

# Long Run Causality between Trade and Budget Deficits In Kenya: A Time Series Analysis (1970-2014)

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## Abstract

Trade deficit and budget deficit are two economic indicators that play a significant role in informing economic, fiscal and monetary policies. The relationship between the two however remains elusive in many research works. There are numerous dangers associated with a budget deficit such as increased borrowing, higher debt interest payments, increased aggregate demand, higher Taxes and lower spending, increased interest rates, crowding out and inflation. The long-term impact of budget deficit compensated through borrowing could spill over into the private sector, constraining production through elevated production costs and ability of private sector access to credit. This paper therefore sought to analyze the long-term causality relationship between trade deficit and budget deficit focusing on the case of Kenya focusing on historical data of between 1970 and 2014. The data collected were analyzed both descriptively and quantitatively, stationarity tests were carried out by using the unit root test on all variables to ascertain their order of integration the variables were further subjected to Co integration Test then Granger causality test was conducted to check the direction of causality between budget deficit and trade deficit. The results show that there exists a bi-directional long run causality running from budget deficit to trade deficit and from trade deficit to budget deficits.

**Key Words:** Trade Deficit, Budget deficit, causality

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## I. Introduction

Trade balance has been defined as the gap between the monetary value of exports and imports within an economy within a given period. Simply put, it infers to the difference between the value of goods a country produces and the value of goods it buys from abroad (Lardy, 1996). The balance of trade plays a vital role in nation's economic development hence its accounted as the net export (Bahmani Oskooe, 2001). Budget deficit on the other hand is the difference between the expenditure of a government and its revenue collections for a given period of time (Feldstein, 1992). When the government expenditures exceed revenue, the government must borrow internally or externally to finance the deficit. On the other hand, when a governments revenues are greater than its expenditure, this implies running on a surplus. According to (Pettinger, 2007), there are numerous dangers associated with a budget deficit such as increased borrowing, higher debt interest payments, increased aggregate demand, higher Taxes and lower spending, increased interest rates, crowding out and inflation. Borrowing to offset budget deficits is unsustainable in the long term and countries using this approach end up burdened with high interest payments as experienced in the case of Russia in 1998, and Brazil.

The long-term impact of budget deficit compensated through borrowing could spill over into the private sector, constraining production through elevated production costs and ability of private sector access to credit. The Country's public debt has been growing at an exponential rate occasioned by surge in budget deficit which peaked at 9.1% of GDP in 2016/2017 financial year. In 2019/2020 financial year the public debt load edged closer to the Sh6 trillion at 55.2 percent of the country's GDP. Although treasury is of the view that the debt was sustainable as long as it is below the 70 percent of GDP, its impact on other sectors of the economy could have been overlooked. This paper therefore sought to analyze the long-term causality relationship between trade deficit and budget deficit focusing on the case of Kenya focusing on historical data of between 1970 and 2014. This provides insights to the planning arm of the government on the likely effect of the current borrowing trends on trade deficit in the long term.

## II. Methodology

### Research Design

This study adopted historical research design since it used past data to capture the causality between budget and trade deficits in Kenya over the period 1970-2014.

### Data Type and Sources

This study employed historical data covering the period 1970-2014 obtained from the World Bank's African Development Indicators, 2014 (<http://databank.worldbank.org/data/reports>). The variables of interest were: Budget deficit (*bd*), trade deficit (*td*), gross domestic product growth (*gdp*), government expenditure growth (*gexp*) and population growth (*pop*).

### Analysis Techniques

The data collected were analyzed both descriptively and quantitatively, stationarity tests were carried out by using the unit root test on all variables to ascertain their order of integration.

### Unit root test

Since most time series data is normally trended or non-stationary, meaning the variables have a mean and variance which was time dependent, therefore they had to be made stationary through differencing so as to obtain valid results. In this study Phillip-Perron test for unit root was used. By conducting the unit root test the order of integration of each variable using Phillips-Perron Tests was determined. The variables were found to be integrated of the same order, then the researcher proceeded to test for the existence of a co integrating vector.

### Co integration Test

In an attempt to establish the relationship between budget and trade deficit, an appropriate econometric method that is co integration and error correction modeling was employed. Thus, the Autoregressive Distributed Lag (ARDL) approach (bounds test approach to co integration) which was popularized by Pesaran and Shin (1999), and Pesaran *et al.* (2001) was used in this study.

### The Granger Causality Test

The Granger approach is used to measure how much of the current B can be explained by past values of B and whether adding lagged values of A can improve the explanation. B is said to be Granger-caused by A if A helps in the prediction of B, or equivalently if the coefficients on the lagged values of A are statistically significant.

## III. Findings And Duccussion

### Descriptive Analysis

The results presented in table 1 shows the summary statistics of the key variables of interest.

