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Threshold Fiscal Deficit on Economic Growth in Kenya

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Abstract: **Aware of the widening fiscal deficit in Kenya, we seek to identify the threshold level of fiscal deficit by employing an annual dataset for the period 1985 to 2015 to estimate the threshold model for Kenya. We find that fiscal deficit, investment, secondary school enrollment, financial deepening and degree of openness to the economy to be positive and significant for growth in Kenya. We also find that the fiscal deficit is good for growth and identified a threshold fiscal deficit level of 5 percent of GDP for the period covered.**

Keywords: **Deficit: Debt: Economic: Fiscal: Kenya: Threshold.**

1. INTRODUCTION

Many economies seek to achieve sustained growth and a stable macroeconomic environment. In recent times, economic growth and stability of developing countries have brought the issues of fiscal deficit[1] into sharp focus. As East Africa's leading economy and one of Africa's important growth center, Kenya's momentum for growth is expected to be sustained by a stable macroeconomic environment, continued investment in infrastructure, improved business environment, exports and regional integration (Magehema, 2015).

However, since its independence, fiscal deficit has become an outstanding feature of Kenya's economy coupled with other fiscal indicators like high public debt, inadequate savings and investment, and inadequate revenue to finance increasing public expenditure. The deficit is incurred to finance revenue and expenditure mismatch, and the problem arises when the deficit levels become too high and persistent, leading to high government borrowing and high debt servicing, forcing the government to cut back in spending on relevant sectors of the economy. Besides, large public borrowing can also lead to crowding out of private investment, inflation, and exchange rate fluctuations (Mohanty, 2012).

Kenya's Vision 2030, targets to achieve annual economic growth of 10 percent. Its fiscal framework aligned to the second Medium Term Plan (MTP II), entails a deliberate effort to exercise prudence in public expenditure management with the principal goal of, containing financial risks, gradually lowering the fiscal deficit, and contain the growth of recurrent expenditures in favor of productive capital spending (KNBS, 2016). Also, the Public Finance Management Act of 2012 provides a requisite framework that ensures fiscal responsibilities on debt, revenue, and expenditure to be pursued prudently.

Despite efforts made by the Government to implement policies, Kenya has experienced fluctuating fiscal deficit since the early 1970s, mainly caused by the rapid increase in Government expenditure over the years, without an increase in revenue. Government spending has been on a rapid rise, due to government initiative to support the free education system, constitution implementation, Vision 2030 flagship projects, and funding the devolution process. In the last five years, government revenue increased by 73.7 percent to Ksh. 1,184.4 billion in 2015, accounting for 18.4 percent of GDP. On the other hand, government expenditure increased by 115.3 percent to Ksh. 2,032.5 billion in 2015, accounting for 31.5 percent of GDP, respectively (GOK, 2016).

[1]Defined as the total government expenditure excess its income. Government puts more money into the economy than it takes out by taxation, with the expectation that increased business activity will bring enough additional revenue to cover the shortfall.

The deficit came from borrowing mostly from both domestic and foreign sources to finance the deficit in revenue, increasing public debt from 38.2 percent of GDP in 2012 to 48.8 percent of GDP in 2015 (GOK, 2016). Leading to widened fiscal deficit in Kenya from 8.7 percent of GDP in 2012 to 10.2 percent of GDP in 2015 and should it continue to widen; more debt would be needed to finance the budget deficit. While it is not wrong for the government to continue operating a fiscal deficit, there is a need to ensure that it is within the required East African Community (EAC) threshold of 6 percent of GDP. Deficit financing, if not well monitored could cause debt overhang, crowd out the private sector, slow down economic growth and cause macroeconomic instability.

The budget policy statement 2016 outlines that the fiscal framework will ensure sustainable debt and emphasizes the plan to lower the fiscal deficit over the medium term. While the goal is to achieve a lower fiscal deficit, there is no set target deficit for the country. This study aims to identify the threshold fiscal deficit that is conducive for growth in Kenya and act as a guide to inform policymakers in adjusting deficits.

The constitution of Kenya Article 201 (c), states that the use of resources and public borrowing burdens and benefits should be shared equitably between the present and future generation. It is hence implying that prudent policy decisions have to be made today in order not to impose an unjustified debt burden on future generations. In this regard, the Public Finance Management (PFM) Act of 2012, 15(2) outlined the fiscal responsibility principles that should be enforced to ensure prudence in public finances. In the same spirit, Kenya's fiscal policy aims to support rapid and inclusive growth by ensuring a sustainable debt position and is set to reduce the fiscal deficit with a focus on higher revenues gradually. It also indicates a deliberate convergence path towards the East Africa Community Monitory protocol for fiscal targets (KNBS, 2016).

To achieve a sustainable growth rate of 10 percent as foreseen in the Vision 2030 fiscal policy is critical in supporting macroeconomic stability and facilitate economic growth. A county will finance its deficits in the short term by borrowing, and the cost of borrowing further exacerbates the deficit in future, and if not checked, the deficit and debt could lead to macroeconomic instability and debt overhang (Sirengo, 2008). It is essential to identify the optimal fiscal deficit to safeguard future generations and enable policymakers in formulating, monitoring and timely adjusting of deficits. In Kenya, several studies have attempted to ascertain the impact and financing of fiscal deficit on economic growth. However, beyond ascertaining the effects, limited studies have attempted to identify the optimal deficit for Kenya. The study fills the existing knowledge gap by identifying the optimal fiscal deficit for Kenya.

1.1 Trends in Economic Growth and Fiscal Deficit in Kenya

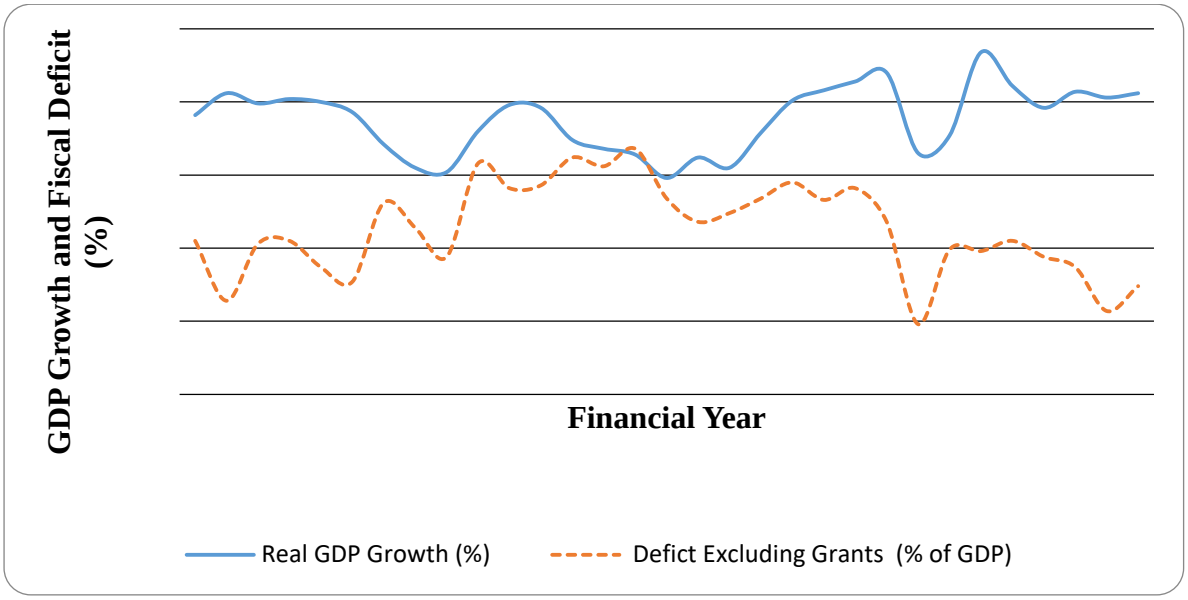
Kenya has had its share of economic growth turbulence, with an upward and downward trend with significant volatilities. Monetary policies, on the other hand, have been unstable, resulting in deficits since 1985 and only recorded surpluses in 1994 and 1997 to 1999 as shown in figure 1.1. The instability could be attributed to several factors that include internal and external shocks, which sometimes require government intervention through fiscal policy. The period 1985 to 1989 was an era of stabilization and structural adjustments for Kenya, marked with declining growth from 1985 to 1994. In 1986, the fiscal deficit widened as a result of a large gap between current issues and current receipts, coupled with rapid growth in capital expenditure (KNBS, 1987). Leading to the introduction of Sessional Paper No. 1 of 1986 on "Economic Management for Renewed Growth" to correct structural weaknesses of the economy and proposed a budget deficit not exceeding 2.5 percent of GDP (Okelo et al. 2013). In 1986, the economy improved a little as a result of the coffee boom and the low oil prices, but slowed down in 1990 due to the deceleration in the agricultural sector, as a result of unfavorable weather and low world coffee prices, as well as a declining manufacturing output (Wanjala and Kiringai, 2008).

