this study. The result of the Wald Test showed that the causality between budget deficit and current account does not exist, but rather the current account deficit is the one that causes the budget account deficit for the Nigerian economy. The ECM which shows the speed of adjustment back to equilibrium reflected that the model has about 59 percent adjustment to equilibrium from the long run to the short run which is a moderate adjustment. The examination of the relationship between the twin deficits has important policy implications for the economy. Firstly, persistent large deficits is believed to cause indebtedness as government will tend to resort to borrowing internally and externally which may affect the debt profile of such economy. Secondly, it imposes burden on the future generations as debt incurred by the government to finance the deficits is carried into future generations. Also, since increases in current account deficit reflect escalating government budget deficits, the current account deficit cannot be remedied by just fiscal consolidation as argued in some empirical literature. Similarly, if the causal role of the twin deficit is incorrect, then reductions in the federal budget deficit may not resolve the current account dilemma causing diversion of scarce economic resources from relevant sectors.

Based on the study’s findings, it was recommended that: If government intends to reduce its “twin deficit” dilemma, it must begin by reducing its current account deficits and this can be achieved by reducing imports, increasing exports or a combination of both measures. Also, since the findings of this study showed evidence of reverse causation from current account deficits to budget deficits, adjustments in fiscal balance can only be achieved through the implementation of strong external policies. The study found that of all the interacting variables, only money supply Granger causes current account deficits. This implies that changes in the money supply base of the Nigerian economy will impact significantly in the current account balance. So the Central Bank of Nigeria must endeavour to consciously monitor the supply of money in the economy. In reducing the current account deficit, increase in domestic savings is required which in turn requires the development of a strong financial sector.

References

- Abbas, S. M., Bouhga-Hagbe, J., Fatás, A. J., Mauro P., & Velloso, P. C. (2010) Fiscal Policy and Current Account. *IMF Working Paper* No 121. May.
- Afonso, A., & Rault, C. (2009). Bootstrap Panel Granger-Causality between Government Budget and External Deficits for the EU. *CESifo Working Paper* No 2581.
- Arize, A. C., & Melindreras, J. (2008). Dynamic Linkages and Granger Causality between Trade Deficits and Budget Deficits: Evidence from Africa. *African Journal of Accounting, Economics, Finance and Banking Research*. 2(2).
- Bagnai Alberto, (2006). "Structural breaks and the twin deficits hypothesis," *International Economics and Economic Policy*, Springer, vol. 3(2), pages 137-155
- Baharumshah, A. Z., Evan, L., & Khalid, A. M. (2006). Testing Twin Deficits Hypothesis Using VARs and Variance Decomposition. *Business Papers*, Bond University School of Business. ePublications@bond.
- Barro, R. J., (1974). Are government bonds net wealth? *Journal of Political Economy*, 82, 1095–1117.
- Baxter, M. (1995). International Trade and Business Cycles. In: Grossmann, G. and K. Rogoff (eds.), *Handbook of International Economics*, 3, North-Holland Elsevier, Amsterdam.
- Brian, N. (n.d). Twin Deficits: An empirical analysis on the relationship between budget deficits and trade deficits in Argentina. Retrieved on May 18, 2012 from <http://business.pages.tcnj.edu/files/2011/07/Ng.Thesis.pdf>
- Bussiere, M., Fratzscher, M., & Muller, G. J. (2005) Productivity Shocks, Budget Deficits and the Current Account. *European Central Bank Working Paper Series*. No. 509.
- Cavallo, M., (2005). Understanding the Twin Deficits: New Approaches, New Results. *FRBSF Economic Letter*. Number 2005-16, July 22.
- Celik, S., & Deniz, P. (n.d). An Empirical Investigation of Twin Deficit Hypothesis for Six Emerging Countries. Retrived on May 18, 2012 from http://www.hull.ac.uk/php/ecskrb/MED2009/Celik_fup.11889.1239886856.
- Chang, J., & Hsu, Z. (2009). Causality Relationship between the Twin Deficits in the Regional Economy. Department of Economics, National Chi Nan University.

