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**GISELE MAH**

**NORTH WEST UNIVERSITY, South Africa**

## **DETERMINANTS OF BUDGET DEFICIT IN SOUTH AFRICA: A BOUNDS COINTEGRATION**

### **Abstract:**

This study examine the determinants of budget deficit in South Africa from 1994Q1 to 2018Q2. Data was collected from the South African reserve bank and Organisation for Economic Co-operation and Development. The Bounds cointegration was employed to analyse the determinants of budget deficit. The findings showed that there is a positive and significant relationship between the lag 4 of national government deficits and national government deficit itself. There is a negative and statistically significant relationship between real exchange rate and national government deficit. Lastly, there is a positive and statistically significant relationship between gross domestic product and national government deficit. It is recommended that, for national government deficit to be reduce, the current national government deficit needs to be reduce, the real exchange rate increased and the growth stabilise.

### **Keywords:**

Budget Deficit, gross domestic product, government expenditure, gross fixed capital formulation, unemployment, South Africa.

**JEL Classification:** H30, C32

## Introduction

Budget deficit has been one of the thoroughly debate topics among economists and fiscal policy makers in the world. According to the statistics from the South African Reserve Bank (SARB, 2018), budget deficit in South Africa has been increasing at is at 4.45% in 2018. In 1994, the budget deficit was 5.4% but it decrease over the years consistently to a point of a surplus in 2008. As from 2009, the deficit became 0.7% and rose to 5.1% in 2010. Since 2010, the budget deficit has on average 4.5%. According to Whelan (2011), the global economy experienced recession due to the 2007/2008 global financial crisis. Armanious (2011) mentioned that this crisis had an effect on the financial markets thereby placing pressure on the budget deficits of the countries.

The national treasury requested that fiscal consolidation be implemented in South Africa to narrow done budget deficit and stabilize debt. The only way to narrow the budget deficit is to reduce expenditure and increase on revenues especially tax bases National Treasury, 2016). An increase in government expenditure has a positive impact on budget deficit only if the spending is productive. Eminer (2015), outlined that an increase in productive spending and non-productive spending will result in budget deficit but would have a different impact on economic growth. If the budget expenditure is too high and if the government uses it for productive purposes instead of political purposes, then the deficit could result in economic growth, Gupta *et al.* (2015). This paper examines the determinants of budget deficit in South Africa using the Bounds cointegration technique.

## Literature review

The Neoclassical economists saw government deficit as structural deficit and mentioned that it affects interest rates on private investment. To them, deficit occurs when government borrows from the public or foreign sources to finance its expenditures. When government competes with other borrowers to borrow funds, this causes an upward pressure on interest rate which crowd out private investors who are competing for the same funds. In the long run, deficit reduces the stock of private investment, hence economic growth. But if the government invests the borrowed funds, it produces capital, and then the burden of debt on future generation is reduced. On the other hand, when funds to finance the deficit are obtained from abroad, it becomes an additional debt serving problem since debt interest has to be paid alongside the principal amount. This constitutes a transfer from domestic country to individuals living abroad thus affecting the domestic citizens. The Neoclassical economist believes that when the government borrows from the country or abroad, it affects the economy of the country (Mah, 2012). On the other hand, Salvi (2011) iterates that Inter-temporal budget constraint (IBC) requires that the total government spending must be within the funds available for it over some long period. According to Salvi (2011), the IBC starts with a public sector income statement with one period budget constraint which explains the evolution of the net debt as

$$B_{t+1} = (1+r)B_t - PB_{t+1} \quad (1.1)$$

where  $B_t$  is the stock of public net debt,  $r$  is the interest rates,  $PB_t$  is the difference between revenue and expenditure excluding interest expenditure.

Some empirical studies were done and different relationships were found. Brunner (2002) iterate that there is a positive relationship between the deficits, interest rates along with the demand and supply stock level. He then concluded that, deficits are uncontrollable at times. Tanzi (2006) found out that there was positive correlation between higher fiscal deficits and real interest rates. Lumengo (2004) results showed a positive statistically insignificance between deficits and interest rates. Dai and Phillipon (2006) and Nurudeen (2006) concluded that there is a positive relationship between deficits and real interest rates

Molefe (2016) and Hassan and Akhter (2015) studied and found an inverse relationship between economic growth and budget deficit while Nayab (2015) and Rahman (2012) found that there is no long run relationship between budget deficit and economic growth. Eminer (2015) had a positive relationship between budget deficit and economic growth. Ahmed (2010) and Wade (2008) found no evidence between the exchange rates

## Methodology

The bounds co integration is used as the estimation technique. It involves carrying out the following test: unit root, bounds co integration, error correction model, and diagnostic and stability test. The model is the model is specified as follows:

$$\text{LNGDIF} = \beta_0 + \beta_1 \text{LREXCH} + \beta_2 \text{LINTL} + \beta_3 \text{LGDP} + \mu_t \dots \dots \dots 1$$

Where LNGDIF= natural logarithm of national government deficit, LREXCH= natural logarithm of real exchange rate, LINTL= natural logarithm of long term interest rate and LGDP= natural log of gross domestic product.