In 1991 to 1993, Kenya's economic performance hit rock bottom, leading to the implementation of Economic Management for Renewed Growth (1986), which forced the government to cut back on spending. Also, negative growth rates in the agricultural sector due to prolonged drought in 1991, ethnic clashes, and uncertainty in the financial markets, worsening of the aggregate real income and decreasing capacity utilization in 1992 had a dampening effect on the economy. Inflation reached a high of 43 percent in 1993 resulting in domestic macroeconomic problems and decline in real investments (KNBS, 1993). In the same year, economic reforms and liberalization were introduced, which included: removal of price and exchange controls, abolishing of import licensing, the introduction of export retention schemes, privatization of a range of publicly owned companies, reduction of many civil servants, and conservative fiscal and monetary policies. Leading to the improved real GDP growth rate in 1994 and recorded a surplus of 0.8 percent of GDP recorded.

The period 1995 to 2004 recorded two surpluses of 1.2 percent of GDP in 1997 and 1.8 percent of GDP in 1999 due to the firm stance of fiscal policy, mainstreamed in declining expenditure and directing expenditure to existing infrastructure instead of undertaking new investments (CBK, 1999). Despite the measures taken by the government, budget outcome deteriorated sharply with the continued suspension of foreign assistance to Kenya in the year 2000. There was growth stagnation in 1997 partly due to reduced economic activity before general elections that and adverse weather conditions (Wanjala and Kiringai, 2008).

Kenya's political developments in the year 2002 significantly impacted Government fiscal operations, with the responsibility of fiscal management being shared between two administrations, confronting substantially similar challenges with different policies, priorities and implementation strategies. This resulted in an expansionary fiscal position which worsened fiscal deficit as high domestic debt remained a significant challenge for fiscal stability, as the government financed its deficit entirely from domestic sources. Expenditure increased due to higher allocations towards the review of the Constitution, general election, financing of the free primary education and adjusted emoluments for segments of the public service (CBK, 2002). In 2003 implementation of the bold economic and structural reforms began, elaborated in the Economic Recovery Strategy (ERS) covering the period 2003-2007 and resulted in a slight improvement in budget balance in the period (Kosimbei, 2009).

Figure 1.1: Growth and Fiscal Deficit as a percent of GDP in Kenya (1985-2015)



Source: KNBS (various), Economic Survey

The economy was on a recovery path from 2004 onwards, and it maintained a growth momentum as government stringent macroeconomic policies were supported by the implementation of the Economic Strategy Recovery, despite the drought in 2006. Kenyan currency appreciated, and inflationary pressure eased as a result of economic resilience, improved business confidence, stable macroeconomic environment. In 2008, real GDP growth declined significantly as a result of combined effects of post-election disturbances, the global financial crisis, and high food and fuel prices, which led to the decline in most sectors of the economy. Leading to a widened deficit of 10.2 percent of GDP, and government expenditure increased by 29 percent to Ksh. 543.5 billion, which was not commensurate by an increase in revenue. The expenditure increase was attributed to increased outlays for improved civil service terms of service, free day school secondary education, servicing domestic debt and resettlement of the internally displaced people (IDPs) following the post-poll crises in 2007(CBK, 2008). Given that the period earmarked for Economic Recovery Strategy lapsed, the Government of Kenya introduced the Vision 2030 as its economic management blueprint.

The year 2009 to 2010 saw the economy improve, with slow growth in 2011 and further in 2012. Growth was supported by the First Medium Term Plan (2008-2012) implementation, evident by a stable macroeconomic environment, low inflationary pressure, increased remittances from abroad and improved weather conditions which contributed to improved economic performance. However, there was a slow growth in 2011 and 2012 due to high oil and food prices, and unfavorable weather conditions, leading to a surge in inflation, and depreciation of the shilling.

Growth in 2013 to 2015 was stable, supported by rapid growth in capital investment, improvement in the key drivers of the economy as articulated in the Second Medium Term Plan (2013-2017). Public consumption rose in line with the devolved system of Government, and there was restrained national Government borrowing (KNBS, 2016). However, the 2013 general elections uncertainty, high incidences of insecurity and unfavorable weather conditions impacted negatively on the country's economic growth. Fiscal deficit continued to widen, recording deficits of 10.2 percent, 11.5 percent and 10.2 percent of GDP respectively in the period (KNBS, 2017), which exceeds the convergence criteria requirement of 6 percent of GDP for the impending East Africa Monetary Zone. Indeed, the large deficits in Kenya have coincided with less efficient government spending (purely recurrent) with rising public sector wage bill, implementation of the devolution process, increasing public debt, corruption, fiscal slippages during election years as well as domestic and external shocks to the economy.

2. LITERATURE REVIEW

Using the Threshold Autoregressive (TAR) Model, Aero and Ogundipe (2016) investigated the effects of fiscal deficits on Nigeria's economic growth from 1981-2014 and established an optimal fiscal deficit of 5 percent at a lag of one year. A positive and significant relationship between economic growth and capital, labor, inflation rate, and trade openness were found. Negative effects were found between fiscal deficit, financial depth, and economic growth.

Slimani (2016) focused on fiscal policy and economic growth for 40 developing countries using panel data for the period 1990-2012. He looked at the comparative analysis between Morocco and the panel. The main finding was that there exists a double threshold effect of the fiscal balance. The results indicated that an anti-Keynesian effect on growth is driven by fiscal deficit exceeding 4.8 percent of GDP and a surplus exceeding the threshold of 3.2 percent of GDP impacts negatively on economic growth. Secondly, the relationship between budget deficit and economic growth is conditioned by the threshold level of a total investment of 23 percent. Higher values than the level result in a positive relationship and become negative when investment falls below this threshold. Finally, for a deficit above 4.8 percent, the average growth rate falls by 2.1 percent, and median growth falls by 1.5percent for Morocco.

In the Gambia, for the period 1980-2009, Onwioduokit and Bassey (2014) estimated the level of fiscal deficit that is conducive for growth. They relied on both the demand and supply side of the economy and used the Threshold Autoregressive Model. Firstly, they established the stationary of the variables and co-integration analysis. The results obtained showed that fiscal deficit affects the real economic growth positively and significantly with a lag of one year, which supported the Keynesian assertion. The study identified a threshold level of fiscal deficit at 6.0 percent for the Gambia.

Akosah (2013) used quarterly data from 2000-2012 to examine the threshold effect of budget deficit on economic growth in Ghana. The study used the growth regression model based on semi-parametric or semi-linear regression, motivated by the work of Khan et al. (2001). The author used both Ordinary Least Square (OLS) for short-run dynamics and VECM for the long-run analysis, incorporating spline regression techniques. He found an inverse long-run relationship between budget deficit and economic growth, such that budget surplus (deficit) tend to slow down growth. In the short-run, he found a deficit to promote economic growth, but a deficit beyond the threshold level of 4 percent of GDP is detrimental to economic growth. The results were found to support the West African Monetary Zone's (WAMZ) primary fiscal convergence criterion and fiscal restraint to the level below the threshold, would both stimulate sustainable economic growth and overall stability in Ghana.

