Assessing Fiscal Policy Cyclicality and Sustainability:
A Fiscal Reaction Function for Kenya

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Abstract. This study sought to determine whether fiscal policy for Kenya is on a sustainable path by estimating a fiscal reaction function. A fiscal reaction function is a rule derived from an inter-temporal government budget constraint which reveals the response of government to accumulating public debt. It also sought to establish whether fiscal policy responds to business cycles by determining its cyclical nature. The study used annual time series data spanning 1970 to 2013 and multivariate analysis was based on VAR and VECM model. The empirical analysis reveals that, firstly fiscal behavior is incoherent with inter-temporal budget constraint and the moderation is low. This implies that if fiscal adjustment is not done, debt is likely to accumulate. Secondly, election cycles expenditures threaten Kenya's long run fiscal sustainability. Finally, fiscal policy is a-cyclical meaning that stabilization objective is not considered while conducting the fiscal policy. The study recommends that fiscal rules, independent fiscal committee and comprehensive fiscal regulations laws should be enacted to correct these biases.

Keywords. Fiscal policy, Sustainability, Fiscal reaction.
JEL. E62, H30, Q56.

1. Introduction

Fiscal policy entails the deliberate measures by the government to influence the direction and the performance of the economy so as to attain specific set objectives namely; fostering macroeconomic stability, efficient allocation of resources and fair distribution of income. Fiscal policy adjustments are normally effected through alterations in the composition and level of government expenditure, changes in tax revenue or changes in tax structure. The effects are either realized through automatic stabilization or discretionary changes through the fiscal budget. Automatic stabilizers are those elements of fiscal policy that reduce tax burdens and increase public spending without discretionary government action.

Kenya's fiscal policy stance is mainly geared towards macroeconomic stability, sustainable growth and conducive environment for investment and innovation. As articulated in budget strategy paper 2012/2013 and 2013/2014 financial years, a sound fiscal policy should not only be sustainable but should also create fiscal space for counter cyclicality in case the economy is exposed to destabilizing shocks. Some of the key indicators of the soundness of fiscal policy are debt to GDP ratio and fiscal deficit as a %age of the GDP. To ensure fiscal sustainability, Kenya targets a fiscal deficit of 3.6% by 2013 while East Africa community target is 6%. On the other hand, as a %age of GDP, public debt increased from 44.5% in the previous financial year to 49.8% in 2013/2014 financial year with the projected

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trend being expected to hit 53.3% in 2014/2015 far above the debt target of 40% of the overall GDP.

This raising debt and fiscal deficit is attributed to increasing government expenditure and a slower growth in revenues. The rising deficit is not only a threat to fiscal consolidation efforts but also poses a great challenge to macroeconomic stability. In addition, it does not only constraints the fiscal space required to design and implement a countercyclical fiscal policy but also raises concerns on sustainability of such a policy.

Fiscal policy is sustainable if it satisfies the inter-temporal budget constraint. This means that the present value of future primary surpluses should be equal or more than the current level of debt(Alesina et al,2011; Bohn, 1998). As debt accumulates, the government should run sufficient future surpluses if debt is to remain non explosive. It implies that the government can run the current fiscal policy overtime without altering taxation or leading to excessive debt accumulation. Fiscal sustainability implies good management of public resources.

Unsustainable fiscal policy has adverse consequences on the economy and the welfare of its citizens. Specifically, it results into a non- stable macroeconomic environment which manifest in financial crisis, weak currency, explosive debt, financial sector failure and volatile interest rates. In addition, non sustainable fiscal policy exposes economies to external shocks, harms the welfare of the state through large fiscal deficits and excessive debt stocks and generates an inefficient allocation of resources. Excessive public debt does not only affect future generations but also leads to inflation volatility(Anca, 2011).

Secondly, it has implications on financial markets and monetary policy stance too. For instance, high public debt and fiscal deficit levels create expectations in financial markets that government is likely to default on debt hence, investors demand a higher interest rate on government debt to compensate for the apparent risk that the government may not be able to repay its loans, causing a sudden and sharp increase in the government's financing costs. The ultimate effect is to crowd out private borrowing due to rising cost of credit. High debt levels may also force the government to monetize the debt or create a surprise inflation, which in turn jeopardizes monetary policy stance (Renee & Weinberg 2007).

As earlier cited, macroeconomic stabilization is one of the key fiscal policy objectives in Kenya. An automatically stabilizing fiscal policy is crucial in cushioning the economy against macroeconomics shocks. For Kenya, the Vision 2030 is based on the assumption that fiscal policy remains sustainable and stabilizing. A stabilizing fiscal policy should not lean on the wind; the government should spend more during economic downswing and spend less during up swing. Such a policy is said to be counter cyclical. Counter cyclical policies as attributed to strong automatic fiscal stabilizers should mitigate both short run and long run business cycles rather than amplifying them. However, empirical evidence has that most developing economies fiscal policies are procyclical, meaning that they lean on the wind hence accelerating instabilities especially after shocks,(Halland & Bleaney, 2009;Alesina et al, 2008;Ilzetzki & Vegh 2008;Mcmanus & Ozkan, 2012).

It's therefore essential to understand the fiscal sustainability prospects for Kenya and from a wide perspective that assesses not only fiscal sustainability, but also automatic stabilizers property of the fiscal tools. One way of assessing fiscal sustainability is through an assessment of how a government reacts to changes in its debt position. For a country like Kenya that has seen considerable increases in total debt levels, an understanding of how the country changes its fiscal policy stance in relation to changing debt positions is important. Fiscal sustainability will be achieved if the increases in expenditures are matched with increases in revenue

(World Bank, 1990).Further, a stabilizing fiscal policy should be sustainable, which implies that it should not lead to excessive debt accumulation. It should also be countercyclical implying that, fiscal position should not accommodate business cycles but rather counter them.

Assessment of the government reaction to debt is done through estimation of a fiscal reaction function. A fiscal reaction function is a rule that reveals how sound a fiscal policy is in terms of sustainability, transmission and cyclicality, (Khalid, 2007; Mello 2005; Baldi & Karstein 2012; Antonio & Tovar 2011;Stoin & Rui 2013). Having the right fiscal reaction function makes fiscal policy and public finance sound and stable (Nguyen 2013).

It is against this background that this study seeks to assess the response of the Kenyan government to changes in debt position through estimation of a fiscal reaction function. This would also give insights into the sustainability of fiscal policy in Kenya and also whether fiscal policy stabilizes business cycles in the economy. The specific objectives of the study include:

1. To estimate a fiscal reaction function for Kenya
2. To asses fiscal sustainability in Kenya
3. To asses cyclicality of fiscal policy in Kenya

The paper is organized as follows. Section two provides background information. Section three provides the theoretical, empirical literature and analytical framework employed in the study. Section four describes the data, preliminary diagnostic tests and empirical findings, while Section five concludes by providing discussion of results and policy recommendations.

