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The Effectiveness of Fiscal Policy on Economic Growth in South Africa: An Empirical Analysis

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Abstract

The study uses annual time series data from the South Africa Reverse Bank (SARB) from 1980 to 2020 to examine the effectiveness of fiscal policy on economic growth in South Africa. The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests, as well as the Johansen Co-integration test, Granger causality test, and Vector Auto-Regression (VAR) method, were used in the study. Real GDP per capita (RGDP) is used as proxy of economic growth and Gross Fixed Capital Formation (GFCF), Government Expenditure (GEXP) and Government Deficit (GOVD) as the proxies of fiscal policy. The ADF test results show that all variables are stationary at the first difference, with the exception of GFCF and GEXP, which are stationary at I(0), whereas the PP test results show that all variables are stationary at I(1), with the exception of GEXP, which is stationary at I(0). At maximum Eigenvalue, the four variables are not cointegrated. The findings of the Granger causality test demonstrated a unidirectional causation from GOVD to RGDP, as well as a bidirectional causality from RGDP to GFCF and GEXP. Error Correction Model Estimated using VAR shows that GFCF, GEXP have positive effect on RGDP whereas GOVD has a negative effect on RGDP in the short run. The findings also presented that the VAR's residuals are homoscedastic, which means they are normally distributed and have no serial correlation.

Keywords: *Economic Growth, Gross Fixed Capital Formation, Government Expenditure, Government Deficit, Vector Auto-Regression and South Africa*

1. Introduction

In economic theory, empirical study, and policymaking, the effectiveness of fiscal policy on economic growth is a contentious and long-standing debate. In South Africa and other emerging economies, optimal fiscal policy plays a critical role in the growth process and therefore acts as a critical economic growth tool. When many initiatives are financed and carried out by borrowed funds, true economic growth and development occur (Ali, 2014). This is justified on the grounds that the private sector alone will not be able to grow the economy. Instead, government involvement and influence are required. South Africa's public finance has changed significantly since post-apartheid (1994), owing to plenty of reforms, one being the adoption of the Medium-Term Expenditure Framework (MTEF) program. The MTEF was carried out between 1997 and 2000, according to (Ocran, 2009), as part of a program of tax reforms and administrative capacity reforms.

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Fiscal policy is defined by Reem (2009) and Agu *et al.* (2015) as the mechanism through which a government modifies its level of expenditure in order to monitor and impact a country's economy. Fiscal policy, according to the IMF (2015), fosters growth through macro and structural tax and spending policies. It plays a crucial influence at the macro level in promoting macroeconomic stability, which is essential for reaching and conserving economic growth. It can promote job creation, investment, and productivity at the micro level by executing well-designed tax and spending policies. According to Ocran (2009), South Africa's fiscal policy effectiveness since 1994 has been uneven. The level of Government Expenditure (GEXP) is another aspect of fiscal policy that determines the rate of economic growth (Ali, 2005). South Africa's growth potential, on the other hand, has yet to be achieved. Slow economic growth has put great strain on the government's budget. In 2020, the South African GDP reduced by an estimated –6.96% (World Bank, 2021). Given the opposing results of existing studies, Adeoye (2006) claimed that the argument over the effectiveness of fiscal policy as a tool for encouraging growth and development remained unclear. According to Barro (1989 and 1991), the rate of per capita GDP growth and the investment-to-GDP ratio are both adversely linked with government spending as a ratio of GDP. Government consumption, according to Barro (1991), causes economic distortions and gives no countervailing stimulus to GDP and investment. Kormendi and Meguire (1985), on the other hand, find no evidence that increasing the government consumption-to-output ratio has an adverse impact on economic growth.

