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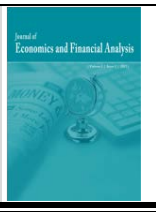

Impact of Fiscal Consolidation on Government Debt in South Africa: Evidence to Structural and Cyclical Effect

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Abstract

The purpose of this paper is to examine the fiscal consolidation impact on government debt in South Africa (SA) looking at both structural and cyclical effects. The paper employs the Structural Vector Autoregression (SVAR) using time-series data from 1990 to 2020 in South Africa. The key contribution of the paper is it with a focus on the effect of fiscal consolidation as well as investigation of the structural and cyclical component effect of government expenditure cut as well as a tax increase in a developing economy like South Africa. We found that government debt falls as of the result of fiscal consolidation achieved through government expenditure cut. The fiscal consolidation of tax increases is better than based on government expenditure cut. The cyclical component of government expenditure increases domestic government debt. This is also found in the structural government expenditure results in an increase in domestic government debt.

Keywords: *Fiscal Consolidation; Structural and Cyclical Fiscal Consolidation; Government Debt.*

JEL Classification: *H63, H76, H81.*

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1. Introduction

The debate on the use of fiscal consolidation in the effort to reduce government debt has been at the center of macroeconomics. However, no consensus has been reached, given the difference in theoretical explanations, and mixed empirical results further fuel the disagreement on what is the impact of fiscal consolidation. Case in point, Giavazzi and Pagano (1995), McDermott and Wescott (1996), Heylen and Everaert (2000), Zaghini (2001), IMF (2010), Afonso (2010), and Alesina and Ardagna (2010), among others that have found that fiscal consolidation can reduce government debt and stimulate economic growth[1]. On the other hand, scholars like Baldacci et al. (2013), Guajardo et al. (2014) and Yang et al. (2015) have shown evidence that fiscal consolidation results in an improvement in government debt. There has been confirmation by Attinasi and Metelli (2017) that fiscal consolidation does not affect government debt, in what they characterize as the phenomenon of self-defeating fiscal consolidation policy. Nevertheless, what gave revival on fiscal consolidation was the pioneering work of Giavazzi and Pagano (1995) and Duperrut (1998) in the case of South Africa (SA). The authors outline that the thinking around fiscal consolidation is that, if fiscal authorities cut government expenditure and increase tax. The present forward-looking economic agents will anticipation a reduction in tax and interest rate. This will increase permanent income as well crowed in investment, as such there will be an increase in economic activities, leading higher economic growth, higher tax collection that can be used to reduce government debt.

At a policy level, SA fiscal authorities have made policy interventions to curb government debt. These interventions include the 1996 Growth Employment and Redistribution (GEAR) and the Public Finance Management Act of 1999 (PFMA)[2], both seek to reduce the deficit to less than 3% of GDP and advocate for expenditure control respectively. Figure 1, graph (A), shows that government deficit was very narrow in the 1990s; however, in recent time's deficit has been very big. In as far as government debt, SA adopted the Southern African Development Community (SADC) 2006 Protocol on Finance and Investment (PFI) which stipulate that all member countries should have a rate of government debt share to GDP that is equal to or below 60%. In Budget Review 2012, the government introduced the expenditure ceiling to constrain high government

[1] Fiscal consolidation is seen as the economic phenomenon the authors also call the 'Non-Keynesian effects' or 'expansionary fiscal contraction'.

[2] The Public Finance Management Act, No. 1 of 1999 and Regulations regulate the management of finances in national and provincial government. It sets out the procedures for efficient and effective management of all revenue, expenditure, assets and liabilities.

debt, as such government committed to limit real expenditure growth to an average 2.9% per year. In the year 2013, the government introduced cost-containment measures, cut expenditure of non-core goods and services which amounted to R1.5 billion between 2013 and 2014. Moreover, from 2013 there were R10.4 billion government expenditure cuts which were reported to be implemented over three years in response to tight fiscal consolidation.

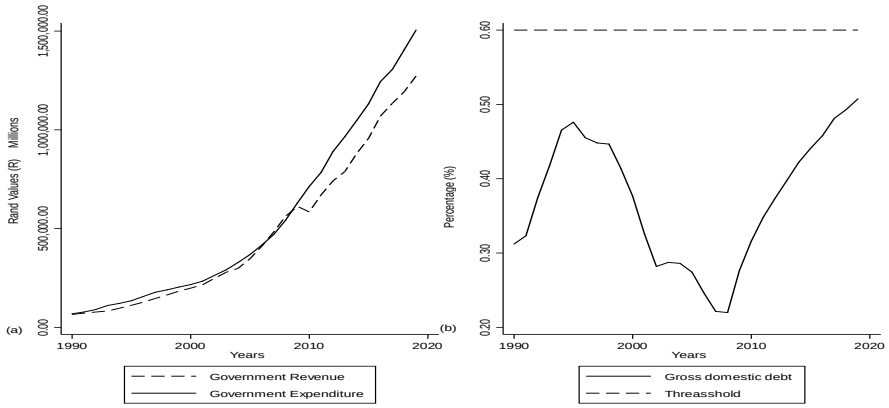

Figure 1. Fiscal Economic Variables in South Africa

Source: South African Reserve Bank Releases (2020)[3]

In 2014 the Financial and Fiscal Commission (FFC)[4] recommended that the government needs to adopt more fiscal consolidation stances in the effort to restore the fiscal position and reduce government debt. The government reflected its commitment to the FFC recommendation in the Medium Term Budget Policy Statement (MTBPS) of 2014 as *"Fiscal consolidation can no longer be postponed. Ensuring continued progress towards a better life obliges the government to safeguard the public finances by acting within fiscal limits that can be sustained over the long term. To do otherwise would risk exposing the country to a debt trap, with damaging consequences for development for many years to come"*. In 2015 the government reduce the expenditure ceiling by R25 billion over two years. While in 2017 the provincial conditional grant was reduced by R4

[3] Online statistical query (historical macroeconomic time-series information). https://www.resbank.co.za/Research/Statistics/Pages/OnlineDownloadFacility.aspx