**Table 1: Descriptive Statistics**

Variable	Obs	Mean	Std Dev	Min	Max
<i>bd</i>	33	-3.20 5627	2.739 938	-10.3 780	1.35 300
<i>td</i>	35	-7.196764	5.020649	-17.47757	4.948779
<i>gdp</i>	35	3.728646	2.338436	-0.799494	8.402277
<i>gexp</i>	33	21.30430	2.141482	18.01700	27.27000
<i>pop</i>	35	3.050052	0.465237	2.580203	3.823203

In the period of this study, trade deficits demonstrated having high volatility since the standard deviation was higher compared to other variables which implied that Kenya was importing more goods than its exports. The standard deviation for budget was also relatively high demonstrating that it was also volatile.

### Correlation Matrix

Variable	<i>bd</i>	<i>td</i>	<i>gdp</i>	<i>gexp</i>	<i>pop</i>
<i>bd</i>	1.0000				
<i>td</i>	-0.2013	1.00 00			
<i>gdp</i>	0.1832	-0.4391	1.00 00		
<i>gexp</i>	-0.487	-0.4962	0.2129	1.0000	
<i>pop</i>	-0.2402	0.5473	-0.0868	-0.5353	1.00 00

The results indicate that trade deficits, government expenditure and population have negative correlation with budget deficits. This implies that the higher the trade deficits, government expenditure and the population is the higher the budget deficits. On the other hand, GDP growth has a positive correlation with the budget deficits although the correlation coefficient is relatively low. This may be due to low economic growth rate that the country has witnessed over time. The positive correlation denotes that the higher the GDP growth the lower the budget deficits.

**Unit Root Test**

Time series data is prone to spurious regression result where unrelated series show robust results yet there is no relationship between or among the variables of interest. This problem was addressed by ensuring that the variables were stationary before regression analysis was conducted. In this study Phillips Perron was used to test for non-stationarity of the variables since it is generalization of ADF test and allows mild assumptions concerning the distribution of the error term.

**Unit Root Test Results**

Variable	Phillips Perron Test		Statistic	First Difference P-Value	Order of Integration
	Statistic	P-Value			
<i>Bd</i>	-1.998	0.289	-3.285	0.016	I(1)
<i>Td</i>	-0.999	0.754	-5.782	0.000	I(1)
<i>gdp</i>	-1.491	0.128	-3.465	0.000	I(1)
<i>g exp</i>	4.000	0.982	-5.126	0.000	I(1)
<i>pop</i>	-1.938	0.314	0.046	0.046	I(1)

The result for the unit root revealed that all the variables had unit root and when differenced once and when subjected for unit root test all were found to be stationary implying that the variables are integrated of order one.

**Cointegration Test**

Since the variables were found to be integrated of the same order, then the next step is to check if the variables had long-run relationship. In this study, bounds test for co integration was used and the results for co integration analysis between budget deficit (trade deficit) and the regressors are presented.

**Bounds Test Results for Co integration Relationship**

Test Statistics	Value	Lag	Significance Level	Bounds	Critical values
F-Statistics	6.82	2		I(0)	I(1)
			1%	4.324	5.402
			5%	3.314	4.216
			10%	2.674	3.354

The F-statistic of the model is 6.82 which is larger than the upper critical bound (5.402) at 1 percent level of significance, which implies that there exists a long-run relationship among the budget deficit and regressors in the model. The critical values confirms the existence of the long run relationship.

**Long-Run Regression Results**

Since budget deficit and the regressors are co integrated, the long-run parameters of the ARDL model were estimated based on the Akaike Information Criterion (AIC) using a lag of one.

**Long –Run Regression Results, Dependent variable Budget deficits**

Variable	Coeff.	Std.	Err. t	P > t
<i>td</i>	-0.1389**	0.0939	-1.88	0.021
<i>gdp</i>	0.2607*	0.1304	2.00	0.055
<i>g exp</i>	-1.2666***	0.1579	-8.02	0.000
<i>pop</i>	-3.8048***	0.8187	-4.65	0.000
<i>cons</i>	3.2317 ***	2.842	6.86	0.000
$R^2 = 0.7221$ $F(4,28) = 18.19$ $Prob > F = 0.0000$ Root MSE = 0.5441				

The above results show that all the estimated coefficients have the expected theoretical sign and are statistically significant. In particular the results reveals the estimated coefficient of trade deficit is statistically significant at 5 percent level illustrating that if trade deficits were to reduce by 1 unit then budget deficits will reduce by 0.1389 units. This result may be due to twin-deficit hypothesis which says that as trade deficits increases then budget deficits will increase. The finding is similar with Alkswani (2000) who found out that there is a long-run relationship between trade deficits and budget deficits. The estimated coefficient of real GDP growth is appropriately signed as suggested by economic theory. The result show that 1 unit increase in GDP growth will lead to 0.2607 unit decrease in budget deficit. This means that long-run increase in real GDP has the potential of reducing the budget deficits in Kenya. The results also reveal that government expenditure has a

negative sign on budget deficit and statistically significant at 1 percent. This result indicates that a 1 unit increase in government expenditure leads to 1.2666 units increase in budget deficits. This implies that if the government were to reduce its expenditure particularly on recurrent expenditure in the long may lead to significant reduction in budget deficits.