The alignment of government spending and taxation is a key aspect in fiscal policy, since various components of spending and forms of taxes levied can have significantly varied long-term effects (Halkos and Paizanos, 2016). To finance increasing government spending, additional tax revenues and borrowing are necessary. More borrowing by the government, according to Halkos and Paizanos (2016), can crowd out private investment by increasing interest rates and resulting in higher income tax rates in the future. Based on endogenous growth theory, King and Rebelo (1990) found that a hike in the tax rate is related with a decline in long-term economic growth. Moreover, according to Browning (1976), a higher corporate tax rate lowers the investment rate of return, resulting in fewer risks and investment projects being undertaken by the private sector, ultimately reducing private sector productivity. Individually, higher rates of labor income tax shrink employees' income, skew their incentives to engage in the job market, and so reduce supply of labor.

The debt profile of South Africa is also rapidly expanding. The government debt stands at 77.1% of GDP in 2020, according to National Treasury (2021), and interest payments continue to rise rapidly. The budget balance fell from a surplus of 1.7% of GDP to a deficit of 6.3% of GDP between 2007 and 2009. South Africa's debt-to-GDP ratio climbed steeply as a result since that period. Unemployment, poverty, and inequality, on the other hand, continue to be major concerns in the country. Instead of decreasing, the unemployment rate has risen from 17% in 1994 to 28.74% in 2020 (Stats SA, 2021). The gap between rich and poor continues to widen. The country's Gini coefficient, which measures income inequality, was predicted to be 0.63 in 2014 (HSRC, 2014), making it one of the highest in the world. South Africa need stronger, more persistent, and inclusive economic growth to address the issues of high joblessness, poverty, and inequality. Fiscal policies can play a significant role in boosting human capital investment. Human capital has long been recognized as one of the most important determinants of long-term growth, as Lucas (1988), Mankiw *et al.* (1992), and Barro (2001) have pointed out.

In light of the argument, the question that arises is: what has been the effectiveness of fiscal policy on the country's economic growth throughout time? Our goal in this paper is not to resolve the argument between fiscal policy and growth, but rather to add to the literature by examining the impact of fiscal policy on economic growth in an emerging market like South Africa. The paper's motivation is that the debate over the effectiveness of fiscal policy in stimulating growth has received little attention thus far. As a result, this paper aims to contribute to the public debate on the subject, but from a South African empirical perspective. In an emerging country like South Africa, the primary goal of fiscal policy is to mobilize resources (investment) in both the private and public sectors. Due to the obvious low rate of savings, the national and per capita incomes are extremely low. Fiscal policy may assist to increase economic growth by increasing investment in both the public and private sectors. As a result, multiple fiscal policy measures such as taxes, public borrowing, and deficit financing should be employed in tandem to avoid adversely affecting consumption, production, and wealth distribution.

Following the introduction in Section 1, the paper is ordered as follows: Section 2 presents the literature review, whereas Section 3 discusses the data, model specification, and technique. The empirical findings are presented and discussed in Section 4, and the study is concluded in Section 5.

2. Literature Review

Three important angles derived with micro basics are commonly noticeable in theoretical models on the effects of fiscal policy: Neoclassical theory, new Keynesian theory, and endogenous growth. According to Keynesians, the greatest ways to boost aggregate demand are to increase government spending and lower tax rates. In times of recession or low economic activity, Keynesians contend that this approach should be employed as a critical instrument for laying the groundwork for robust economic growth and achieving full employment. The new deal's premise was that the associated deficits would be compensated for by an increased economy during the boom that would follow (Giavazzi, 1990). Fiscal policy, according to neoclassical growth theory, can only have a transitory influence on growth, and in the long run, the economy expands at the exogenously determined pace of technological advancement, which should be equivalent in all nations in the long run (Solow, 1956; Swan, 1956). This is crucial because the long-run effects of fiscal policy are less substantial when countries' long-term growth rates are comparable (Gwartney *et al.*, 1998). Endogenous-growth literature, on the other hand, contends that fiscal policy's transitory impacts become permanent effects, implying that fiscal policy has a long-term influence on economic growth (Romer, 1986; Jones *et al*., 1993; Rebelo, 1991, Turnovsky, 2004). The magnitude of the effects, on the other hand, is determined by the effectiveness of fiscal tools, the flexibility of the labor supply, and the ability of technology to amass human capital and produce new commodities (Easterly and Rebelo, 1993).