2.Background

2.1. Fiscal policy stance in Kenya

Fiscal policy seeks to address macroeconomic instability, fostering higher economic growth, reducing poverty rate, and addressing substantial income, asset, and regional inequalities. In Kenya, these objective are pursued in government policy documents such as Sectional paper No.10 of 1965 on African Socialism and its application to Kenya and the Sessional Paper No.1 of 1986 on Economic Management for RenewedGrowthEconomic Recovery Strategy (ERS) of 2003, Vision 2030,Medium Term Expenditure Framework (MTEF) in 2007, the Poverty Reduction Strategy Paper (PRSP) and the Poverty Reduction Growth Facility (PRGF).

From historical perspective, persistent rise in government expenditure on infrastructure, free primary education, military operations, power plants and on other social amenities, coupled with persistently raising recurrent expenditure have raised total government expenditure to GDP from 29% in 1970 t0 40% in 2013. Tax revenue has grown in tandem with the increasing public expenditure, for instance from 9% of the GDP in 1970 to 24% in 2013, which is within the expected target, however, it hardly suffices the expenditure leading to persistent fiscal deficit.

Notably, fiscal deficit has worsened, from 7% 0f GDP in 2004, to 12% in 2012 and 14% in 2013. Kenya is in a worse fiscal position compared to East African economies like Uganda, Burundi and Tanzania. For instance, in 2008/09, 2009/010, 2010/11 financial years, fiscal deficit in Uganda was 4.6%,7.2% and 6.2% respectively. In Tanzania, fiscal deficit remained stable registering 8.6%,9.3% and 11% respectively. In Burundi, the deficit was relatively low showing a drastic decline from 13.6% to 4% in 2009/10 financial year. This is one of the challenges leading to delay in signing the East Africa Community agreement since the expected deficit benchmark should be 6%. To bridge the gap between

revenue and expenditure, tax reforms have been employed severally. Firstly, in the wake of 1970s oil crisis minor tax reforms were undertaken. Sales taxes were introduced as a means of generating extra revenue and trade taxes were used to address the then widening balance of payments deficit.

During the period 1974 through 1985, the tax rates on both personal and corporate income were high with Marginal personal income tax rates ranging from 10% on the first shilling to a top rate of 65%. The tax rate applied to income of domestic corporations was 45% in 1974, while foreign corporations faced a rate of 52%. However, this did not yield much as expected due to low labour productivity, (Wanjala and Karingi, 2005).

In 1986 Tax Modernization Programme (TMP) was approved aimed at broadening the tax base to 28% of GDP in 1992. Subsequently, Budget Rationalization Programme intended to place controls on public spending was put in place in 1987. In 1991 as part of TMP several tax rates were converted into ad valorem tax partially to maximize tax revenue. Other reforms include changes in VAT in line with the East Africa community protocol, more reliance on indirect tax than direct tax and centralization of tax collection purposely to raise tax revenue with zero fiscal deficit being in consideration. Although tax revenue has grown overtime, the zero deficit targets have remained elusive, (Nado, 2009).

Consequently, public debt is used to bridge the gap with the current external debt increasing by 28.7% from Ksh 843.6 billion in June 2013 to Ksh 1085.9 billion in June 2014 largely as a result of the issuance of the International Sovereign Bond and depreciation of the Kenya shilling against the Euro, dollar, Sterling Pound and other major world currencies,(GOK,2024).

This persistent fiscal deficit and a raising public debt raise questions on whether fiscal policy is sustainable in Kenya. On the other hand, it suggests that fiscal policy in Kenya, leans on the wind; that is fiscal policy is run with no consideration on business cycles. Such fiscal policies tend to amplify business cycles or remains non responsive to short run business cycles at all. In addition, macroeconomic stability remains at stake, (Halland & Bleaney, 2009, Alesina et al, 2008, Ilzetzki & Vegh 2008, Mcmanus and Ozkan, 2012).A sustainable fiscal policy must meet the inter-temporal constraint, (Ostry et al 2010).

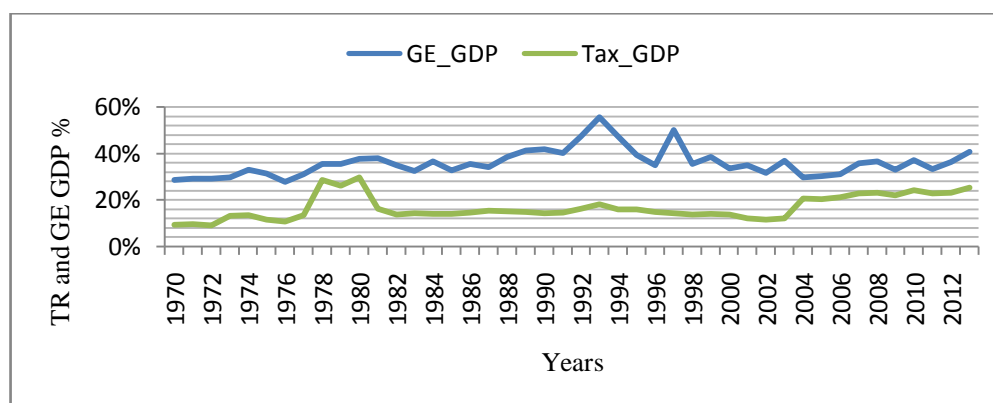*2.2. Revenue and expenditure trends*

Figure 1.*Revenue and expenditure as a %age of GDP*
Source: Economic suvey(2012, 2013,2014)

Figure 1 above, shows a consistent gap between tax revenue and government expenditure measured in GDP especially in the period between 1980 to 2004 as government expenditure proportion of GDP rises to 56% far above 18% TR/GDP in 1993. However, TR/GDP has also grown over time courtesy of various tax

reforms. Although 1970 was characterized by financial crisis originating from oil shock, the declining revenue was countered by 1972/73 tax reforms where sales tax replaced consumption tax and corporate tax was increased by 5%.The introduction of TMP in 1886 lead to a gradual increase in tax revenue as a proportion of GDP reaching 18% of GDP in 1993. There is also a slight decline in government expenditure from 1987 t0 1991 which is attributed to Budget Rationalization Programme enacted in 1987 intended to place controls on public spending.

However, the effect was short lived as government expenditure proportion to GDP took a drastic upswing immediately after 1991 to 56% of GDP attributed to multiparty politics and structural reforms held in the same period. From 1994 revenue takes a down turn partially due to the declining yield of the VAT (Wanjala & Karingi, 2005). Another substantial change in revenue to GDP proportion is experienced from 2004 to 2013 as revenue to GDP %age ratio raises from 12% to 21% in 2004, stabilizing at 26% in 2013. Overly, this growth in tax revenue is attributed to the success of TMP (Wanjala & Karingi, 2005) among other tax reforms and institutional measures.

