Testing the twin deficit hypothesis for Kenya 1970-2012

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Abstract: The Twin Deficit Hypothesis (TDH) is an economic proposition suggesting that there exists a positive causal association between Budget deficit and Current account deficit. This assertion has been the subject of debate in the scholarly and policy front. However, most of the already existing literature on the TDH has focused on already developed economies. Majority of this literature carried out bivariate analysis using annual data. This study investigates the TDH nexus for Kenya using quarterly data spanning from $1970Q_1$ - $2012Q_1$ in a multivariate approach. The study employed various econometric tests including Johansen & Juselius cointergration tests, Vector Auto Regression and Toda- Yamamoto's Granger causality test. The study also estimated the Impulse response functions and Variance decomposition. The results indicate that the TDH does exist in Kenya in a multivariate environment as opposed to directly between budget deficits and current account deficits. The study proposes that the government should formulate adequate fiscal and monetary policies that will effectively manage the country expenditure and revenue. The government should also look into ways of increasing its revenues and reducing expenditures.

Keywords: Twin Deficit Hypothesis, Budget Deficit, Current Account Deficit

1. Introduction

The Twin Deficit Hypothesis (TDH) is an economic proposition suggesting that there exists a positive causal association between budget deficit and current account deficit. The link between the two deficits has been at the core of research interest since the '*Reagan Fiscal Deficits*' in the 1980s, Ahmad, Lau and Ahmed (2006). This period saw an expansion of the two deficits provoking researchers to explore their relationship. Mccoskey and Kao (1999) define the TDH nexus as the long run positive relationship between the budget deficit and the current account deficit. The concept postulates that an increase in budget deficits leads to an increase in current account deficits.

The research on TDH has been the subject of debate in the scholarly and policy front. However, most of the already existing literature on the TDH has mainly focused on developed economies and mainly undertook bivariate analysis using annual data. Over time research on the relationship between the two deficits has spread to developing nations. The different studies have provided different and sometimes contrasting results based on the type of data and methodologies used.

1.1. Background of the Twin Deficit Hypothesis

The twin deficit hypothesis can be explained using the Keynesian income-expenditure framework, Brian, (2011), and the Mundell Flemming framework, Ahmad *et al.,* (2006). According to the former, an expansionary budget leads to increased income ultimately resulting in increase in aggregate demand for domestic and imported goods. The increase in imports leads to a worsening of the current account balance. According to Mundell Flemming, an increase in budget deficit causes an upward rise in interest rates if government borrows domestically to finance the deficit. This rise in interest rate leads to capital inflows and consequently an appreciation of the exchange rates. This means exports become less attractive while imports become attractive ending up worsening the current account. This approach however depends on the openness of the economy and the exchange rate regime. In a fixed exchange rate regime expansionary fiscal policy would lead to increased income a process that would still worsen the current account (Mundel, 1968). There however exists contradicting views whereby some scholars believe there exists no relationship between the variables while others believe the relationship exists and its bi directional. For example, Lau et al. (2006) found support for bi-directional causality while reverse causality was confirmed for Indonesia.

The debate is not without controversy even in countries like Kenya (See for instance, Egwaikhide, Ayodele, Oyeranti and Tchokote, 2002 and Kosimbei, 2002)

1.2. Motivation for Studying the Twin Deficit Hypothesis

Government expenditure is a crucial element in any country as governments have the responsibility of provision of social amenities and as such, it is impossible for a government to curtail its expenditure. Due to low levels of income in developing nations, there is limited scope for increasing tax revenues, Khalid and Guan, (1999) meaning that expenditure more often than not exceeds revenues. Stephen (2010) noted that in order to achieve macroeconomic stability and sustained economic growth, the two deficits have to be kept in control. Keeping a balance between the two macro-economic variables is a problem not only for developed countries but also for developing countries.

The need to understand the relationship between the two deficits is motivated by the fact that large budget deficits have dire consequences on future generations who are left with a repayment burden. Also, the two deficits are known to cause macro-economic imbalances which affect the long run economic development of a nation, (Lau and Khalid, 2006). Large and persistent current account deficits are among the most serious problems of many developing countries since they result in economic crises like currency crises, the burgeoning external debts and the reduction in international reserves.

With this in mind, and considering the severity of the two deficits, it seems imperative to investigate the dynamics of the budget and current account balances.

1.3. Overview of Kenya's Macro Economic Landscape

Kenya's fiscal management is guided by the Fiscal Management Act (2012) and Chapter 12 of the Constitution of Kenya on Public Finance. Despite stringent fiscal policies that seek to bring about fiscal discipline in the country, the problem of expanding budget and current account deficits continue to face the country.