Onwioduokit (2012) used panel data for West African Monetary Zone member countries, to ascertain the optimal fiscal deficit and the relationship between fiscal deficit and economic growth. The study employed the threshold autoregressive model, and empirical results indicated a positive relationship between fiscal deficit and economic growth. Also for WAMN countries, a 5 percent threshold was identified that is consistent with economic growth and recommended that the fiscal deficit criterion should be maintained at 4 percent since it falls within the range of acceptable optimal deficit identified.

Weng et al. (2011) in Malaysia investigated the association among debt, budget deficit and economic growth as well as the threshold using year data from 1970-2009. The study employed various methodologies concerning time series data and cointegration test. They employed the threshold model and established 2.5 percent as the threshold budget deficit and found a positive relationship between budget deficit and economic growth.

In their paper on fiscal deficits and economic growth, Adam and Bevan (2005) examined the relationship between fiscal deficits and growth for a panel of 45 developing (non-OECD) countries for the period 1970-2009. They used simple Overlapping Generations (OLG) Model with a fairly government sector entrenched in an endogenous growth model. The study identified a threshold effect of deficit of around 1.5 percent of GDP. Interaction effects between deficits and debt stocks were found, with high debt stocks exacerbating the adverse consequences of high deficits.

Arestis et al. (2004) examined the long-run sustainability of fiscal deficit in the U.S. using quarterly data over the period 1947 to 2002. The study used a threshold model and applied the time series estimation procedure. The results showed proof of a statistically significant mean-reverting dynamics only in the lower regime that is when the (semi-annual) change in the surplus per capita reaches the estimated threshold point of -0.313.

3. METHODOLOGY

3.1 Theoretical Model of Fiscal Deficit and Economic Growth

The literature reviewed ague for the existence of a threshold fiscal deficit, below which the effect on growth is positive, and above which is detrimental to growth. We employ both the demand and supply side of the economy and borrow from the work of Onwioduokit and Bassey (2014). We follow the Keynesian perspective which articulates that high fiscal deficit accelerates capital accumulation and hence improved growth perspective in the economy. Expansionary effect of fiscal deficit leads to crowding-in, in that an increase in fiscal deficit due to public sector investment encourages private sector investment and eventually results in an improvement in the overall economic growth. In the goods market, the aggregate demand relationship is specified as below:

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

Where: $C = a + bY^d, b > 0, I = \delta + \gamma i, \gamma < 0, G = \overline{G}, X = x + \sigma e, \sigma > 0, M = m + kY^d$ and $Y^d = Y - T$

Y is output; C is total consumption; I is total investment; G is total government expenditure and (X-M) is net exports; Yd is disposable income; T is tax revenue; i, interest rate; and e is the exchange rate.

Substituting the behavioural equations above into equation (1) and assuming that government expenditure is exogenous, output (Y) would be given by:

$$Y - bY + kY = a - bT + \delta + Yi + \overline{G} + x + \sigma e - m + kT \quad (2)$$

Rearranging equation (2) gives: $Y(1 - b + k) = a + \delta + x - m + \gamma i + \sigma e + \overline{G} - bT + kT$ (3)

Letting $1 - b + k$ be equal to η and $a + m + x - m$ be equal to A, equation (3) can be written as:

$$Y\eta = A + \gamma i + \sigma e + \overline{G} - (b - k)T \text{ and } Y = \frac{A}{\eta} + \frac{1}{\eta}\left(\gamma i + \sigma e + \overline{G} - (b - k)T\right) \quad (4)$$

Equation (4) shows that increasing government expenditure will increase output and increasing taxes will reduce output. Fiscal deficit being excess of government expenditure over its revenue and the government fiscal position is given by government expenditure minus taxes (G-T). This assumes that government derives its revenue from taxes. Thus fiscal deficit is given by:

$$FD = G - T \approx \overline{G} - (b - k)T \quad (5)$$

and $(b - k)T$ is the revenue that could be generated from consumption expenditure. Combining equation 4 and 5 gives:

$$\overline{Y} = \frac{A}{\eta} + \frac{1}{\eta}(\gamma i + \sigma e + FD) \quad (6)$$

To capture the whole treatment of the economy, the model above is extended to include the money and the external sector, since Kenya is a small economy unable to influence international prices. The equilibrium condition in the money market is that money demand is equal to the money supply - $M^D = M^S$ and equating the two gives:

i. $sY + \chi i = n_1 \frac{B}{P} + n_2 i$ with $s > 0, \chi < 0$ and $n_1, n_2 > 0$

Where p is the general price level and B is international reserves and n_1, n_2 are coefficients

ii. $\chi i - n_2 i = n_1 \frac{B}{P} - sY$

iii. $i(\chi - n_2) = n_1 \frac{B}{P} - sY$

iv. $i = \frac{n_1}{\chi - n_2}\frac{B}{P} - \frac{s}{\chi - n_2}Y$, but letting $\frac{n_1}{\chi - n_2}$ be equal to λ and $\frac{s}{\chi - n_2}$ be equal to φ.

Therefore i is given by:

$$i = \lambda \frac{B}{P} + \varphi Y, \quad \lambda < 0 \text{ and } \varphi > 0 \tag{7}$$

Substituting equation 7 into 6 gives:

$$Y = \frac{A}{\eta} + \frac{1}{\eta}\left(\gamma\left(\lambda \frac{B}{P} + \varphi Y\right) + \sigma e + FD\right) \approx Y = \frac{A}{\eta} + \frac{\gamma\lambda}{\eta}\frac{B}{P} + \frac{\gamma\varphi}{n}Y + \sigma e + FD \tag{8}$$

Equating $\frac{A}{\eta}$ to A_1, $\frac{\gamma\lambda}{\eta}$ to α_1 and $\frac{\gamma\varphi}{n}$ to α_2, equation 8 can be rewritten as:

$$Y = A_1 + \alpha_1 \frac{B}{P} + \alpha_2 Y + \sigma e + FD \tag{9}$$

The external sector of the economy is incorporated through the balance of payment schedule which is given as:

$$B = A_2 - \delta_0 Y + \delta_1 e + \delta_2 i \tag{10}$$

Where $\delta_0, \delta_1, \delta_3 > 0$ and A_2 is exogenous components in the net export function. Substituting equation 10 into 9 (see appendix 7), produces an output growth model which shows a positive long-run association between output growth and fiscal deficit. Therefore the growth equation is as below:

$$y_t = \beta_0 + \beta_1 i_t + \beta_2 e_t + \beta_3 FD_t + \beta_4 Inf_t \tag{11}$$

Where $y_t = y_t - y_{t-1}$ - the growth rate in GDP, as output is influenced by its path or depends on its momentum in a time series context. i, interest rate; e, exchange rate; FD, fiscal deficit; Inf, inflation and t is the time index.

The supply side of the economy captured by the Cob-Douglas production function outlines that output is a function of capital stock and labor. A simple function is given a growth model of the form:

$Y = AK^{\alpha}L^{\beta}$, which is linearized to produce $\ln Y = \ln A + \alpha \ln K + \beta \ln L$ (12)

Where Y refers to output, K is capital stock, L labor force and α, β are coefficients.

3.2 Model Specification

Relying on the theoretical framework and past studies, where equation (11) and (12) above combined gives the model adopted in the study and provides key variables explaining growth. It indicates that growth rate in output is equal to the sum of interest rate, exchange rate and fiscal deficit on the demand side, and capital stock and labor on the supply side.

Also, variables on financial depth as a result of financial sector reforms and one that captures exposure and vulnerability of the county to external shocks are included in the empirical model. The general growth model adopted can be written as:

$$GDPG_t = f\left(FD_t, Int_t, Ext_t, Inf_{t,} INV_t, L_t, Fin\_Dep_t, Opn_t\right) \quad (13)$$

Where $GDPG$ is the growth rate of real GDP; FD fiscal deficit; Int interest rate; Ext exchange rate, Inf is inflation, INV is investment proxied by gross capital formation; L is labor force proxied by secondary enrollment; Fin_Dep is broad money M_2 measuring financial depth, Opn is the openness of the economy and *t* is time index.

