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THE NEXUS BETWEEN GOVERNMENT REVENUE AND MACROECONOMIC INDICATORS IN SOUTH AFRICA

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Abstract

Government revenue plays a paramount role in any country's development and citizen welfare. This is done through government provision of crucial services related to development which include but not limited to finances or subsidies to business entities and citizens through the national wealth distribution. The importance of government revenue is directly correlated with other equally important outcomes. Hence, there exist an interdependence or interaction between macroeconomic variables and government revenue. Therefore, understanding the relationship between government revenue and macroeconomic variables can assist in improving a country's economy and the development of its people. The core objective of this study was to analyze the effect of some macroeconomic variables on the South African government revenue from 1994 to 2021. Both short-run and long run relationships amongst variables were analyzed using the autoregressive distributed lag (ARDL) model. The long-run and short-run findings indicated that the level of government revenue depends on performance of the analyzed macroeconomic variables namely; balance of payments, economic growth, employment and real effective exchange rate. Employment and economic growth were found to be the major determinants of government revenue. Consequently, the study suggests that the introduction and implementation of policies and strategies that enhance employment opportunities and promote economic growth would be a fundamental way to increase government revenue and improve economic and social well-being.

Keywords: Autoregressive Distributed Lag, Government Revenue, Revenue, Macroeconomic Indicators, South Africa

1. Introduction

The government is typically one of the most important economic agents, particularly in countries with a small household sector. Through its economic policies, the entity can have important implications for economic growth and overall social development. Broadly, economic policy comprises macroeconomic indicators, which are typically comprised of several major policy aspects including but not limited to economic growth, full employment, equitable income distribution, and price stability, which are all typically measured by gross domestic product (GDP), unemployment rate, Gini-coefficient, balance of payments and exchange rates respectively (Mohr and Associates, 2015). These macroeconomic goals are frequently viewed as the main measures to pass judgment on the performance of the economy. As a result, the state of the economy including public confidence, fiscal policy choices as well as administrative efficiency all play an important role in economic progress, especially government's revenue outcomes.

Over the last two decades, South Africa's macro economy has endured prevailing challenges of a weak growth, growing public sector wage bill which has exacerbated spending, widening budget deficit, excessively growing public debt, high risk premium, volatile currency and ultimately increasing loan payment levels among others (Mapenzauswa, 2019; Mdluli *et al.* 2019; Business Tech, 2021; National Treasury, 2021a). The economy has been failing to create the much needed jobs as the official unemployment finds itself at an all-time high rate exceeding 30 percent since the end of apartheid, with the broad unemployment rate, inclusive of the discouraged work-seekers, exceeding 40 percent (Statistics South Africa (Stats SA), 2021a). The declining performance of state-owned entities, which has fueled their demands on the country's budget, has been viewed as probably the best prevention to the development and growth the country needs to manage its numerous socio-economic issues. These are worrying statistics, particularly when a comprehensive overhaul of the country's national accounts by the national statistics office show an upward revision in the size of the economy, being 11 percent larger than previous estimates (Stats SA, 2021b).

The National Treasury (2021b) reports that there have been large gaps between revenue and spending, with revenue collection weakened and exacerbated by the Coronavirus pandemic, especially since income taxes are South Africa's main source of revenue. However, there are arguments that the pandemic exposed the country's cracks, which have long existed (South African Reserve Bank, 2020). Every one of the aforementioned challenges have re-emphasized the significance of adequate government revenue, which has demonstrated to make the financing of interests in human resources and infrastructure conceivable.

The aim of this paper is to therefore investigate how government revenue behaves when macroeconomic indicators change. In addition to contributing to existing debates in literature on the behavior of government finances, particularly revenue, this paper contributes to the understanding and formulation of sustainable fiscal policy as well as the realization of long-term growth and development. This study is very important taking into consideration how government finances across the world have been impacted by the ongoing pandemic. The rest of the paper is divided as follows; Section 2 reviews the literature on government revenue and macroeconomic performance from both the theoretical and South African perspective. Section 3 will discuss the methodological processes followed including the model applied in the study. The results are discussed in Section 4 and Section 5 will conclude the study and provide recommendations.