A striking feature of the country's fiscal operations since the 1970's indicate that Kenya has been running budget deficit and current account deficits for many years since independence. This rise in spending is due largely to government initiatives to improve infrastructure and support the country's free education system for an increasing population as well as due to poor budgetary planning (Wawire, 2006). Government spending has been on a rapid increase that has not been matched by a commensurate rise in government revenue. The worst Budget deficit recorded was in 1992-1994 when donor funding was cut from Kenya. In efforts to rein in on spending, the Kenyan government made policy changes in 2000 and 2001, including efforts to improve fiscal discipline and transparency by strengthening the government's Office of the Controller and Auditor General. In order to increase tax revenue, the Kenyan government has also expanded its consumption tax policy to apply to more goods. These policy changes have been successful at managing the recent budget shortfall, but budget deficits continue to be a problem for Kenya.

The country's current account balance has also remained mostly negative over the years. The current account deficit rose from 2.9 percent of GDP over 1964-73 to 6.9 percent over 1974-79 on account of the two oil shocks, widening trade balance and overvalued domestic currency. Long term flows turned from a position of 5 percent of GDP over 1964-73 to a -1.8 percent of GDP over 1996-2000 prompting the country to rely increasingly on risky short term flows to balance the accounts. The situation was aggravated in the late 90's due to a freeze in donor aid and lending with the country recording lowest budget balance. The trend has been worsening since 2008 partly due to the aftermath of the disputed elections and partly due to rising world oil prices.

The country's import bill continues to expand at a rate that is not commensurate to the expansion of the export bill. It was largely anticipated that, with the implementation of the EAC Customs Union in 2005, Kenya would dominate regional trade by diversifying its exports to the EAC market, given its comparative advantage, especially in the manufacturing sector. However, this has not been the case and as shown above, imports largely exceed the volume of exports.

1.4. Scope of the Study

The study used a four decade secondary quarterly data spanning 1970 Q1 to 2012 Q1. Data for GDP, Exchange rate, Interest rates, Budget and Current account Deficits were collected from the KNBS, CBK, IMF and World Bank's World Economic Outlook Database.

2. Literature Review

2.1. Theoretical Literature

As far as the interaction between budget deficits and current account deficits is concerned, four testable approaches can be studied. However, majority of past studies were based mainly on two testable hypotheses, being; the Keynesian/ conventional proposition and the Ricardian Equivalence proposition.

The Keynesian/ Conventional proposition postulates that a decrease in taxes or an increase in public expenditures causes an increase in the national income which boosts the import sector and this consequently results in the increase of current account deficits. The Mundel-Fleming proposition suggests that a cut in public expenditure in an open economy with a flexible exchange rate regime leads to a reduction in aggregate domestic demand and consequently a fall in GDP. This causes a reduction in the transactional demand for money pilling a downward pressure on domestic interest rates causing a gap between international and domestic interest rates. This difference causes capital outflows and an increase in the demand for investment goods. Depreciation of the domestic currency due to higher domestic demand and lower interest rates brings about correction in both the trade balance and the

rest of the macro-economy, including the budget balance, until the alignment of domestic with international interest rates is restored. The second approach is based on the Ricardian Equivalence Hypothesis which hypothesizes that there exists no relationship between the two deficits. The approach explains that an inter-temporal shift between taxes and budget deficit do not matter for real interest rates, investment or current account balance.

Those two aren't the only testable approaches by which the interaction between the two deficits can be studied. The third approach, known as current account targeting is based on a unidirectional causality that runs from current account deficit to budget deficit which may happen when worsening of the current account leads to slowing of the economic growth thus leading to budget deficit. The final approach is based on a feedback causality may cause the causality to run in both directions.

2.2. Empirical Introduction

Egwaikhide et al., (2002) studied a number of African countries using data for 1970-1999. Their study employed the use of OLS to analyze for correlation between the two deficits. The authors found that there exists a positive relationship between the two deficits for all nations under study except for Cameroon, Cote d'Ivoire, Gambia, Guinea-Bisau and Mali. Granger causality test confirmed twin deficit hypothesis for Benin, Burkina Faso, Ghana, Nigeria and South Africa and bi-lateral causality for Togo. The study found a unilateral causality running from current account deficits to budget deficits for the case of Kenya.