The model is expressed in an econometric form as follows:

$$GDPG_t = \beta_0 + \beta_1 FD_t + \beta_2 Int_t + \beta_3 Ext_t + \beta_4 Inf + \beta_5 GCF + \beta_6 SE_t + \beta_7 M_2 + \beta_8 Open_t + \mu_t \quad (14)$$

Where β_0 is the intercept predicting economic growth when all other variables are kept constant, β_1 to β_8 are coefficients of independent variables and μ_t is the error term. The priori expectations are as follows, and some studies have found fiscal deficit to contribute positively to economic growth, while others found a negative relationship.

$\beta_1, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7 > 0$ and $\beta_2, \beta_3, \beta_4 < 0$

3.3 Threshold Model

The threshold regression uses a dummy variable for different chosen threshold values to determine the one that minimizes the residual sum of squares or the one that maximizes the R-squared. The model for time series[2] is used in the study to identify the optimal fiscal deficit that would be conducive for growth in Kenya. The model specifies that based on the value of the observed variable, individual observations can fall into discrete classes. The model was used by Khan and Senhadji (2000) for the threshold analysis of inflation in industrial and developing countries. Further, it was applied by Akosah (2013) for the analysis of the threshold fiscal deficit for Ghana.

This study applies the model to estimate the threshold level of fiscal deficit above which deficit may affect economic growth in Kenya. The threshold growth equation is specified as follows:

$$GDPG_t = \beta_0 + \beta_1 FD_t + \beta_2 FD_t \rho_t \left(FD_t - K^*\right) + \beta_3 Int_t + \beta_4 Ext_t + \beta_5 Inf_t + \beta_6 GCF + \beta_7 SE + \beta_8 M_2 + \beta_9 Opn_t + \mu \quad (15)$$

Where $\mu_t \approx IID(0, \delta^2)$

FD_t is the threshold variable [3], K^* is calculated threshold level of fiscal deficit and ρ_t is a dummy variable or indicator function which equals:

$$\rho_t = \begin{cases} 1 & if \quad FD_t > K^* \\ 0 & if \quad FD_t \leq K^* \end{cases} \quad (16)$$

There are two 'regimes' depending on whether the threshold variable FD_t is smaller or larger than the threshold K^*. Differing regression slopes distinguish the regimes, β_1 and β_2: (i) β_1 measures the average impact on growth if the deficit is less than or equal to the chosen threshold value and (ii) β_2 measures the additional impact if the deficit is

[2] The model was introduced by Tong (1978) and Tong & Lim (1980) and later discussed extensively in Tong (1990).

[3] It is assumed not to depend on time (time invariant)

higher than the experimental threshold value. Hence, the sum of the two coefficients $\beta_1 + \beta_2$ captures the net impact on the rate of growth, wherein both the higher and lower values are distributed across the chosen threshold value.

The variables description and sources are presented in table 3.1 below:

Table 3.1: Description, Measurement and Source

Variable Name	Description and measurement	Source
Dependent variable: Annual growth rate of real GDP		KNBS
Other variables		KNBS
FD	Annual fiscal deficit as a percentage of GDP (excluding grants)	KNBS
Int	This is the annual nominal principal 91-day treasury bill rate	KNBS
Ext	Exchange rate (Depreciation/appreciation) expressed as local currency per US dollar.	KNBS
Inf	Annual inflation rate	KNBS
GCF	The annual gross capital formation used as a proxy for capital stock and includes gross fixed capital formation plus changes in inventories as a percentage of GDP at current market prices	KNBS
SE	Annual secondary school enrollment as a percentage of the total population	KNBS
M2	Financial deepening measured by the annual broad money M2 as a percentage of GDP at current market prices	KNBS
Opn	This measures the degree of openness to the economy and is calculated as the sum of the value of imports and exports, divided by the GDP at current market price.	KNBS

3.4 Estimation Procedure

We first establish the stationarity of the variables before computing the threshold regression analysis. Then we employ the Augmented Dickey-Fuller (ADF) and Phillip-Peron (PP) to test variables stationarity since they are the two most used methods. It is necessary to achieve variables stationarity so that the mean and variance estimated from such variables would be unbiased estimates of the unknown population mean and variance. Therefore, if the study is to use non-stationarity series, it would produce biased estimates leading to incorrect statistical inferences if such series are not cointegrated. The test hypothesis is that ρ=0 where ρ is α-1 and α=1, in the equation $\left(\Delta y_t = \rho y_{t-1} + \nu_t\right)$, Where νt is the error term. If ρ=0 we conclude that there is unit root meaning that the variables are non-stationary. The study will also check for structural breaks and use the long-run model in the threshold regression.

The threshold regression was estimated using the Ordinary least squares (OLS) method of estimation under the assumption μ_t is $N\left(0, \delta^2\right)$[4]. It involves estimating regressions for different values of K^* which is chosen in an ascending order (i.e., 1, 2 and so on), based on the minimum and maximum of the fiscal deficit series. The optimal value K^* is obtained by finding the value that minimizes the sequence of residual sum of squares (RSS) as proposed by Hansen (1999). The procedure has become widely accepted in the literature on the topic. However, it is tedious as it requires the estimation of the equation several times for different values of K^*. Hence, this study employs a range from a surplus of K = 3 % to a deficit of k = 10 % to identify the deficit threshold.

[4] The error term is normally distributed with a zero mean and a constant variance

The threshold parameter K^* is then estimated by the value that minimizes the sum of squares or maximizes R^2 since they are functionally dependent[5], from the respective regressions if the number of variables is more than one excluding the constant term. The residual sum of squares is referred to as $S_1(K)$ and given by:

$$S_1(K) = \sum^{N}_{i=1} \sum^{T}_{t=1} \varepsilon^2_{it} \quad (17)$$

The threshold parameter is given by:

$$K^* = \arg_k MinS_1(K) \text{ or } K^* = \arg_k MaxR^2(K) \quad (18)$$

Where $S_1(K)$ and $R^2(K)$ depends on the chosen threshold level of fiscal deficit.

We also conducted a diagnostic check on the identified threshold value equation to establish its reliability.

4. DESCRIPTIVE RESULTS

Table 4.1 shows the descriptive statistics where the resultant *p* values for most of the variables were higher than the conventional *p*-value of 0.05 except for INT, INF, and SE. This leads to the acceptance of the Jarque-Bera null statistics that, the distribution of the variables is not statistically different from normal. Implying that the five variables are normally distributed, except for INT, INF, and SE.

Kenya's average GDP growth for the period 1985 to 2015 is approximately 3.781 percent, with a maximum of 6.99 percent to a minimum -0.46 percent in 2007 and 1992 respectively. In the same period, the fiscal deficit averaged -2.83 percent and had a maximum and minimum of 3.65 percent in 1988 and -10.03 percent in 2014 respectively. The standard deviations of 2.13 percent for GDP growth and 2.95 percent for fiscal deficit show a wide variation from the average mean of both variables.