[4] The mandate of the Financial and Fiscal Commission is to make recommendations to Parliament, provincial legislatures, organised local government and other organs of state on financial and fiscal matters as envisaged in the Constitution and other national legislation.

billion and there was an R1.6 billion reduction to the provincial equitable share all in support of fiscal consolidation. In the MTBPS of 2018, the Cabinet subcommittee cut the amount of R85 billion. The Fiscal Responsibility Bill (FRB) was tabled for discussion in the parliament of SA in 2018. The bill seeks to introduce government expenditure cut, limit new government borrowing, maintain expenditure ceiling and eliminate wasteful expenditure. In the year 2019 International Monterey Fund (IMF), Standard and Poor's, Moody's as well as Fitch stressed that SA needs to implement a credible fiscal strategy and fiscal consolidation to contain the rise in government debt. This recommendation came with concern that the country is faced with high government debt and there is policy uncertainty (IMF, 2020). Moreover, despite the above intervention by fiscal authority's government debt share to GDP in SA has been increasing over time reached a rate of 51% in 2019 the heisted in the last 25 years.

Due to a lack of agreement on how fiscal consolidation affects government debt, there is no consensus. Country base investigation of fiscal consolidation is critical to make conclusions particular in SA, where there is willingness towards the adoption of fiscal consolidation; however, there is limited research on such a topic. Given that fiscal consolidation is the response by the government, the paper investigates the cyclical component as well as the structural component of fiscal consolidation on government debt. As such the key contribution of the paper is it with focuses on the effect of fiscal consolidation, with the investigation of the structural and cyclical component effect of government expenditure cut as well as a tax increase. The paper employs the SVAR and two stages least square (2SLS) model. The SVAR provided evidence that government expenditure cut triggers a downward trajectory in domestic government debt after 4 years till it passes through the base in year 6 and operates below base thereafter. The government debt falls from the rage of 5% to 0%, as of the result of fiscal consolidation achieved through government expenditure cut. The range of fiscal consolidation of government revenue or tax increase is better than that of fiscal consolidation based on government expenditure cut. The government debt falls from the rage of 10% to 0%, as of the result of fiscal consolidation achieved through government revenue or tax increase. As such, it recommended that the SA fiscal authorities need to the budge 5% of the total government expenditure to be directed in fiscal consolidation. The 2SLS model reflected that the cyclical component of government expenditure increases domestic government debt. The structural government expenditure results in a 1.73% increase in domestic government debt. A 1% increase in the cyclical and structural component of government revenue results in 0.01% and 0.72% respectively. This result reflects there is a need to increase the management of government expenditure that is

channeled to the fiscal consolidation. This can be achieved by increasing the expenditure ceiling, cost-containment measures, and credible fiscal consolidation strategies.

The rest of the paper has the following. Firstly, section 2 which outlines the empirical and theoretical literature review about the impact of fiscal consolidation government debt. Secondly, section 3 there is a discussion of methodology, including the stylized data and model specification. Thirdly, section 4 is the discussion of the descriptive statistics and empirical results. Fourthly, section 5 will be the summary and conclusion with some policy implications as well as recommendations.

2. Literature Review

As previously stated, there has been no consensus has been reached on the impact of fiscal consolidation in the imperial analyses. However, some of the broad key things that scholars have investigated include, composition, structural as well as cyclical of fiscal consolidation, the definition of fiscal consolidation episodes, and the impact of fiscal consolidation.

2.1. Composition, Structural as well as Cyclical of Fiscal Consolidation

In the querist to investigate the impact of fiscal consolidation on government debt. The composition of fiscal consolidation has been found to the critical by most scholars. Case in point, Alesina and Perotti (1995) used 20 OECD countries from 1960 to 1992 to investigate the impact of fiscal consolidation. They found evidence positive impact on government expenditure cuts than a tax increase. However, while cut in welfare payments, wages cut lead to success, and size is not significant. The authors concluded that but the composition of fiscal consolidation is fundamental. Duperrut (1998) noted that in SA fiscal consolidation is mostly felt on the government expenditure side than the tax side. As such the author recommended for temporary tax increases and permanent spending cuts. Alesina and Ardagna (1998), reflected with 51 fiscal consolidation episodes 19 of success and 23 of expansionary fiscal policy. They found a contrary result to that of Alesina and Perotti (1995) as they noted that economic growth is more likely to increase when government expenditure cuts are implemented by tax increase. Schoeman and Swanepoel (2003) investigated the countercyclical fiscal policy in SA. They found that fiscal policy can stabilize the economy through cyclical stabilizers. In the boom period, growth, consumption, employment, and

government revenue will rise due to higher direct and indirect taxes as well as lower expenditures such as unemployment insurance benefit payments. However, the authors did not factor in fiscal consolidation. Swanepoel (2004) found that both cyclical and discretionary fiscal policies are effective in stabilizing the economy. Note the importance of monetary and fiscal policy. On the other hand, there are limitations to the assessment of cyclical and discretionary fiscal policy due to the lack of common measures that can be attributed to the adjustment of the budget balance. Giudice et al. (2007) found 49 fiscal consolidation episodes; their probit model reflected that at the component level expenditure cuts are more likely to increase economic growth than a tax increase. Thornton (2007) investigated SA fiscal balances cyclicality component from the government revenue and expenditure. The author found that no evidence of no pro-cyclical and cyclical component in the fiscal policy. Therefore, the countercyclical government spending policy is a need in SA. Ajam and Janine (2007) undertook a qualitative analysis of fiscal renaissance in SA. It was found that PFM and multi-year budgeting are credible fiscal reforms. The authors also pointed out the importance of fiscal and monetary policy mix in the effort to stabilize the macroeconomy, reduced uncertainty as well as government debt. Du Plessis and Boshoff (2007) investigated fiscal rule and counter-cyclical fiscal policy in SA. They found a positive correlation in the fiscal stance and the output gap in the mid-1990s which reflect fiscal consolidation was somewhat pro-cyclical. However, from 2004 to 2006 there was a negative correlation which reflected fiscal stance that is fiscal consolidation and having counter-cyclically. Coenen et al. (2008), government expenditure, and tax-based fiscal consolidation result to a 1% high economic growth compared with the initial steady state and improve budgetary position. IMF (2010) sound that 1% increase in fiscal consolidation result to 0.5% fall in real GDP after two years the fiscal consolidation has taken effect. At a component level fiscal consolidation through tax increase was found to detrimental on economic growth. Aydin (2010) investigated the disaggregated approach to in the effort to assess cyclical component of the budget balance in SA. It was found that cyclicality of tax revenue is given by variations in tax bases. It was noted that movement in the credit for private sector have an impact in revenue.