In another study, Kosimbei (2002) used annual data for 1964 to 2000 to analyze the relationship between fiscal and current account deficit. The author carried out Granger causality tests which revealed that there was no causality between fiscal and current account deficits. The study concluded that the Ricardian equivalence is valid in the Kenyan case with short-run dynamics being the same as long run equilibrium relationships. This was a contrast to the findings by Kosimbei (2002), Egwaikhide et al., (2002) found a unilateral causality that runs from current account deficits to budget deficits for the case of Kenya.

Lau and Baharumshah (2004) used annual data for 1976-2000 to investigate the causal link between the two deficits for Malaysia. By employing the Toda Yamamoto granger causality test, the authors found support for bi-directional causality.

Lau, Mansor and Puah (2006) examined the TDH link for 4 countries which are India, Malaysia, Thailand and Philippines. While still making use of the Toda-Yamamoto granger causality test, the authors found support for bi-directional causality in India & Malaysia- just like their study for Malaysia two years prior. The study also found strong support for TDH for Thailand while for Indonesia, reverse causality was confirmed. The study confirms that exchange rate and interest rates are important channels for causality.

Marinheiro (2006) analyzed data for Egypt for the period 1974 – 1989. Using VECM model, the author tried to determine whether the budget deficit leads to an external deficit in Egypt. The findings indicated that there exists a causal relationship from the current account deficit to the budget deficit.

Lau et al. (2007) used quarterly data to examine the TDH nexus in the Five Asian Countries; Korea, Malaysia, Philippines, Indonesia, Thailand. The researchers used Johansen and Juselius cointergration procedure and VECM for Granger causality. Their study was split into two sub periods of 1976 Q1 to 1997 Q2 and 1997Q3 to the end for each country's sample. In the pre-crisis period, the authors found support for the TDH for Malaysia, Philippines, and Thailand. Results indicate causality runs in the opposite direction Korea and Indonesia. In the Post Crisis period, their research returned similar results with the exception of Philippines which had a bi directional causality. The researchers concluded that while as managing the deficits should be an important national agenda, TDH is not a universal phenomenon, and rather, it is country specific.

Jayaraman and Lau (2008) studied six Pacific Island Countries (6 PIC's) for 1988-2004 using VECM and fully modified OLS method. The study found a bi-directional relationship in the short run which they indicate is not an unusual phenomenon for countries that rely on export revenues. In the long run, the study could not find any causality.

Sadullah and Deniz (2008) used quarterly data for 1996 Q1-2006 Q4 to study six emerging countries. Using panel cointergration and fully modified OLS Method, the authors in similarity with Akbostanci and Tunc (2002) found supports the twin deficit hypothesis for Czech, Brazil, Mexico, Colombia, South Africa and Turkey. Their study points out on the important role of intermediary variables i.e. interest rates and exchange rates.

Ganco (2010) undertook to establish the relationship between the two deficits for Bulgaria. Using annual data from 2000 to 2010, Granger causality and Vector error correction models found out that Budget deficit has impact of Current account deficits. The study concluded that TDH is not valid for Bulgaria and that fiscal policies should not be used as a substitute for monetary policy.

Saeed and Khan (2012) used annual data for 1972-2008 to investigate the dynamics of the two deficits in Pakistan. Using Johansen maximum likelihood procedure for long run cointergration and granger causality, the researchers found a long run relationship between the two deficits. This causality runs from budget deficit to current account deficit thus conclude that Pakistan is a non Ricardian economy.

Brian (2012) employed the use of VAR model to empirically examine the causal relationship between BD and CAD for Argentina. Using quarterly data from 1976 Q1-2010 Q3, the study couldn't find causality in any direction. As such, the study concludes that Argentina is a Ricardian nation. The authors are however quick to warn on the imperfect nature of the data used. They also indicated that there is evidence that a better fitting model can be made

Merza et al. (2012) used Ganger causality test, Johansen

cointergration test, Vector Auto regression and Impulse response functions to study the Twin Deficit Hypothesis for Kuwait. Results for the data spanning from 1993 Q1- 2010 Q4 indicates that though budget deficits and current account deficits are cointergrated in the long run, budget deficits respond negatively to shocks in current account deficits. The findings that twin deficit hypothesis is not existent for the Kuwaiti economy is consistent with study by Alaksami (2000) for Saudi Arabia which is a similar economy in terms of being an oil rich economy.

3. Methodology

3.1. Theoretical Framework

The theoretical foundations of the connection between the budget and current account deficits can be traced from both the national income identity as well as the Mundel Flemming (M-F) framework. Virtually, all analyses of the twin deficit hypothesis begin with a review of a basic national accounting identity as highlighted in equation 3.1.

$$Y=C+G+I+(X-M) \qquad (3.1)$$

Where;
Y- GDP which is the output produced by the economy
C- Consumption
I- Investment
G- Government expenditure
(X - M)- Net Exports
The current account is given as

$$CA=X-M+Nt \qquad (3.2)$$

Where N_{tr} is net transfer. This component was assumed to be very small or negligible for case of Kenya.