2. Literature review on government revenue and macroeconomic indicators

Economic policy has important implications on an economy, and depending on how productive its implementation is, it can either promote or discourage growth and development. Theoretically and practically, the amount of revenue the government receives determines how much it can spend (Fourie and Burger, 2011). This revenue is directly correlated with other equally important outcomes, which makes the collection of taxes, being the most important sources of revenue a key development priority (Mohr and Associates, 2015; Muttaqin and Halim, 2020). In turn, government's policy choices in addition to fluctuations of the business cycle, determine how much revenue is required to deliver to citizens and to pay financial responsibilities such as debt (OECD,

2019). In essence, the greater the amount of revenue the government receives, the greater the opportunities to do more towards the country's development (Sun'an, 2018; Iiyambo and Kaulihowa, 2020) on the assumption that the spending is primarily on productive assets (Barro, 1997). The business cycle usually has an impact on the performance of revenue since government revenues have really become sensitive to fluctuating economic circumstances (McGranahan and Mattoon, 2021). Revenue is typically expected to decline in periods of recession when the government spurs economic activity by increasing spending and / or reducing taxes and the opposite is true during slow economic activity, when government withdraws a fiscal stimulus (Weinstock, 2021).

Turning to selected macroeconomic indicators, employment broadly comprises of all people who are of working age and are in paid employment or self-employment (Mohr and Associates, 2015). In the most general sense, a decline in employment levels implies an increase in unemployment. Unemployment in this regard is defined as a state where an individual has been looking for work but cannot find any for various reasons including but not limited to the state of the economy and poor labor market conditions (Kingdon and Knight, 2001; Danacica and Mazilescu, 2014; Baumann, 2016). The relationship between government revenue and employment is theoretically straightforward, where a rise in the employment rate increases government revenue, in particular, the revenue that arises from taxes of the employed (Greg, 2010) and also through increased economic activity. At the same time, when government revenue grows and is directed towards productive efforts such as infrastructure development, unemployment rate is positively affected (Zulhanafi et al. 2013). The increased government spending will increase output, which will in turn increase the demand for factors of production, one which is labor, thus resulting in an increase in the employment rate, ceteris paribus (Sun'an, 2018).

Economic growth on the other hand is defined as a rise in the production of goods and services produced in a country over a certain period of time. Gross domestic product (GDP) in this regard is often used as a proxy to measure economic growth, and is widely reported (Mankiw et al. 2018). From a macroeconomic perspective, GDP still remains an important measure of a country's economic performance (Perkins et al. 2006). If a country's GDP grows, then the revenue government collects/receives will also grow (Gokal and Hanif, 2004). Contrariwise, if an economy is in an economic recession, then GDP and employment will tend to decline, thus leading to a decrease in government revenue. Hence, Muttaqin and Halim (2020) maintains that economic growth has a significant influence on increasing revenue.

The balance of payment (BOP) cannot be analyzed in isolation without considering exchange rates. The BOP is an account that records a country's transactions with the rest of the world (Mohr and Associates, 2015). On the other hand, the exchange rate typically specifies how much one currency is worth in terms of another (Van der Merwe et al. 2014). From a theoretical perspective, the more open an economy is to international trade and the more liberalized its trade is, the higher the probability exchange rate volatility (persistent up and down movements). Specifically, an appreciation in the exchange rate results in a decline in import prices, thereby inducing people to import more goods and services. The opposite is true when the exchange rate depreciates. For instance, Adam et al. (2001) contended that a depreciation of the exchange rate induces revenue in Sub-Saharan Africa. Hence, it could be argued that a volatile exchange rate could have implications on revenue. Since exchange rate volatility is more common and noticeable in open economies, revenues in such economies are most likely to be adversely affected (Calderon, 2004). "This suggests that in economies where exchange rate volatility persists, the degree of openness to trade or trade liberalization policies could have a greater impact on revenue generation" (Ofori et al. 2018, p. 3).