2.2. Composition, Structural as well as Cyclical of Fiscal Consolidation

There has been extensive analysis of the impact of fiscal consolidation, among others includes the early work of Giavazzi and Pagano (1995), who found evidence of the non-Keynesian effects of fiscal policy changes in Swedish. They

also noted that the effect of expectation embedded in the principles of the Ricardian model out weight the negative on economic growth. Duperrut (1998), one of the key early scholars to investigate fiscal consolidation in SA from 1973 to 1997. The author followed Alesina and Perotti (1995) definition of fiscal consolidation. There were 9 fiscal consolidation episodes and fiscal consolidation was found to result in a 1.87%, 2.96%, and 1.81% increase in economic growth before, during, and after implementation respectively. In a probity model evolution by Zaghini (2001), 13 cases of fiscal consolidation successful episodes where found. Moreover, there was evidence that fiscal consolidation based on government expenditure cut is more successful. In a fixed effect model Gupta et al. (2005), found a positive effect on fiscal consolidation on GDP per capita, external debt, and budget balance in 30 low-income countries from 1990 to 2000. Baldacci et al. (2006) indicated that there is a very fractional improvement in the fiscal position of a country which is brought about by fiscal consolidation. In other words, they document that fiscal consolidation leads to a government debt reduction of 0.25%. Yartey et al. (2012) used a panel data set of 155 developing economies and found that there is a 15% reduction of government debt share to GDP over five years since the adoption of fiscal consolidation in these countries.

On the other hand, there is evidence of the negative impact of fiscal consolidation. The international monetary fund (IMF) has advocated for fiscal consolidation but noted that the policy needs to be implemented effectively IMF (2010), as it can result in a reduction of economic growth by 0.5% after two years. However, Cherif and Hasanov (2012) noted that the horizon of the start of detrimental effect is evident after 5 years as the government debt share to GDP initial fall but thereafter reflect an upward trajectory of about 0.3 percent of GDP in year 5. Using the CAPB as a proxy discretionary measure of fiscal consolidation Baldacci et al. (2013) found that increase in fiscal consolidation results in a 0.27% fall in economic growth leading and increase government debt. Contrary to Cherif and Hasanov (2012) and Baldacci et al. (2013), Cottarelli and Jaramillo (2013) found the lowest detrimental effect that is triggered by fiscal consolidation. They found that fiscal adjustment results in a 0.012% increase in government debt share to GDP.

Mixed results have been evident in the debate of fiscal consolation impact case in point Afonso (2010), noted that that the net effect of the increase in government expenditure cut and tax increase was found to be zero. Kumhof et al. (2010) found that there a positive and negative effect that fiscal consolidation has on the current account which only leads to stable economic growth. Kleis and Moessinger (2016) looked at 5 OECD countries and found that there were 3 cases of positive effects on economic growth in the United Kingdom as well as Portugal

and in Spain, there was no fiscal consolidation. While in 2 cases of negative impact on economic growth was reflected in Austria and Belgium. Attinasi and Metelli (2017) that fiscal consolidation does not affect government debt, in what they characterize as the phenomenon of self-defeating fiscal consolidation policy.

2.3. Theoretically Review of Fiscal Consolidation

Theoretically, the Classical school of thought advocates that fiscal consolidation based on tax increase results in less production, as tax increase the cost of doing business. On the other hand, when fiscal consolidation is based on government expenditure cut, this will crowd in investments. As such there is less room for government intervention in the economy (Mankiw, 2019). Given the positive and negative impact that may come with fiscal consolidation, the net effect depends on the size of fiscal consolidation (Alesina and Ardagna, 2013). The traditional Keynesian with sticky nominal wages and prices advocates that there are detrimental effects on economic growth which are induced by fiscal consolidation as it limits the government to spend on economic activities that can boost economic growth. The traditional Keynesian proposes for the use of the opposite instrument of fiscal consolidation (Mankiw, 2019). The Ricardian Equivalence theorem counter auger the proposal of the standard Keynesian school, as it argues that economic agents are forward-looking, meaning; an increase in government expenditure financed by debt triggers an expectation of higher taxes in the future. As a result, economic agents in the present time will spend less and save more in anticipation of future tax increases that they will need to pay to settle the debt. In such a situation, increasing government expenditure through debt financing will not trigger economic growth, as demand will remain unchanged (Mankiw, 2019). The new-Keynesian point out that fiscal consolidation has a positive effect on economic growth. The new-Keynesian advocated that if the Ricardian Equivalence concept of forward-looking is accepted. Therefore, government expenditure cuts will lead to an agent's expectation of the reduction of tax in the future. This will increase the agent's permanent income as a result of tax reduction; therefore, agents will spend, and economic growth will increase. As such the economy may have a greater return to reduce government debt (Alesina and Ardagna, 2013).

3. Methodology

The paper has used the quantitative analysis adopted because outcomes can be validated empirically. The secondary data is used sourced from IMF, South Africa Reserve Bank (SARB), and National Treasury. The time-series data is utilized for 1990 to 2020. The paper adopts the structural VAR (SVAR) model which is a further development from the Sims (1980) VAR. The SVAR is effective as it can distinguish between the investigation of cyclical and discretionary shocks. The paper follows Blanchard and Perotti (2002) in the identification of fiscal policy shocks and further incorporates the theoretical framework. The SVAR is adopted to reflect the dynamic effect of fiscal consolidation. On the other hand, in the effort to investigate the cyclical and structural effect of government expenditure and revenue. The paper uses the stylized data of the Hodrick-Prescott (HP) and Christiano-Fitzgerald (CF) filter. The HP is used in the effort to be in line with most of the literature. While the CF is adopted for the sensitivity and a key check against the HP. The stylized data of the cyclical and structural effect of government expenditure and revenue is factored in the two stages least square (2SLS) model among others is adopted in this paper.