The national investment equation in an open economy is given as;

$$S=Y-C-G+CA \qquad (3.3)$$

National Investment is given as

$$I=Y-C-G \qquad (3.4)$$

Considering an open economy, the savings equation can be given as

$$S=I+CA \qquad (3.5)$$

Equation (3.5) illustrates that an open economy can source domestically and internationally for the funds needed for investment activities, that is, borrowing can allow domestic investments to exceed domestic savings. Savings can also be separated into private savings (S^{pr}) and government savings (S^{g}) to get

$$S=S^{pr}+S^{g} \qquad (3.6)$$

$$S^{pr}=Y^{d}-C \qquad (3.7)$$

Private savings is given by the part of disposable income

(Y^{d}) that is saved after consumption. The government savings on the other hand is given as government revenue in terms of taxes less expenditure in terms of expenditure (G) and government transfers (T_{r}) as given in equation (3.8) below.

$$S^{g}=T-G-T_{r} \qquad (3.8)$$

Rising from the above identities, and having separated private savings from government savings, equation (3.9) holds.

$$S=S^{pr}+S^{g}=I+CA \qquad (3.9)$$

Equation (3.9) provides a possibility for re-writing previous equations to a form that is useful for analyzing the impact of government savings on an open economy.

$$S^{pr}=I+CA-S^{g}=I+CA-(T-G-T_{r}) \qquad (3.10)$$

Re-arranging equation (3.10)

$$CA=S^{pr}-I-(G+T_{r}-T) \qquad (3.11)$$

Where, the expression $(G + T_{r} - T)$ in equation 3.11 represents consolidated public sector budget deficit. It represents the extent to which the government is borrowing to finance its expenses.

The equation in 3.11 above can be expressed in a simplified form as,

$$(X-M)=(S-I)+(T-G) \qquad (3.12)$$

Where (X-M) is the current account balance, (S-I) is the saving and investment balance, (T-G) is the budget balance. Considering the assumption that S = I, the current account imbalance may be attributable to a fiscal imbalance.

Equation 3.12 presents the framework under which changes in the budget deficit would result in changes in the current account deficit. An increase in the former would result in an increase in the latter if and only if the rise in government deficit decreases total private saving. For instance, if (S − I) remains the same and tax revenues (T) are constant, an increase in government spending (G) will positively affect the current account balance. This way, the government deficits that result from increased purchases tend to reduce the country's current account surplus, worsening of the external balance.

Equation (3.12) is dismissed as a simple identity equation and its assessment as an inappropriate exercise. Additionally, its estimation is considered to be misspecified to the extent that variables like exchange rate and interest rates are absent. This study considered that the transmission mechanism is important and should be explicitly taken into account. The study therefore adopted the Mundel Flemming approach in the analysis of effects of government policies to budget and current account balances.

3.2. Model Specification

The study utilized a structural Vector Auto Regressive (VAR) model which unlike other models doesn't- than necessary- impose restrictions to identify the system. Sims

(1980) described the other models as "incredible." The VAR's model is particularly important because the variables are treated symmetrically in a structural sense with each variable having an equation explaining its evolution based on its own lags and the lags of the other variables in the model. Also, no priori knowledge about the variables is required.

The VAR model took the form,

$$CAD_t = \sum_{i=1}^{n} \alpha_i CAD_{t-i} + \sum_{j=1}^{n} \beta_j BD_{t-j} + \sum_{k=1}^{n} \phi_k EXRATE_{t-k} + \sum_{l=1}^{n} \phi_l INR_{t-l} + \mu_1 \quad (3.13)$$

$$BD_t = \sum_{i=1}^{n} \alpha_i BD_{t-i} + \sum_{j=1}^{n} \beta_j CAD_{t-j} + \sum_{k=1}^{n} \phi_k EXRATE_{t-k} + \sum_{l=1}^{n} \phi_l INR_{t-l} + \mu_2 \quad (3.14)$$

$$INR_t = \sum_{i=1}^{n} \alpha_i INR_{t-i} + \sum_{j=1}^{n} \beta_j CAD_{t-j} + \sum_{k=1}^{n} \phi_k EXRATE_{t-k} + \sum_{l=1}^{n} \phi_l BD_{t-l} + \mu_3 \quad (3.15)$$

$$EXR_t = \sum_{i=1}^{n} \alpha_i EXR_{t-i} + \sum_{j=1}^{n} \beta_j CAD_{t-j} + \sum_{k=1}^{n} \phi_k BD_{t-k} + \sum_{l=1}^{n} \phi_l INR_{t-l} + \mu_4 \quad (3.16)$$

Where;
CAD- Current Account Deficit
BD- Budget Deficit
EXRATE- Exchange Rate
INR- Interest Rate

3.3. Data Analysis

The study pursued a number of empirical tests based on time series econometric techniques such as unit root test, VAR analysis and Cointegration analysis. To establish the direction of causality between the variables of study, Toda and Yamamoto (1995) causality analysis was done.