Several empirical studies have been conducted with regards to how the abovementioned economic indicators are associated with government revenue. In their study which analyzed the correlations that exist between fiscal policy and macroeconomic indicators in Romania between 1990 and 2007, Brasoveanu and Paun (2007) found an opposite relationship to be existing between government revenue and the unemployment rate; and government revenue and economic growth. Egbulonu and Amadi (2016) in their study that was analyzing the effects of fiscal policy on unemployment in Nigeria found a positive relationship between government

revenue and unemployment. In their study on exchange rate volatility and government revenue in Ghana, Ofori *et al.* (2018) found that exchange rate volatility has a damaging impact on revenue but the effect is additionally noticeable in the long-run. Another study by Fierro and Reisen (1990) found that a devaluation of the exchange rate has a positive influence on the revenue government collects in Korea and Mexico.

Rosoiu (2015) in a study that was investigating how government revenue and expenditures affects economic growth in Romania found a positive relationship between government revenue and GDP. Specifically, government revenue increased economic growth. In another study by Gurdal *et al.* (2020) examined the relationship between tax revenue, government expenditure, and economic growth in G7 countries using various panel causality tests and found that there are a bidirectional short- and long-run causality between economic growth and tax revenue, proposing that tax policies are a significant tool that assists with the achievement of macroeconomic indicators in the G7 economies.

Yi and Suyono (2014) in their study investigating the relationship between tax revenue and economic growth of Hebei province of China concluded that government revenue and GDP are positively associated. The findings of Ofori *et al.* (2018) found that an increase in trade openness results in a decline in revenue in Ghana. These results proposes that given the exchange rate volatility, trade liberalization policies are harmful to revenue generation in Ghana. The subsequent section discusses the methodological processes followed in the study.

3. Data source and methodology

3.1. Data and data source

The current study employed a quantitative approach built on secondary macroeconomic data sourced from the South Africa Reserve Bank. The sample period starts in the first quarter of 1994 and ends in the second quarter of 2021. In this study, government revenue (REV) is used as the dependent variable while the balance of payment (BOP), employment (EMP), economic growth of gross domestic product (GDP) and the real effective exchange rate (REER) serve as explanatory variables. The selection of the study variables and the sample period was based on data availability.

3.2. Methodological approach

To analyze both long-run and short-run relationships between variables, the study employed one of the modern econometric approaches commonly known as the Autoregressive Distributed Lag (ARDL) model. Financial and economic literature refers to the ARDL model as the bound testing for cointegration (Finger, 2008) and its usefulness is grounded on numerous validations. Firstly, the ARDL model generates accurate results even when applied to a small sample. Secondly, according to Pesaran *et al.* (2001), the ARDL model applies to variables with different integration orders. Simply put, ARDL provides solid results from a mixture of I(0) and I(1) variables. Thirdly, while other models such as VAR use a similar number of optimum lags, the ARDL model can analyze a relationship using a specific number of lags for each selected variable. Additionally, the ARDL model is capable of providing long-run and short-run estimations simultaneously. Furthermore, the ARDL approach makes a distinction between regressors and regressands; and provides unbiased estimates even when independent variables are a mixture of endogenous and exogenous variables (Harris and Sollis, 2003).

To assess the long-run relationship between two or more variables, the ARDL model follows major step procedures. The second step, in particular, depends on the results obtained from the first step. The first step consists of estimating the long-run relationship through the ARDL bounds testing. If the first step identifies the existence of the long-run relationship, then the second step, which is the estimation of long-run parameters, is projected. The current study performed the aforementioned two steps using the equation below:

$$\Delta LREV_t = \alpha_0 + \sum_{i=1}^p \beta_i \Delta LREV_{t-i} + \sum_{i=1}^{q1} \beta_i LBOP_{t-i} + \sum_{i=0}^{q2} \delta_i \Delta LEMP_{t-i} + \sum_{i=0}^{q3} \eta_i \Delta LGDP_{t-i} + \sum_{i=1}^{q4} \psi_i LREER_{t-i} + \lambda_1 LREV_t + \lambda_2 BOP_t + \lambda_3 LEMP_t + \lambda_4 LGDP_t + \lambda_5 LREER_t + e_t \quad (1)$$