Several scholars have written on various elements of fiscal policy particularly as it relates and affects the economy's macroeconomics. The influence of fiscal policy on economic growth is an age-old subject that has prompted much discussion in both industrialized and emerging countries (Nwankwo *et al.*, 2017). Agu *et al.* (2015) used descriptive statistics to show the contribution of government fiscal policy to economic growth, as well as to ascertain and explain growth rates, and an Ordinary Least Square (OLS) in a multiple form to ascertain the link between economic growth and **GEXP** components after ensuring data stationarity to determine the impact of various components of fiscal policy on the Nigerian economy. According to the findings, overall **GEXP**s have tended to rise in lockstep with government revenue, with expenditures peaking ahead of revenue. Investment expenditures were significantly lower than recurrent expenditures, indicating the country's dismal economic growth. As a result, there appears to be a linkage between government spending on economic services and economic growth. Similarly, Ubesie (2016) investigated the impact of fiscal policy on Nigerian economic growth. The study relied on secondary data from the Central Bank of Nigeria's (CBN) Statistical Bulletin, which covered the years 1985 to 2015. After confirming data stationarity, descriptive statistics and the OLS multiple regression analytical approach were utilized for data analysis. According to the findings, overall **GEXP**s are strongly and positively connected to government revenue, with spending peaking quicker than revenue. Investment expenditures were significantly lower than recurrent expenditures, indicating the country's dismal economic growth.

Using the Auto Regressive Distributed Lag (ARDL) model, Shahid and Naved (2010) investigated the effectiveness of fiscal policy and its impact on macroeconomic activities in Pakistan from 1972 to 2008. They discovered that the overall fiscal deficit has a negative impact on economic growth in the long run. As a result, this analysis suggests that Pakistan experiences expansionary fiscal contraction. They apply the Error Correction Mechanism (ECM) to estimate short-run dynamics. The total budget deficit has a substantial influence on economic growth in the short term. According to the report, the budget deficit should be kept within a restricted range of 3 to 4% of GDP. Munongo (2012) looked on the effectiveness of fiscal policy in boosting Zimbabwe's economic growth. Annual data from 1980 to 2010 was used. The series' unit roots were investigated using the Augmented Dickey-Fuller (ADF) approach, followed by a cointegration test using the Johansen approach. Short-run dynamics were modeled using error-correction methods. The findings show that government consumption spending and income tax have a positive influence on economic growth throughout the study period, while government capital expenditure has a negative impact, and the cointegration test confirms that there is a long-run link between them. Ali (2014) looked at the impact of fiscal policy on Jordan's economic development from 1989 to 2013. A mathematical model was created to quantify the impact of fiscal policy on Jordan's economic development. The author discovered that current spending and annual tax revenues have a statistically significant influence on Jordanian economic development, while capital expenditures have a statistically significant negative effect on Jordanian economic development.

Agyemang (2013) investigated the linkage between Ghana's fiscal policy and economic growth. For the analysis of the study, a dynamic approach to the Keynesian framework was utilized to reduce the chance of estimating misleading results while simultaneously collecting both short and long run information. Economic growth drives indirect taxes, exports, and domestic borrowing, according to the study, whereas private investment promotes economic growth. The conclusion also demonstrates that indirect taxes induce GEXP, but that increase in GEXP supports both domestic and international borrowing, as well as domestic borrowing driving investment growth. Hoppner (2011) used a structural VAR technique using quarterly data from 1970 to 2000 to investigate the impact of fiscal policy on output in Germany. The findings revealed that tax shocks had a negative impact on GDP whereas expenditure shocks have a favorable one.