Majority of past literature on the twin deficit hypothesis have concentrated on granger causality test to test for the causality on the two deficits. These tests have been blamed for concentrating on time rather than causality itself (Abdur and George, 2003). In most cases, time series data are non-stationary which means that parameters estimated from the non-stationary variables do not follow the standard statistical distributions for testing significance & have to be differenced. Granger causality is done in an environment of Error Correction, (Granger, 1988). The Error Correction Models (ECM's) like Engel Granger Error Correction Model and the Johansen & Juselius Vector Error Correction Models help omit misrepresentation and omission of important constraints. The Error Correction Models are sensitive to the values of nuisance parameters in finite samples making the results unreliable, (Toda & Yamamoto, 1995) & involve cumbersome process which results in loss of simplicity and ease of application, (Rambaldi & Doran, 1996).

Toda & Yamamoto (1995) proposed a procedure that allows for causal inferences to be made at level VARs that may not be stationary without use of the rigorous pretests and strict reliance upon cointergration and integration properties. They propose a modified WALD –MWALD- for testing granger non causality which impose nonlinear restrictions in the properties of the VAR models needless to test for unit roots and cointergration ranks. Not only is the procedure simple, it has also been found to be superior to both the LR test, (Moscani & Gianni, 1992) and the Wald test of Toda & Phillips (1993, 1994), as verified by Zapata & Rambaldi, (1997).

4. Research Findings

4.1. Introduction

The empirical studies by Egwaikhide et al., (2002) and Kosimbei, (2002) employed VAR model and error correction models. Borrowing from those studies, this study utilized the VAR model which contains information on the variables themselves, their interactions and the dynamic short-run and long-run relationships. However, this study used a different model from those of Egwaikhide et al., (2002) and Kosimbei, (2002) to test for causality between budget deficit and current account deficit.

4.2. Diagnostics

4.2.1. Unit Root Test

Table 4.2. Augmented Dickey-Fuller results

Test critical values:		5% level			
Lag length criteria		Sbc		Modified aic	
Variable	Included	Probability at levels	At 1st difference	At levels	At 1st difference
Bd	Intercept	0.0828	0.0004	0.4267	0.0000
	Trend & Intercept	0.0757	0.0024	0.6391	0.0000
	None	0.2524	0.0000	0.3345	0.0000
Cab	Intercept	0.0049	0.0005	0.142	0.0005
	Trend & Intercept	0.0250	0.0037	0.3768	0.0037
	None	0.0556	0.0000	0.0806	0.0000
Exrate	Intercept	0.918	0.0038	0.9045	0.0337
	Trend & Intercept	0.3763	0.0195	0.3752	0.0265
	None	0.932	0.0010	0.9116	0.0124
Inrate	Intercept	0.1821	0.0103	0.1821	0.0000
	Trend & Intercept	0.2354	0.0404	0.2354	0.0000
	None	0.2749	0.0006	0.2749	0.0000

The study first investigated the integration properties of the data since most of economic time series data are non-stationary. Augmented Dicky-Fuller test (ADF), Philliphs- Perron test and

Kwiatkowski-Phillips-Schmidt-Shin test statistics were used. The lag lengths for the ADF equations were chosen by the Modified Akaike Information Criterion (AIC) and Schwartz Bayesian Criterion (SBC). The lag lengths for PP and KPPS tests were chosen using Newey-West Bandwidth and Andrews Bandwidth.

Table 4.2 presents the results of the ADF unit root test. As shown in Table 4.2, the variables under study were found to be integrated of order one, I (1). (See detailed unit root test results in Appendix III).

The four variables namely, budget deficits, current account balance, interest rates and exchange rates were found to have a unit root at levels. They were however found to have no unit

root at first difference. Hence the variables became stationary on the first difference.

4.2.2. Lag Length Selection

The maximum lag length was chosen using Akaike information Criterion (AIC), the Swartz Bayesian Criterion (SBC) and the Sim's modified log-likelihood test (LR) test. Table 4.3 illustrates the lag selection results.