The long-run results further demonstrate that population has a negative sign on budget deficit. This is because a large population will imply that more of government resources might be allocated to consumption at the expense of development. The findings of this study indicate that 1 unit increase in population will lead to 3.8048 units increase in budget deficit. The coefficient of determination shows that the regression model has a good fit since the explanatory variables explains the largest percentage of the variation in the budget deficits (dependent variable). Specifically the result show 72.21 percent of the variation in the budget deficits is explained jointly by the independent variables included in the model.

**Long –Run Regression Results, Dependent variable Trade Deficits**

Variable	Coeff.	Std. Err.	t	P >  t
<i>bd</i>	-0.8057**	0.4288	-2.08	0.031
<i>gdp</i>	0.4784**	0.3232	1.98	0.015
<i>g exp</i>	-1.4469**	0.6342	-2.28	0.030
<i>pop</i>	1.1822***	0.6143	2.65	0.000
<i>cons</i>	1.2317 ***	2.842	3.86	0.000
<i>R</i> <sup>2</sup> = 0.7597 <i>F</i> (4,28) = 8.21 <i>Prob</i> > <i>F</i> = 0.0002      Root MSE = 0.7181				

NB: \*\*\* significant at 1 percent and \*\* is significant at 5 percent level of significance and \* significant at 10 percent.

The results above reveal that all the estimated slope coefficients have the expected theoretical sign and are statistically significant. Specifically the results indicate that the estimated coefficient of budget deficit is statistically significant at 5 percent level illustrating that if budget deficits were to reduce by 1 unit then trade deficits will reduce by 0.8057 units other factors being constant. This result confirms the twin-deficit hypothesis in Kenya. The estimated coefficient of real GDP growth has a positive and statistically significant effect on trade deficit as hypothesized by economic theory. In particular a 1 unit increase in economic growth will lead to 0.4784 units decrease in trade deficits. This means that in the long-run if the government can pursues policies that are geared towards promoting can significantly succeed in reducing the trade deficits. Consistent with the long-run results on budget deficits government expenditure has a negative sign and statistically significant at 5 percent level. In particular the results indicate that a unit increase in government expenditure leads to 1.4469 unit increase in trade deficit. This result suggest that if the government in the long run were to reduce government expenditure by 1 unit then can reduce the trade deficits to a sustainable level. In the long-run results, population growth has a positive sign and statistical significant effect on trade deficit. The results indicates that a unit increase in population growth will lead to 1.1822 unite increase in trade deficits. Consistent with the long-run regression results on budget deficits, the model has a good fit shown by relatively high coefficient of determination. Specifically the coefficient of determination is 0.7597 implying that 75.97 percent of the variation in the trade deficits is explained jointly by the regressors in the model.

**Granger Causality Test**

Granger causality test was conducted to check the direction of causality between budget deficit and trade deficit the results are presented below.

**Granger Causality Test between Budget Deficit and Trade deficit**

Direction	F-Statistic	P-Value	Conclusion
$\Delta td \rightarrow \Delta bd$	6.38	0.0052***	Bi-directional Causality running from
$\Delta bd \rightarrow \Delta td$	7.95	0.0018***	trade deficit to budget deficit and from budget deficit to trade deficit

**Note:** \*\*\* Significant at 1 percent.

The results show that there exists a bi-directional causality running from budget deficit to trade deficit and from trade deficit to budget deficits. The result concurs with (Nyongesa, 2007) and (Nyongesa & Onyango, 2009, 2012) who reported that current account deficit is the cause of budget deficit in Kenya. Also, it concurs with (Zamanzadeh & Mehrara, 2011) who found out bidirectional relationship between the two variables using Granger causality test.

#### **IV. Conclusions**

In the long run, the results reveal that all the estimated slope coefficients have the expected theoretical sign and are statistically significant. Specifically the results indicate that the estimated coefficient of budget deficit is statistically significant at 5 percent level illustrating that if budget deficits were to reduce by 1 unit then trade deficits will reduce by 0.8057 units. On the other hand, if trade deficits were to reduce by 1 unit then budget deficits will reduce by 0.1389 units other factors being constant. The overall study reveals the effect of change in a unit of each variable on the other variable. The results show that budget deficit is a key element to be observed as this gives a larger number of unit change as compared to trade deficit. This result confirms the bi directional relationship between the two variables “The twin-deficit hypothesis” in Kenya.

The study of granger causality test on the direction of causality between budget deficit and trade deficit revealed a bi-directional causality running from budget deficit to trade deficit and from trade deficit to budget deficits in Kenya. Budget deficit gives a positive relationship to the country’s trade deficit and vice versa.

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