**Unit root testing:** It is important to know the order of integration of each variables because for Bounds co integration to be estimated, the variables need to be of order I(0) and I(1) variables. The Augmented Dickey Fuller (ADF) tests is employed to examine the level at which each variable in this study is stationary.

**Bounds co-integrating technique:** The autoregressive distributed lag (ARDL) or Bounds testing methodology of Pesaran and Shin (1999) and Pesaran et al. (2001) is advantageous when there is a mixture of I(0) and I(1) variables. Also, it involves just a single-equation set-up, making it simple to implement and interpret and the different variables can be assigned different lag-lengths as they estimate the model. Then, the ARDL Bounds test is carried out to determine the long run relationship. The null hypothesis states that there is no cointegration. If the F-statistic is greater than then the critical upper bound I(1) values, then we conclude that there is cointegration. If the F-statistic is less than the critical lower bound I(0), we conclude that there is no

cointegration. When there is cointegration, then the elasticities of the long run relationship are estimated.

**Error correction Model:** When there is cointegration, there is need to estimate the elasticities of the short run relationship. This is estimated at first difference and the error term needs to be negative and statistically significant.

**Diagnostic test and stability test:** After estimating a model, there is need to check that there is no heteroscedasticity (White heteroscedasticity), serial correlation (LM serial correlation) and normality test (Jarque-Bera). For the stability, the cusum test is used.

## Results

**Stationarity:** The ADF test results reveal that real exchange rate is stationary at I(0) while national government deficit, long term interest rate and gross domestic product are stationary at I(1). Since the variables are stationary at I(0) and I(1), we can confident proceed with the bounds cointegration.

### Bounds co-integrating Results

The F-statistics of 3.859 is greater than the upper bounds values at 5% level of significance, hence we conclude that there is co-integration.

**Table 1: Bounds co-integrating Results**

Test Statistic	Value	k
F-statistic	3.858782	3
Critical Value Bounds		
Significance	I(0) Bound	I(1) Bound
10%	2.37	3.2
5%	2.79	3.67
2.5%	3.15	4.08
1%	3.65	4.66

Since there is cointegration, we proceeds to estimate the long run relationship which is presented in Table 2 below.

### ARDL long run relationship

At 10% level of significance, lag 4 of national government deficit, real exchange rate, gross domestic product, and lag 3 of gross domestic product are statistically significant. This means that a 1 unit increase in lag 4 of national government deficit, will cause national government deficit to increase by 0.846 units. Also, there is positive and statistically insignificant relationship between long term interest rate and budget deficit in South Africa. Furthermore, there is a negative and statistically significant relationship between real exchange rate and budget deficit. A 1 unit increase in real exchange rate will cause national government deficit to decrease by 0.062 units. This

results are contrary to that of Ahmed (2010) and Wade (2008) who did not find any evidence between the exchange rates and deficit. Gross domestic product is positive and statistically significant. A 1 unit increase in Gross domestic product will cause national government deficit to decrease by 18.861 units. This results is in line with that of Eminer (2015). Lastly, the lag one value of gross domestic product is negative and statistically significant. This results are in line with that of Molefe (2016), Hassan and Akhter (2015) and Nayab (2015).

**Table 2: ARDL long run relationship**

Levels equations				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNGDIF(-1)	0.040741	0.056039	0.727020	0.4693
LNGDIF(-2)	-0.023558	0.054966	-0.428589	0.6693
LNGDIF(-3)	-0.057594	0.054860	-1.049837	0.2968
LNGDIF(-4)	0.846160	0.055823	15.15794	0.0000
LINTL	0.142574	0.508428	0.280421	0.7799
LREXCH	-0.062582	0.034027	-1.839179	0.0695
LGDP	18.86085	10.98936	1.716283	0.0898
LGDP(-1)	-8.977906	18.57348	-0.483372	0.6301
LGDP(-2)	11.32495	18.48571	0.612633	0.5418
LGDP(-3)	-21.18860	10.66969	-1.985868	0.0503
C	-1.155871	10.59945	-0.109050	0.9134

### Error Correction Model results

In the short run, the only variables that are significant are deficit at lag 4 and gross domestic product. Also, the error term is negative and statistically significant. The Adjusted R-squared of 0.847, this means that the independent variables explains 84.7% of variation in dependent variable. The probability of F-statistic reveals that the overall model is statistically significant.