Table 4.1: Descriptive Statistics

Variable	Mean	Std. Dev.	Max	Min	Probability
GDPG	3.780776	2.127404	6.993045	-0.461734	0.26740
Annual fiscal deficit	-2.828790	2.950806	3.648410	-10.02720	0.897843
Annual nominal principal	13.2435	7.554695	39.34000	1.41000	0.00005
EXT	60.28511	25.40893	98.18000	16.04200	0.191355
INF	11.46129	8.962205	46.00000	1.60000	0.00000
GCF	18.57098	2.563096	22.49441	14.44226	0.352879
SE	3.07274	1.041325	5.78955	2.043623	0.009423
M_2	30.88314	4.449864	38.74404	21.73211	0.431068
OPN	0.510862	0.059052	0.604487	0.383388	0.31888
Observations	31	31	31	31	31

4.1 Unit Root Tests

Time series data are associated with stationarity problems, and unit root test provides a basis for assessing if a time series is non-stationary and integrated of a particular order for elimination of spurious results. We used both the Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) tests. The results in table 4.2 indicate that the six variables were nonstationary at level, which lead to first differencing. The first differencing of the variables showed that all the variables

[5] Since the $R^2 = 1 - \frac{sumofsquaredresiduals}{totalsumofsquares}$, then the maximum of R^2 will be achieved at the minimum of sum of squared residuals.

are integrated of order one and they were significant at 1 percent, except for fiscal deficit which was significant at 5 percent in the ADF test.

Table 4.2: Augmented Dickey-Fuller and Phillips-Peron Tests

Augmented Dickey-Fuller Test

Variable Name	Levels		First Difference		Order of Integration
	Intercept	Trend and Intercept	Intercept	Trend and Intercept	
GDPG	-2.361812	-2.517818	-4.876149*	-4.865273*	I (1)
FD	-2.621634	-3.091673	-7.069644*	-4.238349**	I (1)
INT	-1.673591	-2.955514	-5.922882*	-5.851842*	I (1)
EXT	-1.230524	-2.508398	-8.084729*	-8.008338*	I (1)
INF	-2.752222	-2.987609	-63202967*	-5.661428*	I (1)
GCF	-2.086282	-2.281506	-4.677490*	-4.813560*	I (1)
SE	-3.683397	-2.258078	-5.220723*	-6.337435*	I (1)
M_2	-2.065622	-2.290398	-6.565944*	-6.486430*	I (1)
OPN	-2.308051	-2.259377	-6.241821*	-5.894817*	I (1)

Phillips- Peron Test

Variable Name	Levels		First Difference		Order of Integration
	Intercept	Trend and Intercept	Intercept	Trend and Intercept	
GDPG	-2.417995	-2.144299	-5.336955*	-7.195000*	I (1)
FD	-2.555302	-2.976426	-8.523890*	-19.12929*	I (1)
INT	-3.337046	-3.047441	-10.08949*	-9.934395*	I (1)
EXT	-0.969655	-2.340390	-8.185961*	-8.302314*	I (1)
INF	-2.883495	-2.893620	-6.471035*	-6.415464*	I (1)
GCF	-2.040442	-2.231834	-6.408612*	-6.342209*	I (1)
SE	-4.122926	-2.357126	-5.314891*	-6.258131*	I (I)
M_2	-2.065622	-2.232925	-6.572519*	-6.486430*	I (1)
OPN	-2.259063	-2.147278	-6.434359*	-7.181778*	I (1)

Significant levels: *(1%); ** (5%) and *** (10%)

4.2 Diagnostic Checks

We conducted diagnostic tests on the general regression model in appendix 2 and the stability, and residual tests results are shown below:

4.2.1 Residual Tests

Residual tests, test the behavior of the error term and the results in table 4.3 indicate that the *p* values are insignificant in all the three tests, resulting in acceptance of the null hypothesis. The residual for the equation estimated was normally distributed (see appendix 3), no serial correlation and no heteroscedasticity was observed.

Table 4.3: Residual Tests

Test	Statistic	Value	Probability	Conclusion
Normality	Jarque-Bera test	0.412624	0.813579	Residuals are normally distributed
Serial Correlation LM test	Obs*R-squared	0.897366	0.638500	No serial correlation
Heteroskedasticity test: Breuch-Pagan- Godfrey)	Obs*R-squared	18.32499	0.305200	No heteroscedasticity

4.2.2 Stability Tests

The stability of the model was tested by applying the Ramsey Rest test, Cusum test, and Recursive coefficients test. The results showed that the model is well specified, with a probability of 0.3268. The cusum test (see appendix 4) indicates that the model is stable at 5 percent level of significance and hence it is not sensitive to changes in the size of the sample.

4.2.3 Co-integration

The differencing of time series data to achieve stationarity results in loss of valuable long term relationship between variables. Co-integration is a proposed remedy to this problem, and we applied the Eangle-Granger two-step procedure. The long-run relationship residuals were generated and tested for stationarity using ADF. The results in table 4.4 show that the residuals were stationary in levels, indicating the presence of long-run equilibrium among the variables.

Table 4.4: Co-integration- Engle Granger Test

		Test Statistic	1% Critical value	5% Critical value	10% Critical Value	Probability
Residuals	Intercept	-3.52729**	-3.71146	-2.98104	-2.62991	0.01530
Residuals	Trend and Intercept	-3.42880***	-4.59503	-3.59503	-3.23346	0.06930

Significant: * (1%); ** (5%) and *** (10%)

4.3 The Long Run Model

The optimal lag length for the model was determined in order to ensure that it is well specified. The Akaike Information Criterion (AIC) and the Schwartz Bayesian Information Criterion (SBIC) were used, and one lag was identified as fit for the model. The Eangle-Granger test indicated co-integration among the variables, which lead to the estimation of the long run model. Structural breaks were revealed in the years 2008, 1992 and they were included as a dummy in the model and Table 4.5 presents the results.

The adjusted R-squared of 0.750051 for equation 15 indicates that the overall fitness of the model was satisfactory. The F-statistic of 9.702347 (*p*-value 0.000015) shows that independent variables have a good joint explanatory power and Durbin Watson statistics of 1.353083 being within the acceptable range indicates no presence of serial autocorrelation. The explanatory variables were lagged one period which provided the best fit model for GDPG. The constant term was found positive and though not significant indicating that growth would still arise at 0.05373 units, even if all the variables in the model were held constant.

Fiscal deficit was found to have a positive impact on the economy, which is consistent with the Keynesian perspective. It shows that a 1 unit change in fiscal deficit contributes to 0. 263774 units change in economic growth. Similar results were established by Onwioduokit and Bassey (2014) in the Gambia, Onwioduokit (2012) in there study of WAMZ countries and Weng et al. (2005) in Malaysia. The negative association between the interest rate and growth was as expected and 1 unit change in interest rate results to change in growth by -0.156000 units. Higher interest rate reduces consumer spending, makes borrowing expensive leading to reduced borrowing and hence investment. This supports the crowding out effect of the higher interest rate. Onwioduokit (2012) and Akosah (2013) established the same results.

The exchange rate was negative and highly significant in influencing growth, in that a 1 unit change in the exchange rate would lead to -0.147300 units change in growth. The results are consistent with those obtained by Onwioduokit and Bassey (2014), Akosah (2013) and Onwioduokit (2012) in Gambia, Ghana and WAMZ countries respectively. Previous investments had a positive and significant impact on economic growth in that 1 unit change contributes to 0.368268 units change in the growth of the economy. This supports the priori expectation and indicates that growth depends on the rate of return on investment. Implying, in the long run, investment remains an engine of growth, and Kenya's economy is likely to improve if resources are diverted to investment. This is depicted in the recent high infrastructural investment in the country.

Secondary school enrollment was positive and significant as expected in the study. A one unit change would lead to 3.238159 units change in the growth of the economy. The productivity output to the economy is seen after schooling and education has externality effects across the economy. Education not only improves an individual's skills and but also

productivity. In Nigeria, Aero and Ogundipe (2016) found similar results. The sign for inflation was as expected, though not significant in the model in explaining the change in growth

Regression results showed that financial deepening impacted positively on growth, confirming priori expectation. Indicating that, financial reforms have been adequate in inducing growth in Kenya. The study established a positive and significant association between the degree of openness of the economy and growth as expected. A one unit change would result in 27.31176 units change in economic growth. Similar results were found by Aero and Ogundipe (2016) in Nigeria. Dummy D2008 had a negative and significant effect on economic growth as a result of combined effects of the post-election crisis, the global financial crisis, and high international crude fuel prices which led to a decline in most of the sectors of the economy (CBK, 2009). The year 1992 contributed negatively to growth due to political reforms which lead to re-introduction of the multi-party political system, accompanied by political uncertainty when general elections approached. There was also a suspension of foreign aid causing foreign exchange crisis (KNBS, 1993).