3.1. SVAR Model Specification

This paper adopts the theoretical framework of government debt accumulation reflected in equation (1).

$$DD_{t+1} = DD_t + \underbrace{PD_t + iDD_t}_{total\ deficty} \tag{1}$$

$$DD_{t+1} = DD_t + \underbrace{PD_t + iDD_t}_{total\ deficty} + GDP_t + CPI_t + GE_t + GR_t \tag{2}$$

$$DD_t = \underbrace{PD_t + iDD_t}_{total\ deficty} - DD_{t+1} \ \ldots\ldots if\ \forall\ DD_{t+1} = 0 \tag{3}$$

$$DD_t = \underbrace{PD_t + iDD_t}_{total\ deficty} + GDP_t + CPI_t + GE_t + GR_t \tag{4}$$

Where in equation (1) DD_{t+1} is domestic government debt accumulation DD_t is domestic government debt PD_t is denote primary deficit iDD_t is the accumulated interest rate on domestic government debt and subscript t over time. The theoretical framework from equation (1) is extended with the inclusion of other economic variables of interest in the effort to investigate the impact of fiscal

consolidation on government debt in equation (2). Where in equation (2) GDP_t is a gross domestic product CIP_t is a consumer price index GE_t is government expenditure GR_t is government revenue. Given that our variable of interest DD_t is domestic government debt in equation (1), therefore it can be rearranged to equation (3), and we equate $DD_{t+1} = 0$. As such in this paper, the theoretical framework with extended variables is given by equation (4). Equation (4), is incorporated in the SVAR model framework represented in equation (5).

$$AX_t = (L)X_{t-1} + BV_t \tag{5}$$

Where subscript A reflect contemporaneous relationships between the endogenous variables are given by $n * n$ matrix $X_t = [\, DD_t \; PD_t \; iDD_t \; GDP_t \; CPI_t \; GE_t \; GR_t]$ reflect matrix $n * 1$ vector of endogenous variable. The error terms reflect the structural shocks in the system is denoted by, BV_t, with uncorrelated or orthogonal structural disturbances with a zero mean in a matrix $n * 1$. The SVAR expressed in equations (5) cannot be estimated directly because of the theoretical contrast of feedback[5]. However, to remedy this the reduced form VAR needs to be estimated by multiplying the SVAR model in equation (5) with A^{-1} an inverse in equation (6a to 6b).

$$A^{-1}AX_t = A^{-1}(L)X_{t-1} + A^{-1}BV_t \tag{6a}$$

$$X_t = A(L)X_{t-1} + U_t \tag{6b}$$

$$AU_t = BV_t \tag{7}$$

Where the result of the multiplication of parameters with the inverse gives $A^{-1}AX_t = X_t$, $A^{-1}(L)X_{t-1} = A(L)X_{t-1}$ and $A^{-1}BV_t = U_t$ express a reduced VAR in equation (6b). Where U_t is the VAR error or shocks which are independent and identically distributed with variance-covariance matrix $\sum_U E(U_t, U_t')$. The paper follows the AB-model by Amisano and Giannini (1997) that explained reduced-form and structural shocks shown in equation (7). Equation (7) reflects matrices $n * n$ in A and B which is explained by instantaneous relation between the variables and shocks. The $U_t\big[\, u_t^{DD} \; u_t^{iDD} \; u_t^{GDP} \; u_t^{CPI} \; u_t^{GE} \; u_t^{GR}\big]$ shows VAR residual. In the effort to find cyclical and discretionary fiscal policy we follow Perotti (2005), that augment errors terms u_t^{GE} and u_t^{GR} have a linear

[5] SIMS, C.A. (1986). Are forecasting models usable for policy analysis? Quarterly Review, 2-16., where he advocated that the SVAR is identification of the interpretation of the historically observed variation in data in a way that allows the variation to be used to predict the consequence of an action on yet undertaken.

combination of two types of shocks. The first shock has a cyclical movement of government expenditure and revenue which is triggered by iDD_t , GDP_t and CPI_t . Therefore, discretionary fiscal policy shocks are identified by equation (8a and 8b).

$$u_t^{GE} = a_t^{GE} u_t^{iDD} + a_t^{GE} u_t^{GDP} + a_t^{GE} u_t^{CPI} + \beta_{GR}^{GE} v_t^{GR} + v_t^{GE} \quad (8a)$$

$$u_t^{GR} = a_t^{GR} u_t^{iDD} + a_t^{GR} u_t^{GDP} + a_t^{GR} u_t^{CPI} + \beta_{GE}^{GR} v_t^{GE} + v_t^{GR} \quad (8b)$$

$$u_t^{GE^{CA}} = u_t^{GE} - a_t^{GE} u_t^{iDD} - a_t^{GE} u_t^{GDP} - a_t^{GE} u_t^{CPI} = \beta_{GR}^{GE} v_t^{GR} + v_t^{GE} \quad (9a)$$

$$u_t^{GR^{CA}} = u_t^{GR} - a_t^{GR} u_t^{iDD} - a_t^{GR} u_t^{GDP} - a_t^{GR} u_t^{CPI} = \beta_{GE}^{GR} v_t^{GE} + v_t^{GR} \quad (9b)$$

The subscript v_t^{GE} and v_t^{GR}reflect structural shocks that can be attributed to discretionary fiscal policy by government expenditure and revenue side. However, a_t^{GE} and a_t^{Gr} in equation (8a and 8b) reflect the cyclical aspect of the fiscal variables and need to be factored out in equation (9a and 9b). It is important to note that if $\beta_{GR}^{GE} = 0$ this reflects that government expenditure reaction comes first. However, ordering the act of fiscal authorities does no have a significant effect on the result. It is possible to estimate β_{GR}^{GE} by OLS from the following equation (8a and 9b).