Chinn, M. D. (2005). Getting Serious about the Twin Deficits. The Bernard and Irene Schwartz Series on the Future of American Competitiveness. CSR NO. 10, September. Council on Foreign Relations.

Egwaikhide, F. O. (1997). Effects of Budget Deficits on the Current Account Balance in Nigeria: A Simulation Exercise. *AERC Research Paper* 70. Nairobi.

Egwaikhide, F. O., Oyeranti, O. A., Ayodele, O. S., & Tchokote, J. (2002). Causality between budget deficits and the current account balance in African Countries. *West African Journal of Monetary and Economic Integration*. 2(2).

Evan, L., and Tang, T. C. (2009). Twin deficits in Cambodia: Are there Reasons for Concerns? An Empirical Study. Monash University, Business and Economics. Department of Economics. *Discussion Paper* 11/09.

Evan, Lau; Puah, Chin-Hong and Tan, Kim Lee (2006): Budget-current account deficits nexus in Malaysia. *The Journal of Global Business Management*, Vol. 2, No. 2, pp. 126-135.

Fleegler, E. (2006). The Twin Deficits Revisited: A Cross Country Empirical Approach. Being Honors Thesis submitted in partial fulfilment of the requirements for graduation with distinction in Economics in Trinity College of Duke University.

Gadong, T. D. (2009). Fiscal Deficits and the Growth of Domestic Output in Nigeria. *Journal of Economics*. 4(1). Jos.

Ganchev, G. T. (2010). The Twin Deficit Hypothesis: The Case of Bulgaria. *Financial Theory and Practice* 34(4). pp 357-377

Giancarlo, C., & Gernot, J. M. (2006). Twin Deficits: Squaring Theory, Evidence and Common Sense. Preliminary version of a paper prepared for the 43rd Panel Meeting of Economic Policy in Vienna.

Giancarlo, C., & Gernot, J. M. (2007). Twin Deficits, Openness and the Business Cycle. Being paper presented at EEA meeting in Budapest, Goethe University of Frankfurt.

Hakro, A. N. (2009). Twin Deficits Causality Link- Evidence from Pakistan. *International Research Journal of Finance and Economics*. 24.

Hashemzadeh, N., & Wilson, L. (2006). The dynamics of current account and budget deficits in selected countries in the Middle East and North Africa. *International Research Journal of Finance and Economics*. 5.

- Hossain, S. (2012). Multivariate Granger causality between economic growth, electricity consumption, exports and remittances for the panel of three SAARC Countries. *Global Journal of Management and Business Research*. 12(4).
- Jayaraman, T. K., & Chee-Keong, C. (2008). Twin Deficits in Pacific Island Countries: A Case of Vanuatu. *Journal of Small Economies and Global Economies*. Editors: J.R. Pillarisetti, R. Lawrey and J. T. S. Yean.
- Jayaraman, T. K., Chee-Keong, C., & Siong-Hook, L. (2009). Testing the Validity of Twin Deficit Hypothesis in Pacific Island Countries: An Empirical Investigation. *Economics Bulletin*, 30(2).
- Kim, S., & Roubini, N. (2003). Twin Deficits or Twin Divergence? Fiscal Policy, Current Account and Real Exchange Rate in the US, NYU Stern mimeo.
- Kim, S., & Roubini, N. (2007). Twin Deficit or Twin Divergence? Fiscal Policy, Current Account and Real exchange Rate in the US". Loic Berger and Lena Korber, June 15.
- Korsu, R. D. (2006). Fiscal Deficits and the External Sector Performance of Sierra Leone: A Simulation Approach. *Journal of Economics and Monetary Integration*. 9(1).
- Kulkarni, K.G. and Erickson, E.L. (2001). „Twin Deficit Revisited: Evidence from India, Pakistan and Mexico.“ *Journal of Applied Business Research*, 17(2): 97-100.
- Labonte, M., & Makinsen, G. (2005). The Budget Deficits and the Trade Deficits: What is their Relationship? *CRS Report for Congress*. Order code RS21409.
- Mamdouh, A. A. (2002). The Twin Deficits Phenomenon in Petroleum Economy: Evidence from Saudi Arabia. King Saud University Dept. of Economics. Retrieved on January 17, 2012, from <http://www.erf.org.eg/html/finance1.pdf>.
- Mukhtar, T., Zakaria, M., & Ahmed, M. (2007). An Empirical Investigation of the Twin Deficits Hypothesis in Pakistan. *Journal of Economic Co-operation*. 28(4), pp 63-80.
- Neaime, S. (2008). Twin Deficits in Lebanon: A Time Series Analysis. *IFE Lecture and Working Paper Series No 2*. Beirut Institute of Financial Economics, American University of Beirut.
- Nkang, N. M., Abang, S. O., Akpan, O. E., & Offem, K. J. (2006). Co-integration and Error-Correction Modelling of Agricultural Export Trade in Nigeria: The Case of Cocoa. *Journal of Agriculture and Social Sciences*. 2(4), pp 249-255.