In regard to government expenditure, Medium Term Plan for (2008-2012) of Vision 2030 provides the expenditure priorities for the Government for 2011/12-2012/13. In 2012/13, overall expenditures were projected at 29.8%. However, the target was far much surpassed by expenditure which hit 41% of GDP in 2013. The substantial growth in government expenditure is attributed to increasing recurrent and investment expenditure by the government and the fiscal stimulus undertaken between 2008/09 and2010/11, (GOK 2012). However, effectiveness of fiscal restrains is expected if implementation of the Integrated Financial Management Information System (IFMIS) across Ministries and Departments and subsequently at the county level following decentralization is fully put in place.
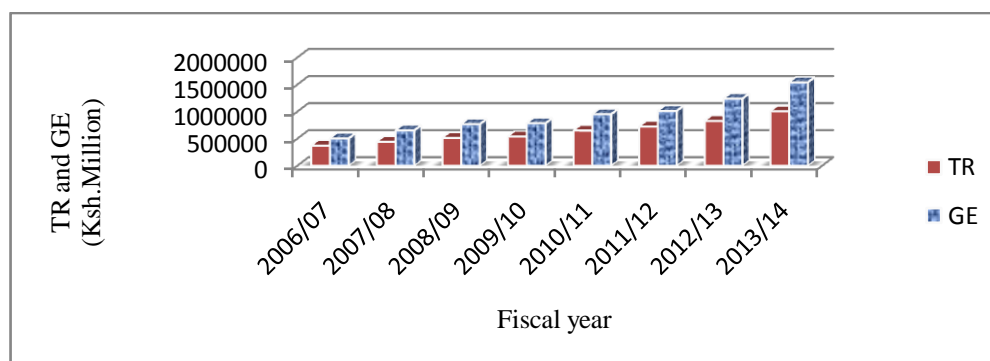

Figure 2. *Nominal total revenue and government expenditure (Ksh Million)*
Source: Economic suvey (2012, 2013,2014)

A look at figure2 above shows that tax revenue has increased over time from a total tax revenue amounting to Ksh 371989.1 million in 2006/07 to Ksh 1006862 million in 2013/14. The increase in tax revenue is attributed to significant increase in income revenue, trade tax revenue, VAT and excise tax revenue over the same period. Substantial growth in exercise duty growth is in the wake of tax amnesty and a waiver of interest on all tax arrears in 2004.However, government expenditure is consistently higher than tax revenue generating a persistent deficit in the economy. Figure 3 below shows tax efforts and government expenditure to rebased GDP in %age. The trend reveals a steady tax effort ranging between 19% t0 21% of the GDP. Similarly, the proportion of government expenditure to GDP has risen to 32% in 2013/14.
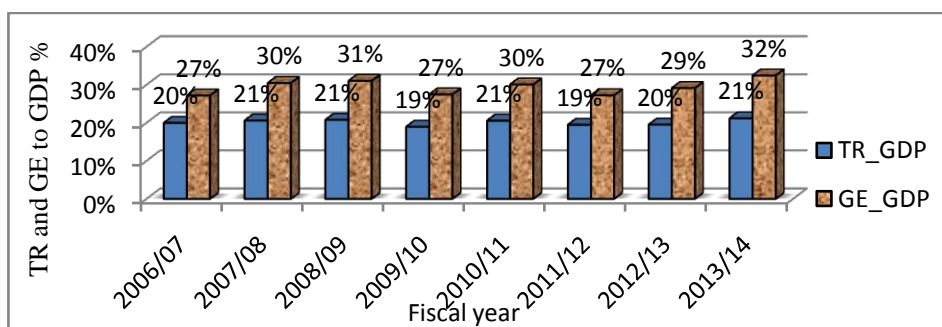
Figure3. *Total revenue and Government expenditure as % of rebased GDP*
Source: Authors computation using Data from economic survey(various issues)

2.3. Fiscal balance and public debt GDP ratio

Public debt is composed of both domestic and external borrowing by the government. Debt is often used to finance the government deficit in Kenya for instance fiscal stimulus of 2009 t0 2011 lead to growth of public debt to 45% of GDP.

Debt to GDP ratio remains high at 52% of GDP in 2013 rising from 42% in 2010 as shown figure 4 below. The projected ratio is to increase to 53% of GDP. However, looking at debt trend after GDP rebasing, the ration is still high at 40% in 2013. Looking at the figure above, high debt ratios are observed especially between the period 1993 to 1994, 2000 and 2004, 2008 and 2012. Such periods are associated with high deficit ratios implying that deficits are funded by increased debt. The declining debt trend overtime can be attributed to continued fiscal consolidation efforts that started in 2010/11 budget as well as efficiency in spending and improved tax performance following reforms in expenditure management and tax legislations.
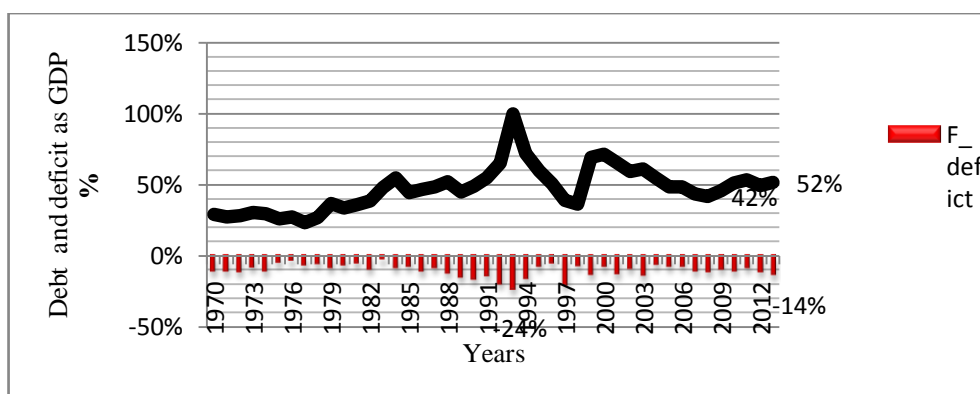

Figure 4. *Fiscal deficit and Debt GDP ratio*
Source: Economic suvey(1975 to 2014)

The government envisages in 2012 budget strategy paper that the sustained easing of debt to GDP ratio will provide a room to conduct countercyclical fiscal policy should the economic situation worsen in the future. However, the debt burden is on increasing trend as the cost of servicing debt increased from 2008 amounting to KSh250 billion in 2013. The increase in debt around 2008 reveals that the fiscal stimulus package was funded by debt. It also suggests that there may

be limited fiscal space to run counter cyclical policy in Kenya however this is subject to empirical confirmation in this study. It also implies that it is most likely that the existing fiscal stance is purely non countercyclical putting macroeconomic stability at stake especially in case of unexpected shocks. In the absence of any deficit bias, we would observe budgets to be alternatively in deficit and in surplus depending on economic and/or political conditions. These fluctuations would be mainly driven by business cycles when fiscal policy is run counter cyclically, as should be, (Wyploz, 2012).