Ocran (2009) used the structural Vector Autoregression (VAR) estimation technique to examine the effect of fiscal policy variables associated with GEXP, tax revenue, and budget deficits on economic growth in South Africa from 1990 to 2004. The findings confirmed the theory that government consumption expenditure has a large beneficial impact on economic growth. The government's Gross Fixed Capital Formation (GFCF) has a positive influence on output growth as well, although it is smaller than the impact of consumption expenditure. Tax revenue has a favorable impact on output growth as well. The amount of the deficit, on the other hand, has little bearing on growth results. Leshoro (2017) used the ARDL approach to investigate the effects of government investment and consumption spending, as well as groups of control variables, on economic growth in South Africa. The study utilized annual data from 1976 to 2015. During the time studied, the results reveal that disaggregated GEXP is positively associated to economic growth both in the long and short run. Murwirapachena (2011) investigated the influence of South Africa's fiscal policy on unemployment. Annual time series data from 1980 to 2010 were used in the study. The impacts of fiscal policy aggregates on unemployment in South Africa were studied using a Vector Error Correction Model (VECM). Government investment spending, government consumption expenditure, and tax were the fiscal policy aggregates examined in this study. According to the findings of this study, government consumption spending and taxes have a beneficial influence on unemployment in South Africa, but government investment expenditure has a negative impact.

We may conclude from the literature studies that the influence of fiscal policy on economic activity is ambiguous because various research produced different outcomes for the same variables and even for the same country. Taxation has a less equivocal influence on long-run growth rates than government spending, and it tends to be negative, as most studies show.

3. Methodology

3.1. Data and Source

Annual time series data from 1980 to 2020 were used in the study. The South African Reserve Bank (SARB) provided all of the data.

Table 1: Summary of Variables, Data Source and Expected Signs of Their Coefficients

Variables Explanations	Variables Symbols	Source	Expected, A Prior
Real Gross Domestic Product per capita	RGDP	SARB	+ (positive)
Real Gross Fixed Capital Formation % of GDP	GFCF	SARB	+ (positive)
Real Government Expenditure % of GDP	GEXP	SARB	+ (positive)
Real Government Debt % of GDP	GOVD	SARB	– (negative)

3.2 Description of Variables

The Real GDP (RGDP) per capita is represented as . It is calculated by multiplying the actual GDP by the total population. It depicts South Africa's economic growth from 1980 to 2020. The government's GFCF is used to account for investment spending. It's calculated by multiplying the real GFCF by GDP. GEXP as a ratio of GDP (GEXP) gives a sense of how huge the government is in different nations. This indicator's wide range reflects the diversity of nations' ways to delivering public goods and services and providing social security, rather than disparities in resources spent. The general government debt-to-GDP ratio Government Deficit (GOVD) is the overall gross government debt as a fraction of a country's GDP. It is a critical aspect in the long-term viability of government finances and a measure of an economy's health.

3.3. Model Specification

The author considers a Cobb-Douglas production function, which is described as follows, in accordance with Rivera-batiz (2004) and Iheanacho (2016).

$$Y = AL^{\alpha}K^{\beta} \qquad ...(1)$$

where Y is economic growth as expressed by **RGDP** per capita, K is capital stock as measured by **GFCF**, and A is total factor productivity, the proportion of output that goes to capital and the share that goes to labor is determined. Assuming the author adds Real GEXP percentage of GDP and Real Government Debt ratio of GDP to the neoclassical Cobb-Douglas production, $A = f$ (Real GEXP percentage of GDP and Real Government Debt ratio of GDP), whereas L cancels out on both the right and left sides of the equation to yield RGDP and GFCF, respectively. As a result, the Neo-classical Cobb-Douglas model might be revised to produce the following model:

$$RGDP = f(GFCF, GEXP, GOVD) \quad ...(2)$$

The following equation may be stated in econometric model and natural log form as follows:

$$\ln RGDP = \alpha_0 + \beta_1 \ln GFCF + \beta_2 \ln GEXP + \beta_3 \ln GOVD + \varepsilon_t \quad ...(3)$$

Where *lnRGDP* is log of Real GDP per capita, *lnGFCF* is log of gross fixed capital formation, *lnGEXP* is log of real government expenditure, *lnGOVD* is a log of government debt ε_t is the error term and α_0 is the intercept.