Table 4.5: Best Fit Model

Dependent variable: GDPG				
Method: Least Squares				
Sample (adjusted): 1986 2015				
Included observations: 30 after adjustments				
Variable	Coefficient	Std. Error	t-statistic	Prob.
C	2.689364	4.095615	0.656645	0.5193
FD	0.263774	0.118591	2.224236	0.0385
INT(-1)	-0.15600	0.036865	-4.231627	0.0005
EXT	-0.147302	0.024526	-6.005867	0.0000
INF	-0.024081	0.026966	-0.893002	0.3830
GCF(-1)	0.368268	0.147030	2.504713	0.0215
SE	3.238159	0.584069	5.544139	0.0000
M2(-1)	0.051004	0.101814	0.500955	0.6222
OPN	27.31176	6.060500	4.506520	0.0002
D2008	-3.298544	1.168691	-2.822426	0.0109
D1992	-2.562616	1.239206	-2.067950	0.0525
R-squared	0.836240			
Adjusted R-squared	0.750051			
Durbin-Watson Stat	1.353083			
Sum squared residue	21.86882			
F-statistic	9.702347			
Prob(F-statistic)	0.000015			

Significant: * (1%); ** (5%) and *** (10%)

4.4 Analysis of Threshold Regression

The threshold regression model was estimated using the long-run model, taking into consideration the estimation results obtained from the earlier stages. The study estimated the threshold fiscal deficit using OLS procedure as proposed by Hansen (1999). It involves estimating equation 15 with different chosen threshold values which ranged from a surplus of K= 3 percent to a deficit of K = 10 percent based on the minimum and maximum fiscal deficit series. The optimal fiscal deficit is chosen as the one that minimizes the sum of squared residuals (RSS) and hence maximizing the R-squared.

The results in table 4.6 summarized from the threshold regressions show the estimation of different values of K. The one with the lowest RSS for the sample period occurred at the threshold fiscal deficit value of 5 percent, with a value of 19.06904 and highest R-squared of 85.72 percent. The coefficient of the dummy threshold was found to be positive implying that at the optimal deficit a one unit change would lead to 1.331532 units change in growth. The identified optimal deficit for Kenya is below the set target of six percent of GDP for EAC monetary union. At the threshold equation, the fiscal deficit is positive and highly significant. One unit change in fiscal deficit leads to 0.39868 units change in growth. The regression showed that fiscal deficit values above the identified threshold value of 5 percent,

would contribute positively to growth in Kenya. On the other hand, the deficits below the threshold had a negative impact on growth, and hence they would be detrimental to growth in the country.

Similar results were found by Aero and Agundipe (2016) in Nigeria and Onwioduokit (2012) in WAMZ. Other studies found different fiscal deficit threshold levels; for example, Slimani (2016) for 40 developing countries found double effect fiscal balance of 4.8 percent and 3.2 percent. Onwioduokit and Bassy (2014) identified a threshold level of 6 percent for the Gambia. Akosah (2013) found a threshold level of 4 percent for Ghana, while Weng et al. (2011) found a threshold of 2.5 percent for Malaysia, Adan, and Bevan (2005) found a threshold value of 1.5 percent for 45 developing (non-OECD) countries and Ariestis et al. found 3.13 percent for the U.S. All these studies, found that budget deficits exceeding these specified levels were detrimental to economic growth.

Table 4.6: Estimation of the threshold at K= 3 to -10 (Dependent Variable: GDPG)

Dependent Variable: GDPG				
Method: Least Squares				
Sample (adjusted): 1986 2015				
Included observations: 30 after adjustments				
Threshold Value –K (%)	Coefficient	Prob.	RSS	R2
3	0.084842	0.9608	21.86581	0.836263
2	0.084842	0.9608	21.86581	0.836263
1	0.432997	0.7158	21.70383	0.837476
0	0.257841	0.7594	21.75192	0.837115
-1	0.201537	0.7955	21.7851	0.836867
-2	0.894865	0.2925	20.52803	0.84628
-3	1.289856	0.2014	19.92216	0.850817
-4	0.38164	0.6931	21.67512	0.837691
-5* Threshold	**1.331532**	**0.1214**	**19.06904**	**0.857206**
-6	-1.562918	0.2038	19.9423	0.850666
-7	-1.503763	0.2400	20.21061	0.848657
-8	- 0.923493	0.4940	21.29222	0.840558
-9	0.923493	0.4940	21.29222	0.840558
-10	0.923493	0.4940	21.29222	0.840558

4.5 Diagnostic Test Results

The -5 percent threshold value equation was subjected to diagnostic tests and results are shown in table 4.7. There was no serial correlation; no heteroscedasticity and residuals were normally distributed. It was also stable and well specified, implying that the estimate is reliable.

Table 4.8: Diagnostic Tests at -5 per cent Equation

Equation	Test	Statistic	Value	Probability	Conclusion
K^*= -5	Normality	Jarque-Bera test	1.317181	0.51758	Residuals are normally distributed
	Serial Correlation LM test	Obs*R-squared	1.306462	0.52040	No serial correlation
	Heteroskedasticity: Breusch-Pagan Godfrey	Obs*R-squared	6.184488	0.99920	No heteroscedasticity
	Ramsey Rest	F- Statistic	1.731126	0.11420	Stable and well specified

Significant: * (1%); ** (5%) and *** (10%)

5. CONCLUSION AND POLICY RECOMMENDATIONS

This paper sought to identify the optimal fiscal deficit for Kenya and the model used by Akosah (2013) for threshold analysis for Ghana was adopted. Time series annual data for 1985-2015 were utilized in the least squares regression. All the variables were found to be normally distributed at a 5 percent level of significance except for interest rate and secondary school enrollment. Regarding stationary, all the variables were integrated of order one. The long-run model had an adjusted R-squared of 75 percent indicating satisfactory with the overall fitness of the model. The study used one lag and found a fiscal deficit, interest rate, exchange rate, inflation, investment, secondary school enrollment, financial deepening and degree of openness of the economy confirming priori expectation. All the variables were significant in explaining growth in Kenya except for inflation and financial deepening. Structural breaks were found in the years 2008 and 1992, which were negative and significant for growth in Kenya. The long-run model was used for the threshold regression and the results identified fiscal deficit threshold level of 5 percent of GDP for Kenya for the sample period. The diagnostic on the threshold value equation indicated normality of residuals and stability, no serial correlation and no heteroscedasticity.

We, therefore, recommend a 5 percent optimal fiscal deficit for Kenya, which is within the EAC community primary convergence criteria target. The study results are in line with the Keynesian perspective, that fiscal deficit produces a positive impact on the economy as it accelerates capital accumulation. Since the identified fiscal deficit threshold represents the chosen sample, there is a need to examine the threshold level of fiscal deficit for Kenya continuously. We also recommend that policymakers should aim at maintaining the fiscal deficit at 5 percent which is also within the acceptable EAC convergence criteria. Also, to show commitment towards fiscal primary convergence criteria for EAC countries, deficits in Kenya should be adjusted to the identified threshold.

REFERENCES

[1] Adam, C.S. and Bevan, D. L. (2005), "Fiscal deficit and growth in developing countries," *Journal of Public Economics*, Vol. 89, No. 4, pp. 571-597.

[2] Aero, O. and Ogundipe, A. A. (2016), "Fiscal deficit and economic growth in Nigeria: Asertaining a Feasible Threshold," *SSRN Electronic Journal*.

[3] Akosah, N. K. (2013), "Threshold effect of budget deficits on economic growth in Ghana: An Empirical Analysis," Research Department, Bank of Ghana.

[4] Arestis, P., Cipollini, A., and Fattouh, B. (2004), Threshold effects in the U.S. budget deficit, *Working Paper* No. 358.