**Table 3: Error Correction Model results**

Levels equations				
Variable	Coefficient	Std. Error	t-Statistic	Prob.*
D(LNGDIF(-1))	-0.090715	0.212695	-0.426500	0.6709
D(LNGDIF(-2))	-0.129829	0.200893	-0.646257	0.5199
D(LNGDIF(-3))	-0.145626	0.196645	-0.740552	0.4611
D(LNGDIF(-4))	0.763962	0.195807	3.901615	0.0002
D(LREXCH)	-0.038891	0.025625	-1.517685	0.1330
D(LINTL)	-0.109577	0.954754	-0.114770	0.9089
D(LGDP)	20.53647	10.57825	1.941387	0.0557
D(LGDP(-1))	-8.921769	12.41209	-0.718796	0.4743

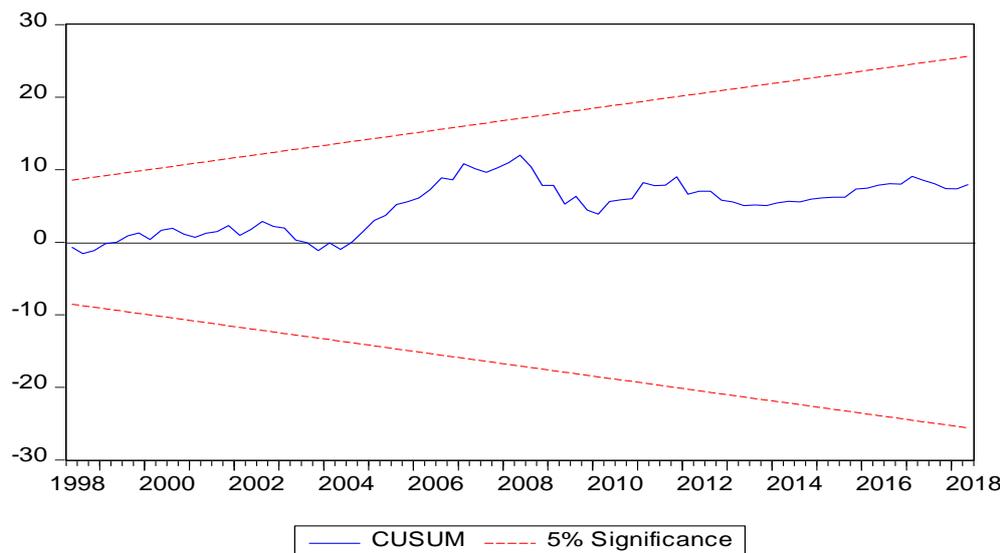
D(LGDP(-2))	6.585826	11.79536	0.558341	0.5782
D(LGDP(-3))	-8.997359	11.14042	-0.807632	0.4217
ECT(-1)	-0.873248	0.244769	-3.567644	0.0006
C	-0.059967	0.111551	-0.537571	0.5923
Mean dependent				
R-squared	0.865184	var	0.007289	
Adjusted R-squared	0.846876	S.D. dependent var	1.228554	
S.E. of regression	0.480746	Akaike info criterion	1.492959	
Sum squared resid	18.72045	Schwarz criterion	1.819746	
		Hannan-Quinn		
Log likelihood	-57.42258	criter.	1.624906	
F-statistic	47.25643	Durbin-Watson stat	2.043282	
Prob(F-statistic)	0.000000			

**Diagnostic and Stability test results:** For the diagnostic tests, there is no serial correlation, no evidence of heteroscedasticity and that residuals are normally distributed.

**Table 4: summary of the diagnostic tests results**

Test	Null hypothesis	p-value	Conclusion
Autocorrelation LM test	No serial correlation	0.278	Accept H0: There is no serial correlation
White	No heteroscedasticity	0.155	Accept H0: There is no heteroscedasticity
Jarque-Bera	Residuals are normally distributed	0.972	Accept H0: Residuals are normally distributed

The stability of the model is tested employing the CUSUM test. Figure 1 indicates the model is stable at 5%.



### Conclusions and policy recommendations

Based on the results, the determinants of budget deficit in South Africa are: lag 4 of national government deficit, real exchange rate, gross domestic product, and lag 3 of gross domestic product. In order to reduce national government deficit, the present national government deficit needs to be reduced since it has a positive effect on the future national government deficit. Also, real exchange rate should increase while growth should be stabilised.

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