3.4. Estimation Techniques

3.4.1. Unit Root Test

The unit root tests ADFand Phillips-Perron (PP) are the focus of this research. Before applying the cointegration test in time series analysis, the variables must be checked for stationarity. As a result, we use unit root tests to determine the order of integration of all variables by testing for the null hypothesis H_0:=0 (i.e., has a unit root), and the another hypothesis is H_1: 0. To prevent erroneous results, all variables should be integrated at first order difference I(1).

3.4.2. Cointegration

This research examines cointegration using VAR. The goal is to capture the causal dynamics of the link between fiscal policy and economic growth while also observing long and short run dynamics. Given a VAR with probable long-run cointegration among a collection of variables, for example.

As a result, we begin with the Johansen cointegration equation, which begins with the VAR of order p and is written as follows:

$$Y_t = \mu + A_1 Y_{t-1} + \ldots\ldots A_p Y_{t-p} + \varepsilon_t \quad ...(4)$$

where Y_t is a (nx1) vector of variables in log form that have been integrated at order one-denoted 1(1), n = $5A_p$ are the parameters to be estimated, and ε_t are the random errors. This (VAR) may be rephrased as follows:

$$\Delta Y_t = \mu + \Pi Y_{t-1} + \sum_{i-1}^{p-1} \Gamma_i \Delta Y_{t-i} + \varepsilon_t \quad ...(5)$$

where, $\Pi = \sum_{i-1}^{p} A_1 - 1$

$$\Gamma_i = \sum_{i-i+1}^{p} A_j \quad ...(6)$$

If the coefficient matrix has a reduced rank of $r < n$, then there are $n \times r$ matrices of α and β each with a rank of r.

$$\Pi = \alpha\beta' \quad ...(7)$$

The element is known as the adjustment parameters in the VECM, and each column of β is a cointegrating vector, where r is the number of cointegrating relationships. After adjusting for delayed differences and deterministic variables where available, the maximum likelihood estimator of â outlines the combination of y_{t-1} that yields the r greatest canonical correlations of Δ_y with y_{t-1} for a given r. The trace test and the maximum eigenvalue test are two distinct likelihood ratio tests of significance for these canonical correlations, as indicated in equations 5 and 6 below.

$$\lambda_{trace}(r) = -T \sum_{1-r+1}^{n} \ln(1 - \lambda_1) \quad ...(8)$$

$$\lambda_{max}(r, r+1) = T \ln(1 - \lambda_{r+1}) \quad ...(9)$$

T is the sample size, and λ_i is the i^{th} ordered eigenvalue (or greatest canonical correlation) from the Π matrix in equation 3. The trace compares the null hypothesis that there are r cointegrating vectors to the alternative hypothesis that there are n cointegrating vectors, with n being the number of endogenous variables. The greatest eigenvalue is used to compare the null hypothesis of r cointegrating vectors against the alternative of r + 1.

The long run coefficients of the variables are estimated after checking for cointegration among the variables. The optimal lag length was determined using VAR Lag Order Selection Criteria in this study. The lack of cointegration among the variables shows that causation in at least one direction does not exist. The error correction model generated using VAR is used to test the short run equilibrium association. In this study, the VAR analysis is based on equation 2, and the short run model is as follows:

$$\Delta \ln RGDP_t = \alpha_0 + \sum_{i-1}^{n} \beta_{1I}\, \Delta \ln RGDP_{t-1} + \sum_{i-1}^{n} \beta_{2I}\, \alpha_0 + \sum_{i-0}^{n} \beta_{2I}\, \Delta \ln GFCF_{1t-1}$$

$$+ \sum_{i-0}^{n} \beta_{3I}\, \Delta \ln GEXP_{2t-1} + \sum_{i-0}^{n} \beta_{3i}\, \Delta \ln GOVD_{2t-1} + \lambda_1 ECM_{t-1} + \mu_t \quad ...(10)$$

The error correction term ECM_{t-1} is derived from the cointegration model. The pace at which the cointegration model corrects its preceding period's disequilibrium or speed of adjustment to reestablish the long run equilibrium connection is indicated by the error coefficients (λ_1). Any short-run mobility between the dependent and explanatory variables will gather back to the long-run link if the ECM_{t-1} coefficient is negative and significant.