[5] Bernheim, D.B. (1989), "A neoclassical perspective on budget Deficit," *Journal of Economic Perspectives*, Vol. 3, No. 2, pp. 55-72.

[6] Brown-Collier, E. and Collier, B. (1995), "What Keynes really said about deficit spending," *Journal of Post Keynesian Economics*, Vol. 17, No. 3, pp. 341-355.

[7] Central Bank of Kenya (Various), Annual Reports, available at: https://www.centralbank.go.ke

[8] East African Community (2013), Protocol for the establishment of the East African community monetary union, EAC Secretariat, Arusha, Tanzania.

[9] East African Community (2016), EAC Vision 2050, EAC Secretariat, Arusha, Tanzania.

[10] Fatima, G., Ahmed, A., & Rehman, W. (2011), "Fiscal deficit and economic growth: An analysis of Pakistan's economy," *International Journal of Trade, Economics and Finance*, Vol. 2, No. 6, pp. 501-504.

[11] Ghura, D. (1997), Private investment and endogenous growth: Evidence from Cameroon, IMF Working Paper, No. 165, IMF.

[12] Government of Kenya (2010), Constitution of Kenya, Nairobi: Government Printer.

[13] Government of Kenya (2010), Kenya Vision 2030, Nairobi: Government Printer

[14] Government of Kenya (2012), The Public Finance Management Act 2012, Nairobi: Government Printer.

[15] Government of Kenya (2013), Second Medium Term Plan, 2013-2017: Kenya Vision 2030, The Presidency, Ministry of Devolution and Planning.

[16] Government of Kenya (2016), Budget Policy Statement, Nairobi: National Treasury

[17] Government of Kenya (2016), Budget Review and Outlook Paper, Nairobi: National Treasury

[18] Government of Kenya (various), Economic survey, Kenya National Bureau of Statistics, Government printers, Nairobi.

[19] Hansen, E.B. (1999), "Effects in non-dynamic panels: Estimation, testing and inference," *Journal of Econometrics*, Vol. 93, No. 2, pp. 345-368.

[20] International Monetary Fund-IMF (2016), "Regional economic outlook, Sub-Saharan Africa", Washington DC, *International Monetary Fund*.

[21] Keynes, J.M. (1936), "The general theory of employment, interest and money", *The University of Adelaide*, Australia.

[22] Khan, M. S. and Senhadji, A. S. (2000), "Threshold effects in the relationship between inflation and growth," *IMF Working Papers,* Vol.48, No. 110.

[23] Ng'eny, L.K. (2015), Kenya and East Africa monetary union. Discussion Paper No.180, Nairobi. *Kenya Institute for Public Policy Research and Analysis*.

[24] Kosimbei, G. K. (2009), "Budget deficits and macroeconomic performance in Kenya: An Empirical Analysis". PhD Thesis, Kenyatta University, Kenya.

[25] Magehema, J.T. (2015), Effect of Budget Deficit on Economic Development in East African Countries. MSC Thesis, University of Nairobi, Kenya.

[26] Mohanty, R. K. (2012), Fiscal deficit-economic growth nexus in India: A cointegration analysis, Centre for Economic Studies & Planning, School of Social Sciences, Jawaharlal Nehru University, New Delhi.

[27] Mosoti, M.M. (2012), "The growth of Public Expenditure in Kenya: Exploring the Causes (1980-2012)". MA Thesis, University of Nairobi, Kenya.

[28] Navaratnam, R. and Mayandy, K. (2016), "Causal nexus between fiscal deficit and economic growth: Empirical evidence from South Asia," *International Journal for Innovation and Research*, Vol. 4, No. 8, pp. 1-19.

[29] Okelo, O.S., Momanyi,G., Othuon, L., Aila, O.F. (2013), "The relationship between fiscal deficit and economic growth in Kenya: An empirical Investigation," *Greener Journal of Social Sciences*, Vol. 3, No.6, pp. 306-323.

[30] Onwioduokit, E. (2012). An empirical estimation of the optimal level of fiscal deficit in the West African monetary zone. *West African Journal of Monetary and Economic Integration*, Vol. *6*, No. 2, pp 1-14.

[31] Onwioduokit, E.A. and Bassey, G.E. (2014), Fiscal deficit and economic growth in the Gambia: A Search for Threshold, *International Journal of Current Research and Review*, Vol. 4, No. 19, PP. 162-181.

[32] Romer, P.M. (1986), "Increasing returns and long-run growth," *Journal of Political Economy*, Vol. 94, pp. 37-1002.

[33] Romer, P.M. (1994), "The origins of endogenous growth," *Journal of Economic Perspective*, Vol. 8, pp. 3-22.

[34] Sirengo, J. (2008), Determinants of Kenya's fiscal performance. Discussion Paper No. 91, Nairobi. Kenya Institute for Public Policy Research and Analysis.

[35] Slimani, S. (2016), "Threshold effects of fiscal policy on economic activity in developing countries," *International Journal of Business and Social Research*, Vol. 06, No. 03, pp. 20-37.

[36] Tong, H. (1990), "Nonlinear time series analysis: A Dynamical Approach" *Oxford University Press*, London.

[37] Wanjala, B. and Kiringai, J. (2007), Sources of economic growth: A Ridux. Discussion paper No.79, Nairobi. *Kenya Institute for Public Policy Research and Analysis*.

[38] Weng, C.K., Meu, E.Y., Hoong, L.K., Ean, T.K. and Shun, T.W. (2011), "Debt, budget deficit and economic growth of Malaysia". Bachelor of Economics, Universiti Tunku Abdul Rahman, Malaysia.

[39] Zuze, M. (2016), "Fiscal deficit-economic growth nexus in Zimbabwe: A vector Auto Regression Analysis," International Journal of Innovative Research and Development, Vol.5, No. 6, pp. 380-38

APPENDIX

Appendix 1: Descriptive Statistics

Sample: 1985-2015

	GDPG	FD	INT	EXT	INF	GCF	SE	M2	OPN
Mean	3.780776	-2.82879	13.24355	60.28511	11.46129	18.57098	3.07274	30.88314	0.510862
Median	4.636545	-2.62776	11.15000	69.3967	9.80000	18.79616	2.516248	31.02446	0.532201
Maximum	6.993045	3.64841	39.34000	98.18000	46.0000	22.49441	5.78955	38.74404	0.604487
Minimum	-0.46173	-10.0272	1.41000	16.042	1.60000	14.44226	2.043623	21.73211	0.383388
Std. Dev.	2.127404	2.950806	7.554695	25.40893	8.962205	2.563096	1.041325	4.449864	0.059052
Skewness	-0.49934	-0.19639	1.349952	-0.63651	2.225353	-0.13061	1.323566	-0.50075	-0.56519
Kurtosis	1.977841	2.887852	5.835243	2.030527	8.604007	1.757176	3.464051	2.452318	2.298612
Jarque-Bera	2.637795	0.215519	19.79878	3.307252	66.15101	2.083261	9.329261	1.682977	2.285879
Probability	0.267430	0.897843	0.00005	0.191355	0.00000	0.352879	0.009423	0.431068	0.31888
Sum	117.2040	-87.6925	410.55000	1868.838	355.3000	575.7004	95.25495	957.3773	15.83673
Sum Sq. Dev.	135.7755	261.2177	1712.203	19368.41	2409.634	197.0838	32.53072	594.0386	0.104613
Observations	31	31	31	31	31	31	31	31	31