2.4. Fiscal stance and business cycles

One of the key roles of fiscal policy both in the long run and the short run, as earlier cited, is to ensure macroeconomic stability. Majorly, it should stabilize overall economic performance by ensuring that output gap both in the long run and the short run is minimized (Halland & Bleaney, 2009). We assess how fiscal policy responds to economic swings, by examine the relationship between primary fiscal balance (as the measure of fiscal stance) and output gap (as measure of business cycles). Primary balance is the difference between tax revenue and government expenditure excluding debt servicing cost. Output gap is the deviation of the actual output from potential in a given year. It is computed using the Hodrick-Prescott (HP) filter Method.

The HP filter is a two-sided linear filter that computes the smoothed series y_t^* of y_t by minimizing the variance of y_t around y_t^* subject to a penalty that constrains the second difference of y_t^* and is formally stated as:

$$Min \sum_{t=0}^{T} \left(y_t - y_t^* \right)^2 + \lambda \sum_{t=2}^{t=1} \left(\left(y_{t+1} - y_t^* \right) - \left(y_t^* - y_{t-1}^* \right) \right)^2.$$ Where λ is a parameter which controls the smoothness of the series

When output gap is positive, it means the economy is operating above the potential and the aggregate demand is likely to cause macroeconomic instability. Similarly, a negative output gap suggests that the economy is operating below is potential. A counter-cyclical policy should be expansionary (primary deficit) when output gap is negative and tight when the gap is positive(primary surplus). From figure 3 below, the economy experienced noticeable down swings 1n 1972 during the financial crisis as a result of oil crises that occurred in the same period. Similar down swings tend to persist from 1998 to 1992 and 2002 to 2003 consistent with economic history in Kenya. The two variables tend to co-move, as noted clearly in 1972t0 1975,1998 t0 1993, 1996 to 2000 and 2002 to 2005 a strong indication that the government has not been pursuing fiscal policy in a manner consistent with the business cycle movements.
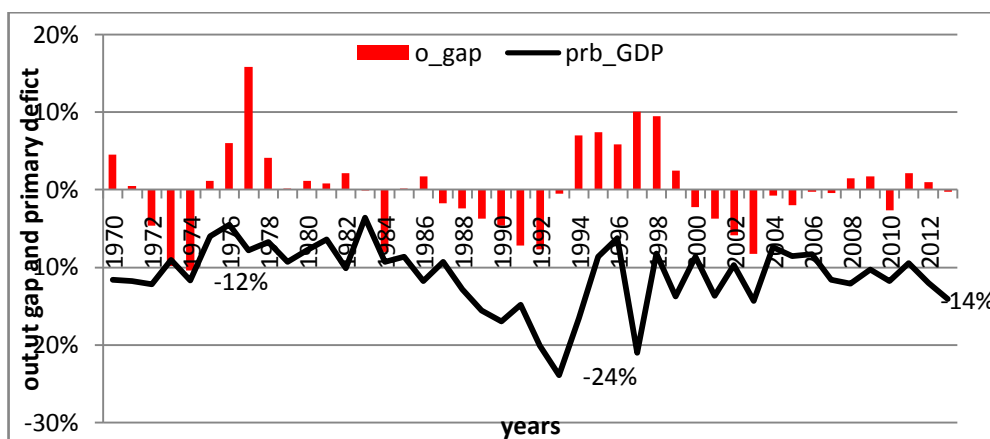
Figure 3. *Fiscal stance and business cycles in Kenya*
Source: Source: Authors' computation, data from KNBS

With the widening fiscal deficit which tends to persist even after KRA meets is revenue targets, with increasing debt burden and fiscal stance indicating to be inconsistent with business cycles, this sought to assess the soundness fiscal policy in Kenya using a fiscal reaction function.

3. Literature Review

This chapter contains both theoretical and empirical review of literature on fiscal reaction function, fiscal sustainability, effectiveness and cyclicality.

3.1. Theoretical overview

Keynesian theory postulates that with sticky prices and wages, economy does not respond immediately to demand fluctuations hence fiscal policy should be countercyclical. A countercyclical fiscal policy helps the economy to adjust more completely, and more rapidly, to such fluctuations. Fiscal policy should therefore actively smooth the business cycle by lowering taxes and increasing expenditure in bad times, thereby increasing aggregate demand, while reducing expenditure and increasing savings in good times, (Halland and Bleaney, 2009). Neoclassical theoretical perspective stipulates that fiscal policy should aim to minimize distortions. Barro's (1979) tax smoothing hypothesis shows that tax rates should be held constant over the business cycle as long as spending shocks or shocks to the tax base are temporary. This implies a positive correlation between the budget balance with output (Fatás and Mihov, 2009). A pro-cyclical fiscal policy is sub-optimal both by Keynesian and by neoclassical standards, (Ilzetzki & Vegh 2008).

3.2. Empirical review

Fiscal sustainability has received the attention of economic researchers in the recent past following the global financial meltdown in 2008 and the subsequent debt crisis in Greece 2009. According to Anca, (2011) running unsustainable fiscal policies is not only a recipe for macroeconomic instability but also do expose economies to exogenous shocks. An unsustainable fiscal policy characterized by large fiscal deficits and excessive public debt stocks has harmful consequences as typified by Greece crisis in 2009.Ensuring fiscal sustainability is crucial.

Gauging fiscal sustainability has taken various analytical angles categorized in to stationarity tests where the debt/GDP ratio is tested for unit root. The presence of unit root shows that fiscal policy is unsustainable, (Trehan 1991; Corsetti & Roubini, 1991; Caporale, 1995; Uctum, 2000). The second category is cointegration tests which test for cointegration between tax revenue and government expenditure.If the two fiscal variables are not co-integrated, fiscal policy is unsustainable. This approach is employed by (Haug 1995; Payne 1997; Stoian 2008). The third category is the fiscal reaction function where the responsiveness of fiscal primary balance to debt accumulation is tested, if positive and significant at conventional levels, an internal debt correction mechanism is said to be in existence and fiscal policy is sustainable, (Bohn, 1998;De Mello, 2005; Stoian,2006;Ostry, 2007;Mendoza et al., 2011).

The three categories are based on the inter-temporal budget constraint(IBC). However, Bohn (2007) shows that IBC imposes a very weak econometric restriction on the series of debt or revenue and expenditure. The study shows how a broader of class stochastic processes may comply with an IBC and yet violate stationarity and cointegration conditions for sustainability hence invalidating the usefulness of the first two approaches. Instead, fiscal reaction approach which represents an error-correction type policy reaction function is more promising in

understanding fiscal imbalances, (Bohn,2007). A fiscal reaction function checks whether the government behavior has been sufficiently responsive to increment in debt, (Stoian, 2006; De Mello, 2005).