Diagnostic tests are used to check the model's adequacy of fit. Diagnostic tests look for serial correlation and heteroscedasticity in the model.

3.4.3. Granger Causality Test

One of the ultimate objectives of empirical econometrics has been to investigate causal associations between economic variables. Cointegrated variables, according to Engle and Granger (1991), must have an error correcting representation. If non-stationary series are cointegrated, one of the series must granger cause the other, according to the Granger representation theorem (Gujarati, 2001). Granger causality is used to investigate the direction of causation in the presence of cointegrating vectors, and it is based on the following:

$$\Delta Y_t = \delta_0 + \sum_{i-1}^{n} \beta_{1i}\, \Delta Y_{t-1} + \sum_{i-1}^{n} \beta_{2i}\, \Delta X_{1t-1} + \grave{\omega}_{1i}\, ecm_{t-1} + v_t \quad ...(11)$$

$$\Delta X_t = \delta_0 + \sum_{i-1}^{n} \beta_{1i}\, \Delta Y_{t-1} + \sum_{i-1}^{n} \beta_{2i}\, \Delta X_{1t-1} + \grave{\omega}_{2i}\, ecm_{t-1} + v_t \quad ...(12)$$

Our non-stationary dependent and independent variables are Y_t and X_t, ECM is the error correction term, and $\grave{\omega}_{1i}$ and + $\grave{\omega}_{2i}$ are the adjustment speeds. The subscripts *t* and *t-i* signify the current and lagged values, respectively. Φ is the optimal lag order. The error correction terms will not show in equations 11 and 12 if the series are not cointegrated.

3.4.4. Variance Decomposition

Once a VAR model has been fitted, variance decomposition assists in interpretation it. In VAR models, the variance decomposition shows how much information each variable provides to the other variables. It shows us how much of a sequence's motions are caused by its own shock and other identifiable shocks (Enders, 2004). As a result, variance decomposition can reveal the relative relevance of each variable in explaining fluctuations in the VAR's endogenous variables. The residuals in the equations must be orthogonalized to allocate variance shares to the different variables. As a result, the Cholesky decomposition method will be used in the research.

4. Results and Discussion

4.1. The Unit Root Test

To establish the presence of unit roots and the sequence of integration in all the variables, stationarity testing was conducted using ADF and PP unit root tests, first in levels and then in first difference.

The results of the ADF test were used to identify the order of integration of the series. The ADF unit roots test revealed that lnRGDP and lnGOVD are non-stationary (have unit roots) at levels, so the null hypothesis of unit root for the variables cannot be rejected at levels; however, the variables become stationary after first differences, with the exception of lnGFCF and lnGEXP, which are stationary at levels. We reject the null hypothesis of unit root for the variables because the critical values are less than the ADF test statistics at the 5% level of As a result, we conclude that all of the gathered time series are stationary.

The findings of the PP test were used to identify the order of integration of the series. The results of the PP unit roots test, shown in Table 2(b), indicated that all four variables are non-stationary (have unit roots) at levels, with the exception of lnGEXP, which is stationary at all levels. As a result, the null hypothesis of unit root for all variables cannot be rejected at levels; nevertheless, the null hypothesis of unit root for all variables becomes stationary after the first differences, i.e., I(1), (except of lnGEXP), since the critical values are less than the PP test statistics at 5% level of significance, we reject the null hypothesis. As a result, we conclude that all of the gathered time series are stationary.