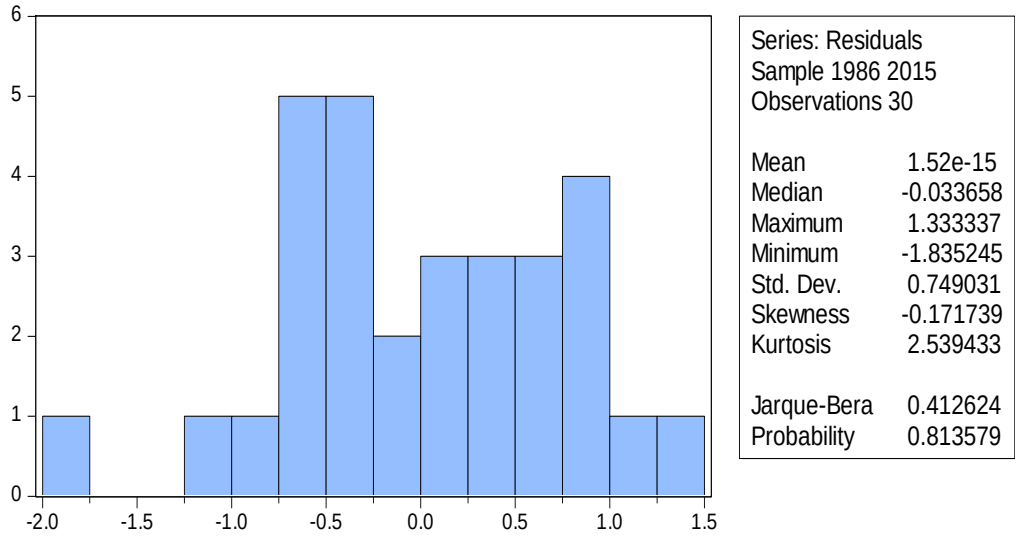
Appendix 2: General Model

Dependent Variable: GDPG
Method: Least Squares
Sample (adjusted): 1986 2015
Included observations: 30 after adjustments

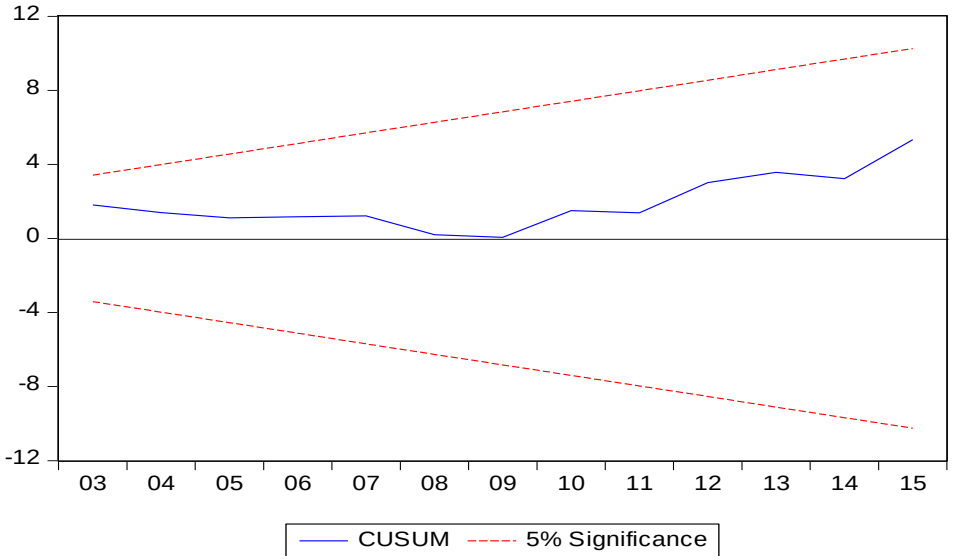
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.663169	8.454257	0.078442	0.9387
FD	-0.023740	0.178350	-0.133111	0.8961
FD(-1)	0.014891	0.168683	0.088281	0.9310
INT	0.050643	0.065550	0.772595	0.4536
INT(-1)	-0.264028	0.057626	-4.581711	0.0005
EXT	-0.215337	0.057488	-3.745789	0.0024
EXT(-1)	0.066542	0.055777	1.192998	0.2542
INF	-0.166384	0.056693	-2.93482	0.0116
INF(-1)	0.174552	0.066447	2.626942	0.0209
GCF	-0.023239	0.235964	-0.098485	0.9230
GCF(-1)	-0.361624	0.250183	-1.445437	0.1720
SE	1.752370	1.449372	1.209055	0.2482
SE(-1)	0.917689	2.159103	0.425033	0.6778
M2	-0.433171	0.185658	-2.333164	0.0363
M2(-1)	0.604215	0.223926	2.698275	0.0183
OPN	24.792470	9.487283	2.613232	0.0215
OPN(-1)	-7.155936	9.379492	-0.762934	0.4591

R-squared	0.878163
Adjusted R-squared	0.728209
Durbin-Watson stat	1.977659
Sum squared resid	16.27037
Log likelihood	-33.39038
F-statistic	5.856236
Prob(F-statistic)	0.001287

Appendix 3: **Histogram Normality Test**



Appendix 4: **Cusum Test Graph**



Appendix 5: **Substituting equation 10 into 9**

i. $$Y = A_1 + \frac{\alpha_1}{P}\left(A_2 - \delta_0 Y + \delta_1 e + \delta_2 i\right) + \alpha_2 Y + \sigma e + FD$$

ii. $$Y = A_1 + \frac{\alpha_1}{P}A_2 - \frac{\alpha_1}{P}\delta_0 Y + \frac{\alpha_1}{P}\delta_1 e + \frac{\alpha_1}{P}\delta_2 i + \alpha_2 Y + \sigma e + FD$$

iii. $$Y + \frac{B}{P}\delta_0 Y - \alpha_2 Y = A_1 + \frac{\alpha_1}{P}A_2 + \frac{\alpha_1}{P}\delta_1 e + \frac{\alpha_1}{P}\delta_2 i + + \sigma e + FD$$

iv. $$Y\left(1 + \frac{\alpha_1}{P}\delta_0 - \alpha_2\right) = A_1 + \frac{\alpha_1}{P}\left(A_2 + \delta_1 e + \delta_2 i\right) + \sigma e + FD$$

v. $$Y = \frac{A_1}{\frac{1}{p}\left(1+\alpha_1\delta_0-\alpha_2\right)} + \frac{\frac{\alpha_1}{P}\left(A_2+\delta_1 e+\delta_2 i\right)}{\frac{1}{p}\left(1+\alpha_1\delta_0-\alpha_2\right)} + \frac{\sigma e}{\frac{1}{p}\left(1+\alpha_1\delta_0-\alpha_2\right)} + \frac{FD}{\frac{1}{p}\left(1+\alpha_1\delta_0-\alpha_2\right)}$$

Letting $\left(1+\frac{\alpha_1}{P}\delta_0-\alpha_2\right)$ be equal to θ, equation above will be:

vi. $$Y = \frac{A_1}{\theta} + \frac{\frac{\alpha_1}{P}\left(A_2+\delta_1 e+\delta_2 i\right)}{\theta} + \frac{\sigma e}{\theta} + \frac{FD}{\theta}$$

vii. $$Y = \frac{A_1}{\theta} + \frac{1}{P}\alpha_1\frac{\left(A_2+\delta_1 e+\delta_2 i\right)}{\theta} + \frac{\sigma e}{\theta} + \frac{FD}{\theta}$$

Letting $\frac{A_1+\alpha_1 A_2}{\theta}$ be equal to C, $\frac{\delta_1}{\theta}$ be ϖ_1, $\frac{\delta_2}{\theta}$ be ϖ_2, $\frac{\sigma}{\theta}$ be ϖ_3 and $\frac{1}{\theta}\varpi_4$

Thus equation Vii becomes:

viii. $$Y = C + \frac{1}{P}\left(\varpi_1 e+\varpi_2 i\right)+\varpi_3 e+\varpi_4 FD$$

If $\varpi_1 e+\varpi_3 e$ is equated to be ν and taking the second term on the right side of the equation in a generic logarithmic term, then equation Viii will be:

ix. $$Y = C + \nu e + \varpi_2 i - Inf + \varpi_4 FD$$

Recasting the above equation ix gives:

x. $$Y = C + \beta_1 e + \beta_2 i + \beta_3 FD + \beta_4 Inf \qquad (11)$$