Researchers can iterate the government inter-temporal budget constraint to produce different fiscal reaction functions (Nguyen, 2013). There are two possible approaches used in iteration process. In the first approach, the fiscal reaction functions are model-based as in the case of (Penalver & Thwaites 2006) while in the second approach which is commonly used, researchers use econometric approach to measure the relationship between fiscal balance and the debt /GDP ratio plus other macroeconomic variables. This approach is applied by (Bohn, 1998; de Mello 2005; Khalid et al., 2007; Burger et al., 2011).

The estimation technique also varies across studies. Bohn,(1998) uses simple ordinary least squires(OLS) model to show that US debt is sustainable. Khalid uses vector autoregressive approach (VAR) to gauge fiscal sustainability in Pakistan. The VAR model includes fiscal deficit, output gap, and inflation. The advantage of VAR model is that it does not only show variable relationship in linear models, but also provides rich dynamic relationship between variables. Within VAR models, transmission, responsiveness and effectiveness of fiscal policy shocks is easily captured. Burger et al. (2011) finds consistent results using, OLS, threshold autoregressive (TAR), VAR, general methods of moments GMM, vector error correction mechanism (VECM), and State-Space methods is South Africa.

This study employs a VAR method to estimate a fiscal reaction function for Kenya.

3.3. Fiscal cyclicality and fiscal stabilization

There is a rich literature showing evidence of fiscal procyclicality and explaining why fiscal policy in developing economies is rarely countercyclical. Gavin and Perotti, (1997) show evidence of fiscal cyclicality differences between regions, ((Kaminsky et al., 2004; Talvi & Végh 2005; Ilzetzki & Végh 2008)), show similar difference in rich and poor countries or across time for the same group of countries (Fatás & Mihov (2009); Gavin & Perotti (1997)) observe that, while fiscal policy in the OECD is countercyclical or acyclical, it is procyclical in Latin-America. Kaminsky et al. (2004), using various measures of cyclicality in a study of 104 countries for the period 1960-2003, confirm the countercyclicality or acyclicality of the OECD economies, while finding fiscal procyclicality in developing countries. Similarly, (Talvi & Végh 2005) observe that fiscal procyclicality is predominant in Latin American feature and in 36 developing countries of their sample. Thornton (2008), in a study of 37 African countries over the period 1960-2004, finds real government consumption in 32 of these countries to be extremely pro cyclical, with half of the countries having a government spending response to output fluctuations even above proportionality.

Woo (2006) using econometric analysis shows that fiscal pro cyclicality bias is largely explained by social polarization of preferences arising from inequalities. In addition, the study shows that pro cyclical fiscal policy is negatively and strongly associated with long run economic growth. Manasse (2006), shows that the severe difference in policy cyclicality between developed and developing countries is due to the higher severity of the shocks that hit developing countries.

Other hypothesis that explain fiscal cyclicality are restrictions on access to domestic credit, (Caballero & Khrisnamurthy 2004), international credit markets (Gavin & Perotti 1997; Calderón & Schmidt-Hebbel (2008), institutions or political structures (Lane 2003; Talvi & Végh 2005;Alesina et al., 2008)

According to Gavin & Perotti (1997) developing countries are less able to smooth the business cycle because limited access to international credit markets prevents them from borrowing during bad times. Similar argument is supported by

(Calderon & Schmidt-Hebbel 2008), using the ratio of foreign liabilities to GDP as their measure for financial openness, find that wider access to domestic and foreign capital markets enables countries to run countercyclical policies. Riascos & Végh (2004) confirm that limited financial depth proxied by domestic credit to the private sector is a major constraint to the implementation of countercyclical fiscal policy.

On the other hand Thornton (2008) contrary to (Alesina et al., 2008), in a sample of 37 African countries concludes that less corruption leads to more pro-cyclicality. His explanation is that, if corruption leads to lower levels of tax collection, generating lower government expenditure, then better governance may be positively correlated with fiscal pro-cyclicality if it increases the tax revenues available for fiscal expenditure. This study sought to establish whether fiscal policy is pro-cyclical, countercyclical or acyclical in Kenya.

4. Methodology

4.1. Analytical Framework

Fiscal reaction function is useful in gauging fiscal sustainability, cyclicality and effectiveness of a fiscal policy. The arithmetic's of fiscal sustainability start with government budgetary constraint, Burger et al, (2011), where the constraint is represented as,

$$D_t = D_{t-1} + \left(1 + i_t\right)D_{t-1} - pB_t \tag{1}$$

Where: D is public debt stock, i is nominal interest rate on government bonds, and pB is primary balance which can be a surplus or a deficit position. Equation 1 is also known as the law of motion for debt. Applying forward substitution, t=1,t=2,..,t=n, and generalizing, we obtain the intertemporal budget constraint and solvency condition as equation 2,

$$D_N = \left(1+i\right)^N D_0 - \sum_{j=1}^{N}\left(1+i\right)^{N-j} pB_j \tag{2}$$

Rearranging equation 2 and discounting by interest rate $i,$ results into equation 3.

$$D_0 = \sum_{j=1}^{N}\frac{1}{\left(1+i\right)^N} pB_j + \frac{1}{\left(1+i\right)^N}\cdot D_N \tag{3}$$

Equation 3 implies that initial debt stock is related to the intervening primary balance and terminal period debt. Imposing the transversality (no Ponzi game) condition, that is $\lim it_{N-\infty}\left(\frac{1}{1+i}\right)^N D_N = 0$ which prohibits the government from issuing more and more debt without repaying principle and accumulated interest of previous debt stock, we obtain equation 4.

$$D_0 = \sum_{j=1}^{N}\frac{1}{\left(1+i\right)^N} pB_j \tag{4}$$

This is known as the solvency condition. It implies that if the initial debt is positive, the government needs to run a positive surplus in future. The relationship between nominal GDP and its past and real interest rate and its past can be expressed as equation 5 and 6 respectively, that is,

$$p_t y_t = (1 + \Pi_t)(1 + g_t)(p_{t-1} y_{t-1}) \tag{5}$$

$$(1 + i_t) = (1 + \Pi_t)(1 + r_t) \tag{6}$$

Using equation 5 and 6, equation 1 can be transformed into debt to GDP ratio time evolution as equation 7 below

$$d_t = \frac{(1 - r_t)}{(1 + g_t)} d_{t-1} - pb_t \tag{7}$$

Where, d_t=D/Y ratio of public debt to GDP at time t, g: real economic growth rate, b_t =B/Y is primary balance and Y is nominal GDP. Equation 7 implies that high primary balance and high economic growth rate leads to a lower debt to GDP ratio. By rearranging equation 7 we obtain an equation of primary balance below.

$$b_t = \frac{r - g}{1 + g} \cdot d_{t-1} \tag{8}$$

In empirical estimation following Bohn (1998) a fiscal reaction function is represented as

$$b_t = \alpha + \beta d_t + \Phi z_t + \varepsilon_t \tag{9}$$

where β is approximately $\dfrac{r - g}{1 + g}$ which measures the presence of internal debt correction mechanism by the government. This is the relationship we sought to establish in regard to fiscal sustainability. Z is a vector of other variables that are targeted by fiscal policy. In this study, Z constitutes output gap-measure of fiscal cyclicality, interest rate, exchange rate and inflation rate. It also includes a political dummy, to capture electoral effect and lagged revenue to GDP ratio to capture fiscal authority's ability to generate fiscal surplus effect on fiscal position.