Four Information criteria suggested that a maximum lag length of 6 for each variable. However, additional test was carried to determine the number of lag length without serial correlation. The results are shown in Table 4.4.

***Table 4.3.** Optimal Lag Length Selection*

Lag	LogL	Modified LR test statistic	Final prediction error	Akaike information criterion	Schwarz information criterion	Hannan-Quinn information criterion
0	-2101.812	NA	3176036.	26.32265	26.39953	26.35387
1	-1068.928	2001.213	9.584755	13.61160	13.99600	13.76769
2	-808.3828	491.7792	0.451018	10.55478	11.24670	10.83575
3	-802.7706	10.31237	0.514048	10.68463	11.68406	11.09047
4	-789.2295	24.20470	0.531040	10.71537	12.02232	11.24608
5	-736.3815	91.82347	0.335999	10.25477	11.86923	10.91035
6	-601.8971	226.9424	0.076729*	8.773714*	10.69570*	9.554165*
7	-597.3614	7.427207*	0.089074	8.917018	11.14652	9.822341
8	-588.5393	14.00502	0.098200	9.006742	11.54376	10.03694
9	-567.4779	32.38193	0.093112	8.943474	11.78801	10.09854

* Indicates lag order selected by the criterion

***Table 4.4.** VAR residual serial correlation LM test*

H$_0$: no serial correlation at lag order h		
Lags	LM-Stat	Probability
1	10.06153	0.8634
2	9.569309	0.8881
3	20.38575	0.2033
4	326.6903	0.0000
5	23.64688	0.0975
6	8.169946	0.9436
7	7.179162	0.9697
8	209.1529	0.0000
9	4.224847	0.9985
10	7.224697	0.9687

Probabilities from chi-square with 16 degrees of freedom.
Based on the results, the lag order 6 was adopted in the causality analysis.

4.3. Cointergration Test

The study tested the long run cointergration properties between the variables. This was to help test for long run cointergration properties which would help identify any equilibrium relationship between variables in the system. The determination of the number of cointergrating vectors was based on the use of two likelihood ratio (LR) test statistics; the trace test and the maximum eingenvalue test. Table 4.5 shows the results from the Johansen cointergration procedure.

As shown in Table 4.5, the null hypothesis of two cointergration tests -trace test and maximum eigenvalue test-indicated the existence of at least one cointergrating equations at 5% level of significance. These findings indicated that that there was significant long run co-movement between the

variables under study.

***Table 4.5.** Cointergration tests for BD, CAB, EXRATE & INTR*

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized	**Trace**		**0.05**	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Probability**
None*	0.164670	53.65263	47.85613	0.0129
At most 1	0.106314	24.68414	29.79707	0.1730
At most 2	0.039981	6.587574	15.49471	0.6260
At most 3	0.000115	0.018471	3.841466	0.8918

Trace test indicates 1 Cointegrating equation at the 0.05 level

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Probability.**
None*	0.164670	28.96849	27.58434	0.0330
At most 1	0.106314	18.09657	21.13162	0.1263
At most 2	0.039981	6.569103	14.26460	0.5413
At most 3	0.000115	0.018471	3.841466	0.8918

Max-eigenvalue test indicates 1 Cointegrating equation at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Considering that interest rates and exchange rates may have a significant impact on the outcome, the test was repeated only for budget deficit and current account deficit. The cointergration test results for budget deficit and current account deficit are presented on Table 4.6.

The null hypothesis of at most 1 cointergrating equation was rejected when the test was done using budget deficits and current account balance only. This suggested that the two variables that did not have long-run relationship. This result

is similar to the finding by Kosimbei (2002) who found the current account deficit and budget deficit were not cointegrated.

Table 4.6. *Cointergration tests for BD & CAB*

Unrestricted Cointegration RankTest(Trace)				
Hypothesized	**Trace**		**0.05**	
No.of CE(s)	Eigenvalue	Statistic	Critical Value	Probability**
None	0.079742	20.39297	25.49471	0.0784
Atmost1*	0.042628	7.013632	3.841466	0.0081
Tracetestindicates2Cointegratingequationatthe0.05level				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No.of CE(s)	Eigenvalue	Statistic	Critical Value	Probability**
None	0.079742	13.37934	14.26460	0.0686
Atmost1*	0.042628	7.013632	3.841466	0.0081

Max-eigenvalue test indicates no Cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

4.4. Test for Causality

Although the Johansen cointergration method confirms for existence or non-existence of long run equilibrium relationship among variables, the method does not explain the direction of causality. The past studies have relied on granger causality to explain the direction of causality between variables. However, in this study Toda and Yamamoto (1995), MWALD testing procedure was used to test for the causal inferences of the variables. The results are presented in Table 4.7.