$$u_t^{GE^{CA}} = v_t^{GE} \quad (10a)$$

$$u_t^{GR^{CA}} = \beta_{GE}^{GR} v_t^{GE} + v_t^{GR} \quad (10b)$$

The remaining coefficients of the equation (8a and 8b) can be estimated as repressed in equation (11a to 11c).

$$u_t^{iDD} = a_{u_t^{GE}}^{iDD} u_t^{GE} + v_t^{iDD} \quad (11a)$$

$$u_t^{GDP} = a_{u_t^{GE}}^{iDD} u_t^{GE} + a_{u_t^{GE}}^{GDP} u_t^{GE} + v_t^{GDP} \quad (11b)$$

$$u_t^{CPI} = a_{u_t^{GE}}^{iDD} u_t^{GE} + a_{u_t^{GE}}^{GDP} u_t^{GE} + a_{u_t^{GE}}^{CPI} u_t^{GE} + v_t^{CPI} \quad (11c)$$

The process in equation (11a to 11c) is done recursively using instrumental variables regressions. In the effort the find the AB model with the use of restriction there can be represented in the matrix (12).

$$\begin{bmatrix} 1 & 0 & 0 & 0 & -a_{GE}^{DD} & -a_{GR}^{DD} \\ -a_{DDE}^{GDP} & 1 & 0 & 0 & -a_{GE}^{GDP} & -a_{GR}^{GDP} \\ -a_{DD}^{CPI} & -a_{GDP}^{CPI} & 1 & 0 & -a_{GE}^{CPI} & -a_{GR}^{CPI} \\ -a_{DD}^{iDD} & -a_{GDP}^{iDD} & -a_{CPI}^{iDD} & 1 & -a_{GE}^{iDD} & -a_{GR}^{iDD} \\ -a_{DD}^{GE} & -a_{GDP}^{GE} & -a_{CPI}^{CE} & -a_{iDD}^{CE} & 1 & 0 \\ -a_{DD}^{GR} & -a_{GDP}^{GR} & -a_{CPI}^{GR} & -a_{iDD}^{CR} & 0 & 1 \end{bmatrix} \begin{bmatrix} u_t^{DD} \\ u_t^{GDP} \\ u_t^{CPI} \\ u_t^{iDD} \\ u_t^{GE} \\ u_t^{GR} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} v_t^{DD} \\ v_t^{GDP} \\ v_t^{CPI} \\ v_t^{iDD} \\ v_t^{GE} \\ v_t^{GR} \end{bmatrix} \quad (12)$$

3.2. Time Series Filters and two stages least square (2SLS) model Specification

The paper employs two filters in the effort to isolate the time series data of the fiscal variable from cyclical movement and structural in the framework given by equation (13).

$$y_t = \tau_t - c_t \quad (13)$$

Where y_t is the time series of interest series in this paper $y_t = [\, PD_t \; GE_t \; GR_t]$ primary deficit, government expenditure, and government revenue. The c_t is the stationary automatic or cyclical component driven by stochastic cycles τ_t is structural or trend component. These filters are employed to find and eliminate trend and seasonal elements from time-series data as well as the approximation of the automatic or business-cycle element in the data (Hodrick and Prescott, 1997). The time series is explained by equation (14).

$$y_t^* = \sum_{j=0}^{\infty} \alpha_j y_{t-j} = \alpha(L) y_t, f_{y^*}(\omega) = |\, \alpha\left(e^{i\omega}\right)|^2 f_y(\omega) \quad (14)$$

Where α_j are the filter of an infinitely long time series y_t is the smoothed without any unwanted stochastic frequence. Under filtering, the smoothed series is defined by the spectral density $f_{y^*}(\omega) = 0$ in which ω denotes the frequency of the independent stochastic cyclic that contribute to the variance and autocovariance of y_t. The gain of the filter $\alpha\left(e^{i\omega}\right)$ mines what is filtered out of the series. The filter adopted in this paper is HP filter is reflected in equation (15).

$$y_{t,HP}^* = \lim_{\tau_t} \left[\sum_{t=1}^{T} (y_t - \tau_t)^2 + \lambda \sum_{t=2}^{T-1} \{(\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1})\}^2 \right] \quad (15)$$

Minimize the sum of squared of deviation of the series $y_{t,HP}^*$ from the trend subject to the smoothing parameter λ typical 1600 for the quarterly data. In

this paper as it uses the annual data it 400[6]. HP filter has the limitation of being bias in its ending point (Hodrick and Banking, 1997). The is solves this in this paper by extending data using the forecasted values in each economy. To note the consistency in the estimation the paper adopted the Christiano and Fitzgerald (2003) filter reflected in equation (16).

$$y_{t,CF}^{*} = \sum_{j=1}^{T-t-1} b_j y_t + j + \tilde{b}_{T-t} y_T + \sum_{j=1}^{t-2} b_j y_{t-j} + j + \tilde{b}_{t-t} y_1 \qquad (16)$$

Equation (16) reflects that there in minimization of the mean square error between the filtered series and the series filtered by the ideal bad-pass filter. The cyclical component is given by $y_{t,CF}^{*}$,and b_0, b_1,..., b_j, reflecting the weight from the ideal band-pass filter (Christiano and Fitzgerald, 2003) as reflected in equation (17).

$$\tilde{b}_{T-t} = -\frac{1}{2} b_0 - \sum_{j=1}^{T-t-1} b_j \ , \ \tilde{b}_{t-t} = -\frac{1}{2} b_0 - \sum_{j=1}^{t-2} b_j \qquad (17)$$

In the effort to find the impact of the cyclical and the structural effect on government expenditure and revenue. The paper used the data generate by equation (15 and 17) in the 2SLS model. The model in equation (18) is used for the estimation of the cyclical and the structural. All variables in equation (19) are, as discussed in the above section.