4.2.Model specification

The study employed a vector autoregressive (VAR) model. According to Sims (1980), macroeconomic variables are potentially endogenous hence, structural models explicitly dictating causality are mis- specified. Alternatively, A VAR model allows the variables to interact without imposing a theoretical structure on the estimates. In addition, VAR models allow for rich dynamics relationship among a vector of macroeconomic variables. Similar approach has been used by (Khalid, 2007; Burger et al., 2011).

The VAR model is specified as:

$$x_t = [Z, d\_GDP, pr\_bal] \tag{10}$$

Where X_t is a vectorof fiscal primary balance as a ratio of GDP(pr_bal), debt to GDP ratio (d_GDP), while Z is a set of economic variables that have influence on fiscal policy behavior. Particularly, vector Z includes output gap (y_gap) proxied as the trend obtained with the Hodrick-Prescott filter to capture the influence of business cycles (Bohn, 1998; De Mello, 2005); commodity prices (CPI), capture the effects of price movement on the fiscal position, real effective exchange rate (*reer*) to capture the effect of persistent depreciation on fiscal position regarding external debt services and the pass through effect on inflation. Following Asiama et al, (2014) fiscal stance in developing countries is highly influenced by national

elections which tend to be accompanied by excessive budget overruns. Therefore, Z also includes a dummy variable, p_dummy to capture possibly electoral effects. According to Asiama et al, 2014 and Abiad et al, 2005 key factor distinguishing fiscal structures between developing countries and developed economies is the relatively lower revenue-to-GDP base of the former. A lagged total revenue-to-GDP ratio (TR_GDP) was used as a proxy for the capacity of the fiscal institution to deliver a primary surplus. Following (Khalid et, al 2007) a structural VAR model is represented as

$$\beta \chi_t = \beta_0 + \sum_{j=1}^{p} Z^i \chi_{t-1} + \varepsilon_t \tag{11}$$

Where ε_t a vector of error terms is, β is a matrix of coefficients capturing the contemporaneous effects of variables on each other. β_0 is a vector of constant terms. Z_t are the matrices of coefficients measuring the lagged effects of variables on each other. ε_t is a vector of error terms that contains zero mean, constant variance and serially as well as cross uncorrelated innovations. i.e. these elements represent pure structural shocks. Through mathematical manipulation, the Standard reduced form VAR with lagged variables on the right hand side can be expressed as

$$\chi_t = A_0 + \sum_{j=1}^{p} A_i \chi_{t-1} + \ell_t$$

Where $A_0 = B^{-1} B_o$, $A_i = B^{-1} Z^i$ and $\ell_t = B^t \varepsilon_t$

However the reduced form disturbances are generally known to be correlated hence it is necessary totransform the reduced form model into a structural form model (Mutuku & Koech, 2014). This is known as VAR identification in econometrics jargon. This study employed recursive identification approach which implies a causal ordering of the variables in the model based on contemporaneous effector on the behavior of variables in the economy also known as recursive orthogonolization.

4.3. Data sources and Definition of Variables

The study employed annual time series data spanning the period 1996Q1 - 2014Q4. These were obtained from Central Bank of Kenya, International financial statistics and Kenya National Bureau of statistics.

Table 1. *Variable definition and description*

Variable	Type of Variable	Measurement	A prior expectation
Debt to GDP ratio	continuous	Ratio	-ve or +ve
0ut put gap	continuous	Ratio	-ve or +ve
Consumer price index	continuous	index	-ve
Real effective exchange rate	continuous	index	+ve
Primary balance as a ratio of GDP	continuous	Ratio	+ve
Interest rate	continuous	%age	+ve
Political dummy	Binary	I or 0 if national elections take place	-ve
Lagged total revenue to GDP ratio	continuous	ratio	+ve

Source: Author,(2014)

5. Findings

5.1.Diagnostic Tests

This section outlines some preliminary tests to gauge the fitness of the model run.

5.1.1. Test for unit roots

Macroeconomic time series variables mostly exhibit time variant moments. This can be confirmed through stationarity test. In testing for stationarity, this study employed the Augmented Dickey-Fuller (ADF) and Phillips-Perron. ADF test was employed with intercept and lag length selected based on the SIC information criterion to ensure that the residuals are white noise. The decision criterion involves comparing the computed tau values with the Mackinnon critical values for rejection of a hypothesis of a unit root.

Table 1. *Test for stationarity results*

Variable	Unit root test with trend and intercept				conclusi
	ADF		PP		
	Level	1st Difference	Level	1st Difference	
D_GDP	-2.5650***	-5.0894	-2.3738***	-6.2196	I(1)
OUTPUT GAP	-3.8074*	-4.8878	-3.3385*	-5.7474	I(1)
LN_CPI	-1.03173**	-3.7709	-0.6084**	-3.9612	I(1)
LN_NEER	-1.03171**	-3.7709	-0.6084**	-3.9612	I(1)
PR_BAL	-2.5582**	-5.9111	-4.3278	-13.0578	I(1)
LN_R	-2.6742**	-6.3865	-2.4196**	-8.9137	I(1)
TR_GDP	-3.8042*	-4.8878	-3.5162*	-5.7474	I(1)

***10%,**5% and *1% significance levels. I(1) integrated of order one

This test shows that all the variables are non- stationary in levels at 1%,5% and 10% significance level. This means that the individual time series have a stochastic trend and do not revert to average or long run values after a shock strikes and the distributions has no constant mean and variance. The fact that debt to GDP ratio is non stationary is an indication of non sustainability of debt or fiscal indiscipline, (Wyploz, 2012).However, as earlier cited, the test is weak.