Table 4.7. *Results of causality test between BD, CAB, EXRATE & INTR*

Chi-sq		df	Prob	
Dependent variable :BD				
CAB	4.520532	6	0.6066	Not rejected
EXRATE	40.14416	6	0.0000	Rejected
INTR	22.52894	6	0.0010	Rejected
Dependent variable: CAB				
BD	10.63800	6	0.1002	Not rejected
EXRATE	11.76823	6	0.0673	Not rejected
INTR	15.10157	6	0.0195	Rejected
Dependent variable: EXRATE				
BD	9.187463	6	0.1633	Not rejected
CAB	1.837902	6	0.0340	Rejected
INTR	15.27498	6	0.0182	Rejected
Dependent variable: INTR				
BD	50.88061	6	0.0000	Rejected
CAB	6.543541	6	0.3651	Not rejected
EXRATE	69.24865	6	0.0000	Rejected

In summary, the study found reasonable evidence to conclude that there was no direct causality from budget deficit to current account balance or from current account deficit to budget deficit. Kosimbei (2002) found similar results using annual data. However, this finding was different from that of Egwaikhide *et al.* (2002) found existence of causality but running from current account to budget deficit.

4.5. Impulse Response Functions and Variance Decomposition

In order to trace out the time path of the effect of a shock to the variables on current account, the study applied impulse response function. The study sought to ascertain the effect of one standard error shock to the variables on the current account. The test results are presented in figure 4.1. The graphs plots the impulse responses of each variable interpreted as their reaction to unexpected shocks
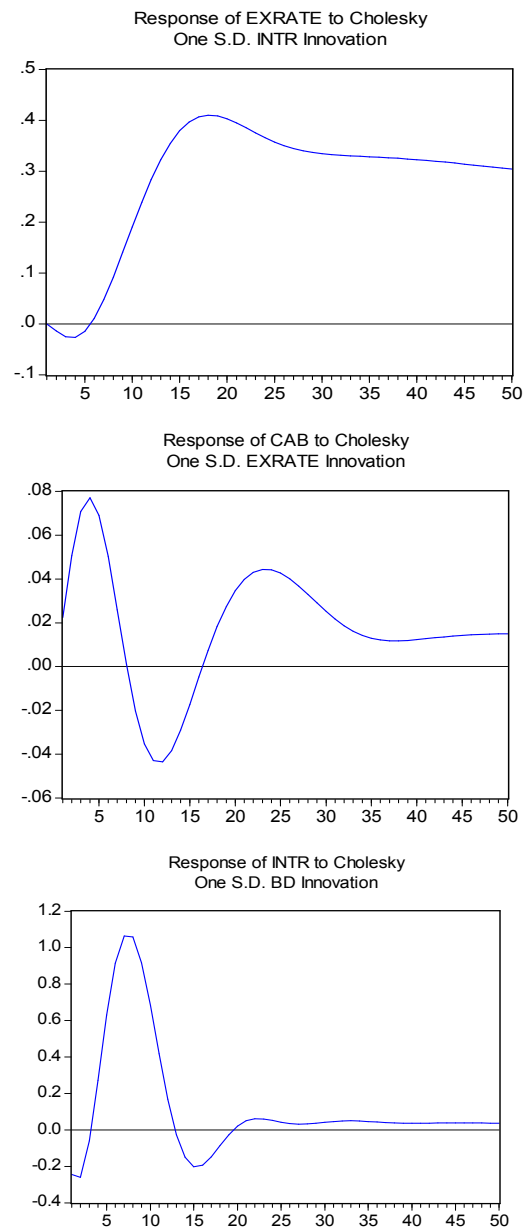

Figure 4.1. *Response of variables to Cholesky one Standard Deviation innovations*