$$\Delta.logDD_t = \beta_0 + \beta_1 \Delta.logGDP_t + \beta_2 \Delta.logCPI_t + \beta_3 \Delta.log\_iDD_t + \sum_{t=1}^{2} \beta_4 \Delta.logGE_t^{*} \qquad (19)$$

$$+ \sum_{t=1}^{2} \beta_5 \Delta.logGR_t^{*} + \left(\left(\Delta.logZ^{j}{}_t + \Delta.logZ^{j}{}_t \sum_{t=1}^{t} (logZ\_intruments_t) \right) + Ce_t \right.$$

Where $\sum_{t=1}^{2} \beta_4 \Delta.logGE_t^{*} = GE\_CC_t^{*} + GE\_S_t^{*}$ and $GE\_CC_t^{*}$ is cyclical government expenditure as well as $GE\_S_t^{*}$ is structural government expenditure. On the other hand, $GR\_CC_t^{*}$ is cyclical government revenue as well as $GR\_S_t^{*}$ is structural government revenue. The subscript Δ demote, lag instrument denoted by $\sum_{t=1}^{t} (logZ\_intruments_{t-n})$ and difference as strong remedy of endogeniety than differencing only. The Durbin–Wu–Hausman test to test endogeneity in the variables (Wooldridge, 2010, Baltagi, 2008). The instruments will be found by

[6] The smooth parameter λ=1600/4=400

using the lag variables provided that they are positively correlated with, $Z^j{}_t$ and $logDD_t - logDD_{t-1}$, but negatively correlated with, e_t (Mankiw, 2012). The 2SLS will use instrument variables to remedy endogeneity. The overall validity of instrument variables will be tested with the Sargan test (Mankiw, 2012).

4. Methodology

Figure (2) shows evidence of fiscal consolidation through government expenditure cut, with the interaction of 4 variables namely, consumer price index, domestic government debt, gross domestic product, and lending rate of domestic government debt.

In figure (2) graph (A), reflect evidence that in the first year of implementation of fiscal consolidation through government expenditure cut the consumer price index is stable. After the first year, the consumer price index reflects a downward trend over time over 9 years; nevertheless, the rate is not significant. These results reflect that less demand-pull pressures triggered by government expenditure cut in SA are effective to reduce the consumer price index. On the other hand, the results are in line with the classical thing that less role of government intervention in the economy and long-run implication of government expenditure cut results in a low level of the price level.

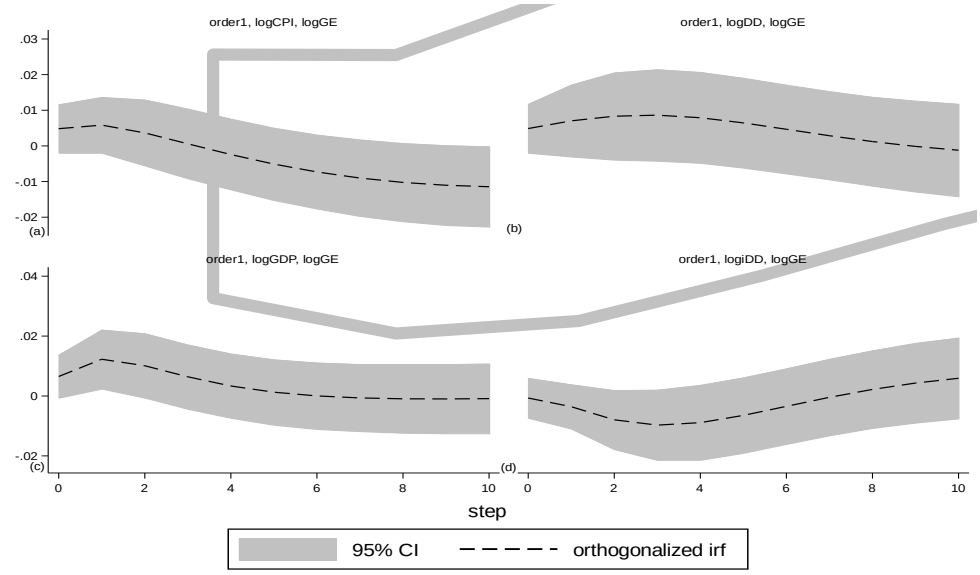

Figure 2. Fiscal variables response to fiscal consolidation base on government expenditure

The variable of interest in figure 2 graph (B) reflect that when there is government expenditure cut this result to an increase in domestic government debt over 4 years. In response to government expenditure cut, domestic government debt shows a downward trajectory after 4 years till it passes through the base in year 6 and operates below base thereafter. The government debt falls from the rage of 5% to 0%, as of the result of fiscal consolidation achieved through government expenditure cut. As such, it recommended that the SA fiscal authorities need to the budge 5% of the total government expenditure to be directed in fiscal consolidation. Also, the plaining of fiscal consolidation through government expenditure cut needs to have a ten-year plan as the rage of 5% to 0% is evident over the period.

There is as need that SA fiscal authorities effectively monitor the borrowing requirements, government debt guarantees, domestic short-term borrowing, domestic long-term borrowing, interest payments, and redemption payments on bonds to further reduce government debt. These results are consistent with that of literature that has found that fiscal consolidation based on government expenditure cut is successful in reducing government debt. Moreover, they proved evidence that the new-Keynesian approach and can be achieved through government expenditure cut. However, the upward curve in the first three years reflects that there is a need to implement a transparent and sound financial system in the effort to fleeting the curve of government debt when fiscal consolidation of government expenditure cut is implemented.