5.1.2 Test for co-integration

Since variables have unit root at level, we tested for long run relationship using the Johansen & Juselius (1990) approach to establish the co-integrating vectors. Two test statistics are used to test the number of co-integrating vectors, based on the characteristic roots. For both trace and Eigen statistics, the null is at most r co-integrating vectors. The trace statistics

$$\lambda_{trace}(r) = -T\sum\nolimits_{i=r+1}^{k}\ln(1-\hat{\lambda}_i) \tag{13}$$

The alternative is at most k co integrating vectors. The maximum Eigen statistics,

$$\lambda_{\max}(r,r+1) = -T\ln(1-\hat{\lambda}_{r+1}) \tag{14}$$

The alternative is at most r+1 CI vectors. It tests rank r+1 by testing if $\hat{\lambda}_{r+1}$ is zero.

Table2.*Co-integration test results*

Trace statistic

Hypothesized		Trace	0.05	
No. of CE(s)	Eigen value	Statistic	Critical Value	Prob.**
None *	0.958212	342.6391	169.5991	0.0000
At most 1 *	0.887197	221.9833	134.6780	0.0000
At most 2 *	0.786180	139.0629	103.8473	0.0000
At most 3 *	0.595858	80.44328	76.97277	0.0265
At most 4	0.424781	46.01567	54.07904	0.2143
At most 5	0.302195	25.00148	35.19275	0.4001
At most 6	0.164440	11.32850	20.26184	0.5108
At most 7	0.111718	4.501698	9.164546	0.3425

*Trace test indicates 4 co-integrating eqn(s) at the 0.05 level. * denotes rejection of the hypothesis at the 0.05 level. **MacKinnon-Haug-Michelis (1999) p-values.*

Eigen statistic

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigen value	Statistic	Critical Value	Prob.**
None *	0.958212	120.6557	53.18784	0.0000
At most 1 *	0.887197	82.92041	47.07897	0.0000
At most 2 *	0.786180	58.61966	40.95680	0.0002
At most 3	0.595858	34.42761	34.80587	0.0554
At most 4	0.424781	21.01419	28.58808	0.3385
At most 5	0.302195	13.67298	22.29962	0.4923
At most 6	0.164440	6.826806	15.89210	0.6906
At most 7	0.111718	4.501698	9.164546	0.3425

*Max-eigen value test indicates 3 co integrating eqn(s) at the 0.05 level. * denotes rejection of the hypothesis at the 0.05 level. **MacKinnon-Haug-Michelis (1999) p-values.*

Both the Eigen and Trace statistic rejects the one co-integration hypothesis at 5% significance level for at 3 and 4 co integrating relationships respectively. This reveals that there is enough statistical evidence for existence a unique co-integrating vector for the set of variables in the VAR model. Co integration results are shown in table 3. Since the set of variables are I(1) and co-integration has been established in Table 3 below ,then it is justifies the estimation of a vector error correction model -VECM -to capture the short run dynamism as in granger representation theorem without losing the long run data properties. Similarly, a non spurious co integrating equation of the variables at level can be estimated as shown in table 4 below.

5.1.3. Optimal lag length selection for the VAR model

The optimal lag length was selected based on comparison of the following information criteria which include Akaike information criterion (AIC) Schwarz information criterion (SC), Hannan-Quinn information (HQ) criterion, Final prediction error (FPE) and Sequential modified LR test statistic. Majority of the criteria as shown in table 2 indicate that the optimal lag length should be 3.

Table 3.*Lag selection criteria*

VAR Lag Order Selection Criteria					
Lag	Log L	LR	FPE	AIC	SC	HQ
0	357.9841	NA	1.38e-18	-18.42021	-18.07546	-18.29755
1	569.1364	322.2852	6.44e-22	-26.16508	-23.06228*	-25.06112
2	649.7278	89.07470	4.31e-22	-27.03831	-21.17747	-24.95307
3	773.2210	84.49537*	8.90e-23*	-30.16953*	-21.55065	-27.10300*

* indicates lag order selected by the criterion. LR: sequential modified LR test statistic (each test at 5% level). FPE: Final prediction error. AIC: Akaike information criterion. SC: Schwarz information criterion. HQ: Hannan-Quinn information criterion

5.2 Estimation of VECM and co integrating model

This part estimates the long run and the short run model using the VAR and VECM approach**.**

The co-integrating model in table 4 above shows that long run coefficients of public debt is negative but statistically insignificant hence the government intertemprol budget constraint is violated. The results reveal that fiscal authorities' reaction to the accumulating debt is non-systematic and the current fiscal policy is unsustainable. Unsustainable fiscal policy means that the expected path for debt is much larger than the likely path of future primary surpluses. This implies that public debt is likely to accumulate in the long run if the government doesn't generate substantial primary surpluses to deal with public debt.

Political dummy representing election cycles has negative significant effect in the long run behavior of primary balance.

Table 4.*Co-integrating model*

Dependent Variable: PR_BAL				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
P_DUMMY	-0.041314	0.018265	-2.261995	0.0302
TR_GDP	0.049288	0.116502	0.423069	0.6749
Y_GAP	0.088832	0.113340	0.783765	0.4386
LNR	-0.002566	0.010624	-0.241528	0.8106
LNCPI	-0.014881	0.008689	-1.712693	0.0959
LN_NEER	-0.001186	0.008258	-0.143626	0.8866
D_GDP	-0.089707	0.061681	-1.454364	0.1550
C	-0.009043	0.031767	-0.284656	0.7776
PR_BAL(-1)	0.175866	0.148241	1.186352	0.2437
R-squared	0.453168	Akaike info criterion		-3.667579
F-statistic	3.522037	Schwarz criterion		-3.298956
Prob(F-statistic)	0.004555	Hannan-Quinn criter.		-3.531642
		Durbin-Watson stat		2.179206

Standard errors in ( ) & t-statistics in [ ] **significance at 5% *significant at 1%

This implies that fiscal position significantly deteriorates during election years probably due to expenditure overruns associated with the national elections. This implies that elections associated expenditure threaten the long term fiscal sustainability of Kenya's public finance.

In regard to revenue collection capability proxied by revenue to GDP ratio, there is a weak surplus generating capacity of the fiscal institution in the long run as the coefficient was positive and statistically insignificant. This suggests fiscal institutions have improved substantially in efficiency and ability to collect tax revenue although more reforms should be encouraged to ensure overall fiscal sustainability. The coefficient of the output gap is positive but statistically insignificant at 5% level, implying fiscal policy is a cyclical in Kenya. Acyclical fiscal policy implies that the policy lacks automatic stabilization effect and in case of destabilizing shocks, the effect is likely to be relatively distortive to macroeconomic stability. The coefficient of output gap is positive bus insignificant at 5% statistical level. This implies that fiscal policy in Kenya is not a cyclical, i.e it does not counter debt accumulation.

5.3 The Short Run Results-Vector error correction model

The error correction coefficient is -0.1260 as shown in the error correction model in table 5. This suggests that 13% of any disequilibrium is corrected in every quarter. In addition, as Asiema et al 2014 reveals, it implies that the explanatory variables Granger-cause primary balance in the long run.