where *LREV* is the log of government revenue, *LBOP* is the log of the balance of payment, *LEMP* is the log of employment, *LGDP* is the log of economic growth, *LREER* is the log of the real effective exchange rate, Δ represent the difference operator, *e* is the error term, *p* and $q_1 \sim q_4$ represent optimal lag length selected using Bayesian criterion (SBC) and included in the model while $\lambda_1 \sim \lambda_5$ denote the long-run terms or coefficients. The null hypothesis $H_0: \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = 0$ and the alternative hypothesis $H_0: \lambda_1 \neq \lambda_2 \neq \lambda_3 \neq \lambda_4 \neq \lambda_5 \neq 0$ were formulated and tested using the F-statistics to determine the presence or absence of a relationship amongst variables.

The following are the decisions that can be induced from the comparison between F-statistics and the bounds critical values: cointegration or long-run relationship if the value of F-statistic > I(1) critical values. No long-run relationship (cointegration) exists among the variables if the value of F-statistics < I(0) critical value. If the value of F-statistic lies between the critical values of I(0) and I(1) bounds, unless additional information is provided, the results are inconclusive. If the first step explained above, identifies the presence of a long-run relationship, then the long-run equilibrium is estimated through the error correction model (ECM) expressed in equation 2.

$$\Delta LREV_t = \alpha_0 + \sum_{i=1}^p \beta_i \Delta LREV_{t-i} + \sum_{i=1}^{q_1} \omega_i LBOP_{t-i} + \sum_{i=0}^{q_2} \delta_i \Delta LEMP_{t-i} + \sum_{i=0}^{q_3} \eta_i \Delta LGDP_{t-i} + \sum_{i=1}^{q_4} \psi_i LREER_{t-i} + \varphi ECT_{t-i} + e_t \tag{2}$$

The conclusion from equation 2 suggests that all shocks within selected explanatory variables converge to long-run equilibrium if the coefficient (φ) of the error correction term (*ECT*) is significant and has a negative sign. It important to note that, prior to the estimation of long-run and short-run relationships among the variables, both descriptive statistics and unit root test were performed to assess central tendency, dispersion and stationarity of variables respectively, as outlined and discussed in section 4.1 and 4.2.

4. Study findings and discussion

4.1. Descriptive statistics analysis

This study adopted descriptive statistics to assess the central tendency and dispersion of variables (Table 1). The mean of the study variables is 147360.2; 41980.96; 98.3; 2709620; 116.2451 for government revenue, the balance of payment, employment, gross domestic product and real effective exchange rate respectively. The high mean is from the balance of payment while employment is the one with the low mean. This result suggests that the balance of payment is of a large magnitude whilst employment is of the lowest magnitude compared to other variables of interest. Considering the volatility of the variables, the balance of payment, gross domestic product and government revenue have high volatility compared to the exchange rate and employment. All variables, except employment, are positively skewed. This implies that variables are fairly symmetrical except the balance of payment that is asymmetric with a large right tail. Lastly, the Jarque-Bera results indicate that the exchange rate is the only variable with normally distributed data.

Table 1. Descriptive statistics results

Variable	Mean	Standard deviation	Skewness	Jarque-Bera
Government revenue	147360.2	100888.4	0.5471	9.4715
Balance of payment	41980.96	25319.26	3.6363	1519.833
Employment	98.30000	6.2229	-0.0975	11.6709
Gross domestic product	2709620	1722969	0.4081	9.4219
Exchange rate	116.2451	15.9027	0.0382	2.0412

4.2. Analysis of unit root

The ARDL results are considered valid if the model is not applied to a variable that is integrated of the second-order or I(2). To ensure that this criterion is met, the Augmented Dickey-Fuller (ADF) unit root test was used to determine the stationarity level for each variable under the study. Results depicted in Table 2 reveal that all the study variables except the real effective exchange rate (REER) are stationary after the first-order.