Gross domestic product in figure 2 graph (C), increase in the first year of fiscal consolidation based on government expenditure cut. However, gross domestic product shows a downward trend after the first years until it passes through the base in year 3 and operates below base thereafter at a stable rate. These results are consistent with the standard Keynesian school that advocates that government expenditure cut will collapse the aggregate demand. As such economic growth is expected to fall in the long run is evident in the results (Giavazzi and Pagano, 1995). There is a possibility of pushing away investors and decreasing investor confidence. Considering the result in figure 2 graph (B and C), there is an indication that there is a trade-off that is brought about by fiscal consolidation through government expenditure for government debt reduction and gross domestic production. In as much as government expenditure cut result in a reduction in government debt, there is also run implication of the reduction in economic growth. If the objective is to reduce government debt fiscal consolidation could be effective but not for long-run economic growth. Therefore, it is key for SA to redirect government expenditure to financing development to boost long-term productivity and economic output. Figure 2 graph (D), fiscal

consolidation of government expenditure result in a fall in the lending rate of domestic government debt in the first 3 years. Thereafter the rate increase but operate below the initial state. The first fall of the lending rate of domestic government debt can be attributed to the credibility that comes with fiscal consolidation based on government expenditure cut. However, the long-run increase is associated with the reduction in economic growth reflected in figure 3 graph (C).

Figure 3 shows evidence of fiscal consolidation through government revenue, with the interaction of 4 variables namely, consumer price index, domestic government debt, gross domestic product, and lending rate of domestic government debt.

In figure 3 graph (A), reflect that fiscal consolidation through government revenue or tax increase result in a fall in the consumer price index and the index is always below the base. The fall in the consumer price index is explained by that the leading rate fall triggered by government expenditure cut, as such businesses find loanable funds cheap and the price level fall. This result also reflects the importance of the balancing act between fiscal consolidations, government expenditure cut and tax increase in the effort to stabilize the economy.

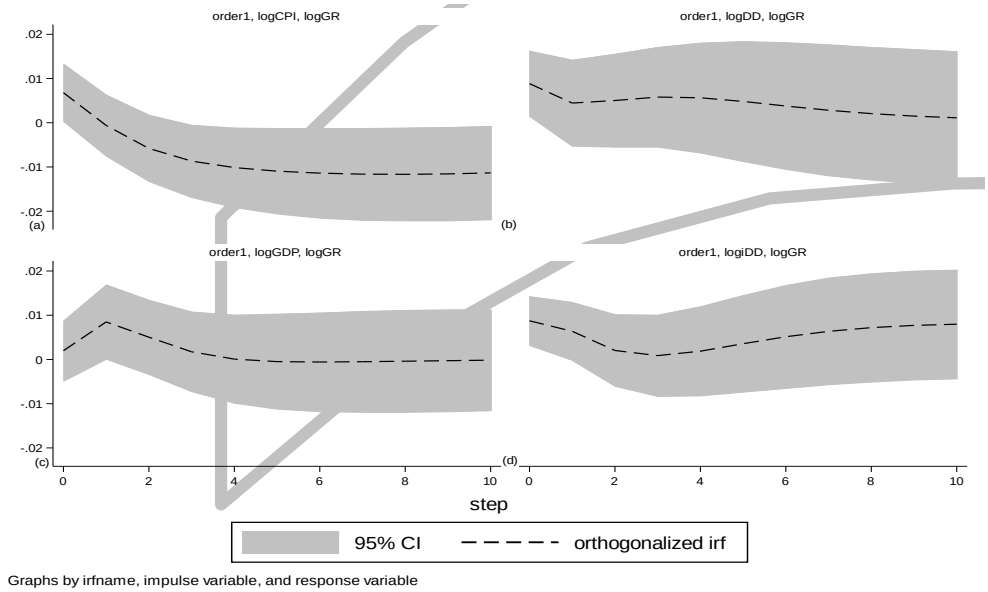

Figure 3. Fiscal variables response to fiscal consolidation base on government expenditure

The variable of interest in figure (3) graph (B) reflects that when government revenue increases through tax increase results in a fall in domestic government debt in the first year. After the first-year domestic government debt is stable for 3 years. After 4 years the domestic government debt falls in response to government revenue increase through a tax increase and remains below the base. The range of fiscal consolidation of government revenue or tax increase is better than that of fiscal consolidation based on government expenditure cut. The government debt falls from the rage of 10% to 0%, as of the result of fiscal consolidation achieved through government revenue or tax increase. The result found of success of government revenue or tax increase is contra to Gupta et al. (2005) and Baldacci et al. (2006) among others that have found that government expenditure cut is effective than tax increase in achieving the reduction in government debt. Government expenditure outperforms tax increase given that expenditure cut is effectively managed by fiscal authorities. However, with tax, there is an interdependence of business that can close, loss output layoff people leading to the overall fall in the revenue back to the government.

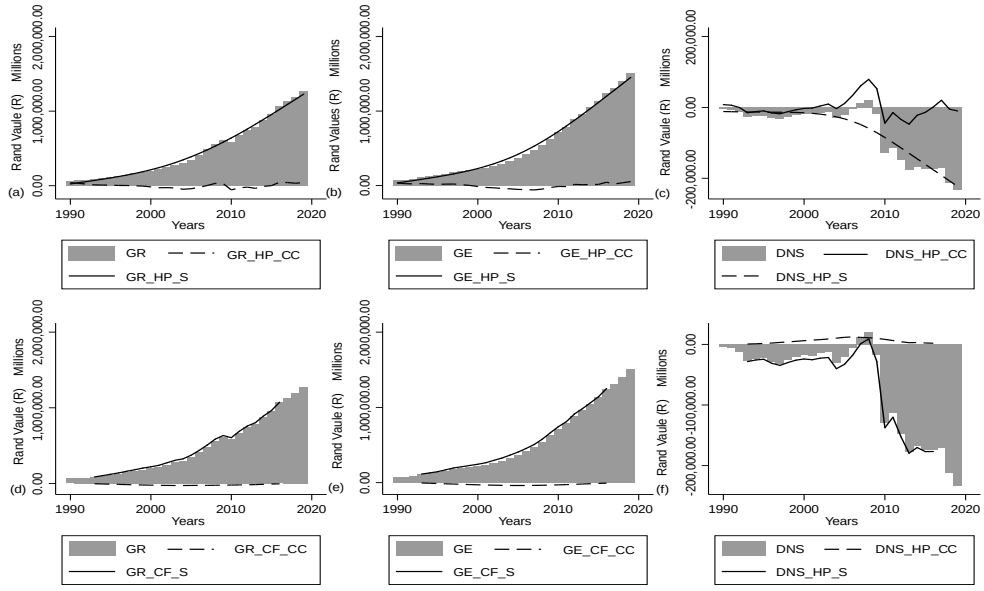

Figure 4. HP and CF Filter

Gross domestic product in figure 3 graph (C), is reflected to increase sharply in the first year in response to fiscal consolidation based on government revenue increase through a tax increase. However, gross domestic product shows a downward trend after the first years until it passes through the base in year 3 and operates below base thereafter at a stable rate. The effect is like that of