For each variable, the horizontal axis on each graph covered the number of quarters after the impulse had been initialized. The vertical axis measured the response of the relevant variable. As shown in Figure 4.1; a one standard deviation shock in any of the four variables had an immediate significant

impact. Generally, a one standard deviation shock caused a volatility on other variables that seemed to die out between the 15th periods to the 30th period. Considering the study was using quarterly data, this period can be interpreted as between the 3rd year and the 7th year. More specifically, the study found out that a one standard error shock on budget deficit appeared to respond with an upsurge on interest rates. The disturbance on budget deficits caused a rise on interest rates until around the 8th period when interest rates would start falling. The disturbance dies out in the 5th year. A one standard error disturbance on the interest rates responded with a rise (depreciation) in exchange. The depreciation of the exchange rates appeared to begin smoothening after the 20th period. Finally, a one standard error disturbance on the exchange rate appeared to cause a disturbance on the current account balance that begins smoothening out between the 25th and 30th period.
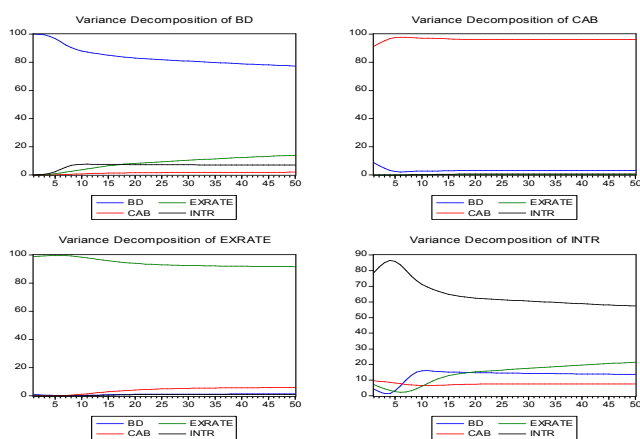

Figure 4.2. *Variance Decomposition*

5. Summary, Conclusion & Policy Implications

5.1. Summary

The study analyzed the twin deficit hypothesis using quarterly data from $1970Q_1$ to $2012Q_2$. The twin deficit hypothesis, consistent with the conventional Mundel Flemming framework postulates that the current account deficit (CAD) and Budget Deficits (BD) move together, either directly or through the interaction of also interest rates and exchange rates. The study used Johansen and Juselius Cointegration test procedure to estimate existence of cointergration and the recent Toda Yamamoto Causality procedure to test for the direction of causality between variables.

The study found out that budget deficits and current account deficits were not directly cointergrated and did not have a long run relationships. However, when interest rates and exchange rates were included in the model, a significant long run co-movement between the variables was established. The results revealed the two deficits are co-integrated with important financial variables of interest rate and exchange rate, suggesting existence of underlying equilibrium relationship binding these macro-economic variables. Additionally, a

causality relationship was found to be evident running from budget deficits to interest rates, exchange rates and current account balance. In summary, the study found reasonable evidence to conclude that there was no direct causality from budget deficit to current account balance or from current account deficit to budget deficit. Kosimbei (2002) found similar results using annual data. However, this finding was different from that of Egwaikhide *et al*. (2002) found existence of causality but running from current account to budget deficit.

This implication of the results in this section is that budget deficit affect current account deficit indirectly. Increased budget deficit results in increased interest rates. This increase in interest rates leads to depreciation of the exchange rate makes imports cheaper and exports more expensive, thus leading to a worsening in the current account balance.

5.2. Conclusion

It can be concluded that there is not direct effect of government deficit on current account deficit. The effect is indirect through transmission from budget deficit to interest rate, from interest rate to exchange rate, and finally from exchange rate to current account deficit.

5.3. Policy Implications

First, the government and policy makers need to control the budget deficits as way of reducing its adverse effect on the current account balance.

Second, need to carry counter measures by the central bank to manage either interest rate or exchange in response to increase in government expenditure. For instance, when budget deficit increase, central bank can increase money supply to reduce interest rate as counter measure.

Lastly but not least, the governments can be encouraged to borrow money on concession rates offshore to reduce the need for domestic borrowing. Increased domestic borrowing increases interest.

5.4. Areas for Further Research

Fiscal imbalances are more often than not associated with economic disruptions, and thus, the debate on fiscal matters warrants more consideration. The study would thus recommend the use of alternate testing approaches like VAR and Impulse response functions (See for example: Abell, 1990; Anoruo and Ramchandar, 1998), assessing Granger non-causality tests (See for example: Kouassi et al., 2004; Pahlavani and Saleh, 2009), and co-integration models with regime shifts (for example: Daly and Siddiki, 2009). (Leachman and Francis 2002) argue that transmission of twin deficits vary across exchange rate regimes. For example, Miller and Russek (1989) observe that twin deficits have no long-run relationship under flexible exchange rates. Similarly, Leachman and Francis (2002) find evidence to argue that in a floating exchange rate regime, neither of twin deficits is co-integrated or multi co-integrated. This means the future studies may assess the TDH phenomena in the context of

different exchange rate regimes in Kenya. These assorted approaches and also general equilibrium models based research are left for future discourse.

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