Table 2. Unit root results

Variables	Model	Levels	1 st Difference	Integration order
LBOP	intercept	0.8134	0.0000***	I(1)
	intercept & trend	0.9631	0.0000***	I(1)
LEMP	intercept	0.5901	0.0000***	I(1)
	intercept & trend	0.9460	0.0000***	I(1)
LGDP	intercept	1.0000	0.0000***	I(1)
	intercept & trend	0.5359	0.0001***	I(1)
LREER	intercept	0.0338**	0.0000***	I(0)
	intercept & trend	0.0836*	0.0000***	I(0)
LREV	intercept	0.3218	0.0000***	I(1)
	intercept & trend	0.9922	0.0000***	I(1)

Note: ***, **, * rejection of null hypothesis at 1%, 5% and 10% significant level respectively.

4.3. ARDL Bounds Testing

Using the Schwartz Information Criterion (SIC), the best model was ARDL (2, 0, 2, 2, 2) and was applied on bounds testing. The result from the best model in Table 3 indicates that the value of the F-statistics is 15.2155 and it is greater than all the upper bound I(1) values even at the 1 percent (0.01) significance level. Based on this result, the null hypothesis of no-cointegration (long-run relationship) was rejected in favor of the alternative. This implies that the long-run behavior of the South African government revenue is statistically influenced by the selected macroeconomic variables namely; balance of payment, employment level, economic growth and the real effective exchange rate.

Table 3. Bound testing results

<i>Selected model: ARDL (2, 0, 2, 2, 2)</i>				
F-Bounds Test		$H_0: \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = 0$		
		Critical values		
Test Statistic	Value	Significance	I(0)	I(1)
F-statistic	15.2155	10%	2.45	3.52
K = 4		5%	2.86	4.01
		2.5%	3.25	4.49
		1%	3.74	5.06

4.4. Estimation of long-run relationship coefficients

As shown in Table 4, the dependent variable (REV) is affected by long-term changes of explanatory variables (BOP, EMP, GDP, REER), therefore, it is crucial to assess the magnitude and the direction (positive or negative) of the regressors' power on the regressand. The result in Table 4 shows that the balance of payment, employment and economic growth have a positive sign. This implies that government revenue increases in response to the improvement of the aforementioned macroeconomic variables. In other words, government revenue increases by 0.09 percent, 0.83 percent and 0.11 percent as a response to a 1 percent increase in the balance of payment, employment and economic growth respectively. However, a negative sign is associated with the long-run coefficient of the real effective exchange rate. Thus, a 1 percent

increase in the exchange rate causes government revenue to decline by approximately 0.1 percent. These findings are in line with the findings of Adam *et al.* (2001), Rosoiu (2015) and Yi and Suyono (2014) stipulating that a positive relationship exists between employment, economic growth and government revenue. The findings are also supported by those of Brasoveanu and Paun (2007) and Ofori *et al.* (2018), which also found an inverse relationship between government revenue and exchange rate fluctuations. Consequently, this study findings suggests that growth in employment and economic growth generate government revenue which in turn can also assist in improving the country's economy. Thus, based on current findings and those in the literature review, governments need to improve their country's economic growth and employment to increase their revenues.

Table 4. Estimated long-run coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LBOP	0.0288	0.0202	1.4245	0.1579
LEMP	0.8294	0.2512	3.3012	0.0014
LGDP	0.9978	0.0243	40.9168	0.0000
LREER	-0.1005	0.0606	-1.6574	0.1010
C	-6.5499	0.9424	-6.9498	0.0000

4.5. Error correction representation and short-run dynamics

Table 5 displays the short-run dynamics and correction model expressed in Equation 2. As expected, the error correction term (ECT= -0.2174) is negative and significant, suggesting that in each quarter, almost 22 percent of model shocks are adjusted towards the long-run equilibrium. This means that government revenue fluctuations (caused by the study's explanatory variables) will take approximately 4.6 quarters (about a year) to be fully adjusted.