government expenditure cut. Figure (3) graph (D), fiscal consolidation of government expenditure results in a fall in the lending rate of domestic government debt in the first 2 years. Thereafter the rate increase but operate below the initial state. Figure 4 shows the cyclical, structural, and actual data of government revenue, government expenditure, and the balance between revenue and expenditure. It is found in figure 4 that across all the graphs of government expenditure and revenue the structural component is less volatile. It is found also the structural component of government expenditure and revenue is larger than the cyclical component.

Table 1 shows the econometrics results of the cyclical and structural component of government expenditure as well as revenue.

Table 1. Econometrics Results

	Cyclical Component	**Structural Component**
	2SLS	**2SLS**
ΔLog(GDP)	-0.0236***	0.0136
	(-4.6300)	(1.1600)
ΔLog(CPI)	0.0246**	-0.0783***
	(3.1400)	(-5.0300)
ΔLog$_i$(DD)	0.0985***	0.2700***
	(13.8900)	(3.9700)
ΔLog(GE_CC)	0.0077	
	(0.7600)	
ΔLog(GR_CC)	-0.0101*	
	(-2.3700)	
ΔLog(GE_S)		1.7380***
		(7.2600)
ΔLog(GR_S)		-1.7260***
		(-7.3300)
intercept	-0.3390***	-0.3390***
	(-4.6800)	(-4.6800)
AR(2)	7.11	7.11
Cragg D-W	3.40	3.40
Sargan Overid	5.79	5.79
N	9	9
instruments	3	3

NOTE: T-values are given in the parenthesis. The *, **, and *** imply statistical significance at levels 10%, 5%, and 1% respectively. Dependent variable is ΔLog(DD).

In table 1, first column reflects evidence that the cyclical component of the gross domestic product if it increases by 1% result to a 0.02% fall in the domestic government debt holding all other factors constant. On the other hand, second column reflects that the structural component of the gross domestic product increases domestic government debt. However, the results are statistically insignificant that we cannot tell how much will be the increase. These results reflect that domestic government debt is highly inelastic to changes in the gross domestic product. This can be attributed to the economic growth has been underperforming with the rate that is below 5% that is most desirable in developing country like SA and as stipulated in the National Development Plan (NDP). The cyclical component of the consumer price index in table, first column, is reflected to result in a 0.02% increase in the domestic government debt when it increases by 1% holding all other factors constant. The structural component of the consumer price index in second column shows that the domestic government debt falls by 0.07% holding all other factors constant. The result reflects the importance of policy mix between fiscal and monetary policy in the effort to reduce government debt. As such the mandate of the South Africa Reserve Bank (SARB) of price stability is critical for stable government debt. The results show that a 1% increase in the cyclical, as well as structural component of the leading rate to domestic government debt, results in 0.09% and 0.27% increase in domestic government debt. Moreover, the results are constant wit he classical school of thought that advocates for the crowd in investment and increases government debt.

The cyclical component of government expenditure in table first column is reflected to increase domestic government debt, however, we cannot tell by how much given that the results are statistically insignificant. However, the structure of government expenditure in second column is shown to result in a 1.73% increase in domestic government debt. These results are inconsistent with that of Baldacci et al. (2013), Guajardo et al. (2014), and Yang et al. (2015) among others that have found government expenditure to result in success in the reduction of government debt. This result reflects there is a need to increase the management of government expenditure that is channeled to the fiscal consolidation. This can be achieved by reducing the expenditure ceiling, cost-containment measures, and credible fiscal consolidation strategies. A 1% increase in cyclical and structural component of government revenue in table results to a 0.01% and 0.72% respectively. These results are contra to that found by Yang et al. (2015) who outline that tax increase is less effective in the reduction of government debt. On the other hand, given that the tax bracket is stretched in the SA there might be no room for increase in tax. Nevertheless, there is a need to investigate effective way

of tax collection and to encourage the culture of compliance amount businesses and individuals in the effort to increase government revenue.

5. Conclusion

The purpose of this paper is to examine the fiscal consolidation impact on government debt in South Africa (SA) looking at both structural and cyclical effects. It is noted that the government debt in SA has been increasing and it at the highest in the last 25 years since 1994. There has been intervention by fiscal authorities to implement fiscal consolidation. Therefore, the fundamental questions are the dynamic effects of fiscal consolidation and impact structural as well as cyclical components of fiscal consolidation on domestic government debt.

The paper employs the SVAR and 2SLS models using data from 1990 to 2020. The SVAR provided evidence that government expenditure cut triggers a downward trajectory in domestic government debt after 4 years till it passes through the base in year 6 and operates below base thereafter. The government debt falls from the rage of 5% to 0%, as of the result of fiscal consolidation achieved through government expenditure cut. The range of fiscal consolidation of government revenue or tax increase is better than that of fiscal consolidation based on government expenditure cut.

The government debt falls from the rage of 10% to 0%, as of the result of fiscal consolidation achieved through government revenue or tax increase. As such, it recommended that the SA fiscal authorities need to the budge 5% of the total government expenditure to be directed in fiscal consolidation. The 2SLS model reflected that the cyclical component of government expenditure increases domestic government debt. The structure of government expenditure results in a 1.73% increase in domestic government debt. A 1% increase in the cyclical and structural component of government revenue results in 0.01% and 0.72% respectively. This result reflects there is a need to increase the management of government expenditure that is channeled to the fiscal consolidation. This can be achieved by reducing the expenditure ceiling, cost-containment measures, and credible fiscal consolidation strategies.

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