Table 5. *Vector error correction model*

Error Correction term: **ECMt-1**	
	-0.126025
D(PR_BAL(-1))	-0.845929*
D(PR_BAL(-2))	-0.165028
D(P_DUMMY(-1))	-0.065271**
D(P_DUMMY(-2))	-0.023981
D(TR_GDP(-1))	-0.156002
D(TR_GDP(-2))	-0.491801**
D(Y_GAP(-1))	0.040525
D(Y_GAP(-2))	-0.130498
D(LNR(-1))	0.029399
D(LNR(-2))	0.001372
D(LNINFL(-1))	-0.026396
D(LNINFL(-2))	-0.001555
D(LN_NEER(-1))	-0.133071
D(LN_NEER(-2))	-0.189955**
D(D_GDP(-1))	-0.027053
D(D_GDP(-2))	0.105700
D(LNCPI(-1))	0.032817
D(LNCPI(-2))	0.163872
C	-0.001762
R-squared	0.695255
F-statistic	2.521585*

**significance at 5% *significant at 1%
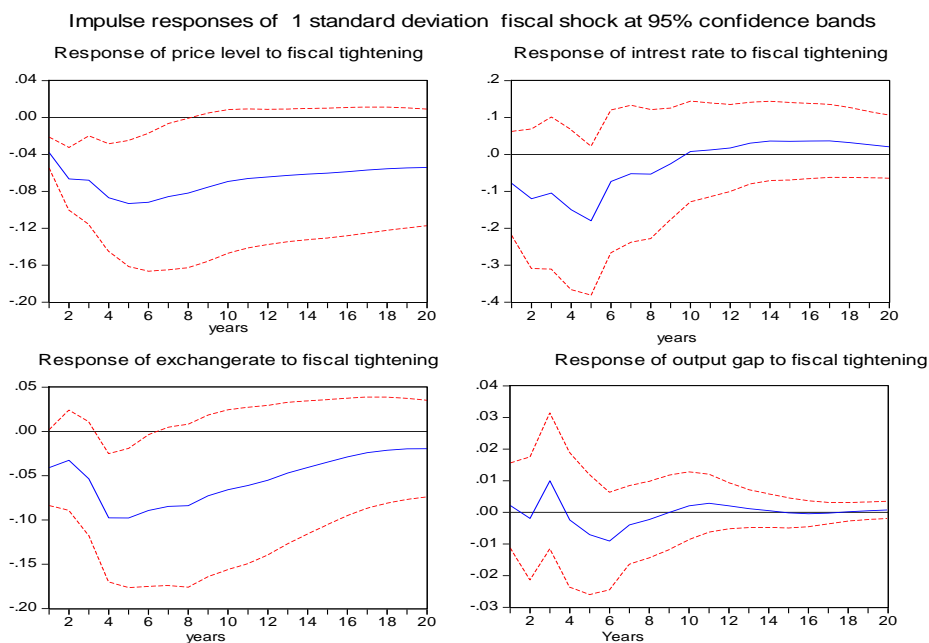
Figure 4. *Impulse response functions*

Figure four below shows the response of macroeconomic variables to fiscal tightening. One standard deviation tightening in fiscal policy significantly reduces

price level for a period of 8 years. A similar effect is realized on exchange rate but with a lag of 3 years. However, the effect decays completely after one year. In the other hand, fiscal shocks have no effect on output gap or interest rate implying that fiscal policy effect is not transmitted to these variables. It also emphasizes the acyclical nature of fiscal policy in Kenya.

6. Conclusions

This study focused on estimating a fiscal reaction function and gouging the long run sustainability of fiscal policy in Kenya. It also sought to establish the cyclical nature of the policy. It specifically sought to ascertain whether the authorities pursued appropriate policies to avert excessive debt accumulation

The empirical analysis reveals that, firstly fiscal behavior is incoherent with intertemporal budget constraint and the moderation is low. This implies that, fiscal authorities react nonsystematically to increasing debt threatening fiscal sustainability in the long run. It also suggests that if no fiscal adjustment, debt is likely to accumulate. Secondly, Election cycles expenditures threaten kenya's long run fiscal sustainability. Thirdly, fiscal policy is acyclical meaning that stabilization objective is not considered while conducting the policy. Similar results were obtained by Khalid,(2007) and Halland & Bleaney,(2009). Thirdly, fiscal shocks have no effect on output gap meaning that the policy is not countercyclical to business cycles

To revert fiscal policy to a sustainable path, address cyclicality and depoliticize macroeconomic policy the following should be done:

Formulate a fiscal rule: Kenya needs an explicit fiscal rule which specifies (a) long term debt (debt/GDP) ratio (b) primary fiscal balance (zero, surplus or deficit) depending on macroeconomic environment, (c) fiscal convergence rate (average rate at which the debt ratio and fiscal balance targets are to be approached incase of deviation (3) degree of fiscal counter-cyclicality (amount of stimulus needed in case of recession or a boom). The motivation for fiscal rules is that they correct government's short sightedness resulting from electoral prospects. They also contain the size of the government and improve fiscal performance. However, rules may constraint discretionary action when needed hence may accentuate fiscal pro-cyclicality. Therefore, rule should be accompanied by escape clause to give leeway for discretionary action only when necessary. Further reason for explicit and flexible fiscal rules is that they promote macroeconomic stability through countercyclical policies, enhance credibility of government's fiscal policy and aids in deficit elimination. They definitely contribute to long term fiscal sustainability

Independent fiscal committee/Authority: To depoliticize fiscal policy and implement clear fiscal targets, there is a need for an independent fiscal policy committee (IFC) to mimic the approach adopted in the case of monetary policy. IFC can shield the budgetary process from pressure connected with the electoral cycles. IFC should have mandate to set debt target and primary surplus required to stabilize debt over a given horizon consistent with business cycle. In addition, IFC should have the authority to decide on budget balance on basis of explicit GDP forecast so as to break out the vicious cycles of fiscal pro-cyclicality /a-cyclicality by setting counter-cyclical budget targets and building surpluses during booms to be tapped during recessions.

Estimating business cycles: Counter cyclicality requires estimation of business cycles. IFC should comprise of technical experts to estimate business cycles and determine the appropriate fiscal balance consistent with the fiscal rule. It should also have the ability to monitor and ensure that the rule is followed. The business

cycles estimates should be published regularly (quarterly e,g South Africa) to guide macroeconomics policy.

Fiscal responsibility laws: A more comprehensive approach would to be to provide well designed fiscal responsibility laws (FRLs) covering all levels of government (including counties) and with strict transparency requirements. Effective FRLs should not be easy to change and suspend, however should be accompanied by quantitative targets.

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