- Olga, V. (2000). Twin Deficit Hypothesis: The Case of Ukraine. A thesis submitted in partial fulfilment of the requirements for the degree of Master of Arts in Economics at the National University "Kyiv - Mohyla Academy"
- Onafowokan, O. A., & Owoye, O. (2006). An Empirical Investigation of Budget and Trade Deficits: The Case of Nigeria. *Journal of Developing Areas*. 39(2), pp 153-174.
- Orebiyi, J. S., & Ugochukwu, A. I. (2005). Budget and Budgetary Control in Nigeria: Procedures, Practices and Policy Issues. *Global Journal of Agricultural Sciences*. 4(1) pp 69- 73
- Osakwe, P., & Verick, S. (2007). Current Account Deficits in Sub-Saharan Africa: Do they Matter? Draft: 7 October.
- Ratha, A. (2011). Twin Deficits or Distant Cousins? Evidence from India. *Economics Working Paper* No 5.
- Rauf, A., & Khan, A. Q. (2011). An empirical study to find the relationship between trade deficits and budget deficits in Pakistan. *Academic Research International*.1 (3).
- Saleh, A. S. (2006). Long-run Linkage between Budget Deficit and Trade Deficits in Lebanon: Results from the UECM and Bounds Tests. *IIUM Journal of Economics and Management*. 14(1).
- Schneider, E., Chen, P., & Frohn, J. (2008). A long run structural macro-econometric model for Germany: An empirical note. *Open-Assessment E-Journal*. 2(16).
- Shukur G. and Hatemi-J A. (2002) "Multivariate-Based Causality Tests of the Twin Deficits in the US". *Journal of Applied Statistics*, Vol. 29(6), 817-824.
- Sims, C. A. (1980). Macroeconomics and Reality. *Econometrica*. 48(1), pp 1-48.
- Suchismita, B., & Sudipta, J. (2011). India's Twin Deficits: Some Fresh Empirical Evidence. *ICRA Bulletin, Money and Finance*. December.
- Sule, K. O., & Momoh, C. O. (2009). The impact of stock market earnings on Nigerian per capita income. *African Journal of Accounting, Economics, Finance and Banking Research*. 5(5).
- Tang, C. F. (2010). Multivariate Granger causality and the dynamic relationship between health spending, income and health price in Malaysia. *MPRA Paper* No 27298. Posted 08/12/2010.
- Yanik, Y. (2006) The Twin Deficits Hypothesis: An Empirical Investigation. A thesis submitted to the Graduate School of Social Sciences Of Middle East Technical University. December.

Zamanzadeh, A., & Mehrara, M. (2011). Testing Twin Deficits Hypothesis in Iran”. *Interdisciplinary Journal of Research in Business*. 1(9) pp 07-11.

Zengin, A. (n.d). The twin deficits hypothesis (The Turkish Case). Zonguldak Karaelmas University. Department of Economics, Zonguldak, Turkey. Retrieved on May 18, 2012 from <http://www.opf.slu.cz/vvr/akce/turecko/pdf/Zengin.pdf>.

Zhidong, B., Heng, L., Wing-Kenng, W., & Zhang, B. (2009). *Multivariate Causality Tests with Simulation and Application*. Springer.