Table 5. Error correction representation and short-run dynamics

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LREV(-1))	0.3255	0.0861	3.7795	0.0003***
D(LBOP)	0.0316	0.0156	2.0233	0.0458**
D(LEMP)	2.7833	0.6433	4.3264	0.0000**
D(LGDP)	0.9450	0.2149	4.3974	0.0000***
D(LGDP(-1))	1.3463	0.1851	-7.2707	0.0000***
D(LREER)	-0.0046	0.1027	-0.0453	0.9639
D(LREER(-1))	-0.1719	0.1019	-1.6857	0.0951*
CointEq(-1)	-0.2174	0.1476	-8.2474	0.0000***

Note: ***, **, * rejection of null hypothesis at 1%, 5% and 10% significant level respectively.

Similar to the long-run results, the outcome of the short-run dynamics indicates that all the explanatory variables are statistically significant to influence short-term change in government revenue. Employment (LEMP) and economic growth (LGDP) have the largest positive impact on the short-term behavior of government revenue. Thus, a 1 percent increase in both employment and economic growth leads to a 2.8 percent and 0.95 percent increase in government revenue respectively. The lagged value of these two variables also has a significant positive effect on government revenue. Additionally, an increase in the balance of payment has a positive effect on government revenue, as a 1 percent increase in balance payment causes the short-term government revenue to grow by 0.33 percent. However, the real effective exchange rate has an inverse relationship with the South African government revenue. Based on both long-run coefficients in Table 4 and short-run results in Table 5, one can conclude that a feasible way to increase government revenue in South Africa would be to create more jobs and implement policies and strategies that enhance economic growth.

4.6. Model diagnostic tests

Various residual or diagnostic tests namely Jarque_Bera and Breusch-Pagan-Godfrey were performed to ensure the reliability of the obtained findings. Table 6 suggests that the estimated ARDL model (ARDL 2, 0, 2, 2, 2) is accurate and reliable as the null hypotheses of normality, homoscedasticity and no serial correlation are not rejected. Furthermore, the results from Ramsey RESET indicate that the employed model is correctly specified. The CUSUM graph confirmed the Ramsey RESET outcome suggesting that the model is stable. The stability in the study parameters infers that the relationship between the dependent variable (government revenue) and explanatory variables was reliable during the study sample period.

Table 6. Diagnostic tests results

Test	Null hypothesis	P-value	Decision
J-B	Residuals are normally distributed	0.29	H_0 not rejected
L-M	No serial correlation	0.2355	H_0 not rejected
Breusch-Pagan-Godfrey	No heteroscedasticity	0.5436	H_0 not rejected
Ramsey RESET	The model is correctly specified	0.6288	H_0 not rejected

5. Conclusion

This study analyzed the effects of selected macroeconomic variables (balance of payment, employment, economic growth and real effective exchange rate) on government revenue. The ARDL model was employed to determine both long-run and short-run relationships between the selected variables. Although findings revealed that all employed explanatory variables influence the long-run level of government revenue, employment and economic growth were found to have the largest contribution on government revenue compared to the share or effect of both balance of payment and real effective exchange rate. These long-run results were supported by short-run outcome, where employment was statistically significant and positively influences government revenue. Contrary to the positive influence on government revenue brought by the growth in employment, balance of payment, and gross domestic product; the growth in real effective exchange rate negatively influences government revenue in both the short and long-run.

Grounded on these findings, the South African government can increase its revenue if more sustainable job opportunities are created and policies that support economic growth are introduced and fully implemented. More resources should be invested towards human capital and infrastructure plans since these are important foundations for growth, employment and long-term revenue generation. Irrespective of the fact that the findings of this study are relevant and useful for economic authorities and policy-makers, the study was limited to only four explanatory variables. Therefore, future studies should consider increasing the number of explanatory variables as government revenue might also be influenced by variables that are not considered in the current study. In addition, the study made use of total government revenue, which is inclusive of both tax, and non-tax revenue. Therefore, future studies could separate the two kinds of government revenue and test them against more macroeconomic variables.

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