Table 2: Unit Root Results				
Variables	**PP Test Stat**	**Critical Value**	**Remark**	**Order of Integration**
(a) ADF Unit Root Test Result				
lnRGDP	-4.051067	-2.948404**	Stationary	I(1)
lnGFCF	-3.045421	-2.948404**	Stationary	I(0)
lnGEXP	-3.902310	-2.945842**	Stationary	I(0)
lnGOVD	-3.165944	-2.948404**	Stationary	I(1)
(b) PP Unit Root Test Result				
lnRGDP	-4.051067	-2.948404**	Stationary	I(1)
lnGFCF	-3.045421	-2.948404**	Stationary	I(0)
lnGEXP	-3.902310	-2.945842**	Stationary	I(0)
lnGOVD	-3.165944	-2.948404**	Stationary	I(1)
Note: (*), (**) and (***) indicate significant at 1%, 5% and 10% respectively. All the variables are log linearized.				
Source: Authors' computation				

4.2. The Johansen Cointegration

After determining the order of integration, we looked for cointegration between the dependent and independent variables to see if there was a long-term link. The optimal lag length is calculated using the VAR approach, with the optimal lag length being "2" according to the Final Prediction Error (FPE), Akaike Information Criterion (AIC), and Hannan-Quinn information criteria (HQ).

Table 3 shows the Trace and Maximum Eigenvalue used to establish the order of integration in the Johansen test of cointegration. Since *p*-value 0.05, we reject the null hypothesis that none of the variables are cointegrated, but trace Eigenvalue reveals that there are at most two cointegrating equations or that *p*-values are more than 0.05 for trace, we reject the null hypothesis that none of the variables are cointegrated. The maximum Eigenvalue shows that the null hypothesis of no cointegration is accepted. That is, there is no long-run causation between the variables. Variables have only a short-run casualty. We have observed that variables are not cointegrated at Maximum Eigenvalue, hence the VECM model cannot be used. We may, however, utilize an unrestricted VAR model instead.

Table 3: Johansen Cointegration Test Results				
(a) Trace Statistic Cointegration Result				
Hypothesized No. of CE(s)	**Eigenvalue**	**Trace Statistic**	**0.05 Critical Value**	**Prob.****
None*	0.541521	59.03905	47.85613	0.0032
At most 1*	0.408881	32.52449	29.79707	0.0237
At most 2	0.343702	14.64941	15.49471	0.0668
At most 3	0.009677	0.330636	3.841466	0.5653
Note: Trace test indicates 2 cointegrating eqn(s) at the 0.05 level; *denotes rejections of the hypothesis at the 0.05 level.				
Source: Authors' computation				

Table 3 (Cont.)

(b) Maximum Eigenvalues Cointegration Result

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None*	0.541521	26.51457	27.58434	0.0680
At most 1	0.408881	17.87508	21.13162	0.1346
At most 2*	0.343702	14.31877	14.26460	0.0490
At most 3	0.009677	0.330636	3.841466	0.5653

Note: Max test indicates no cointegrating eqn(s) at the 0.05 level; *denotes rejections of the hypothesis at the 0.05 level.

Source: Authors' computation

4.3. Normalized Cointegrating Coefficients

In the long term, all exogenous factors have a negative connection with RGDP, according to the cointegrating equation. In the long term, a unit reduction in GFCF, GEXP, or GOVD reduces RGDP by 1895.563, 3972.556, or 162.2438 units, respectively.

Table 4: Normalized Cointegrating Coefficients (Cointegrating Equation)

RGDP	GFCF	GEXP	GOVD
1.000000	-1895.563 (172.037)	-3972.556 (391.763)	-162.2438 (56.3785)

Source: Authors' computation

4.4. The Granger Causality Test

The study uses a pair wise Granger causality test with lag 2 to determine the direction of causation between fiscal policy variables and economic growth. The findings are shown in Table 5.

The Granger causality test findings for the variables are shown in Table 5, indicating bidirectional causation from GFCF to RGDP, RGDP to GFCF; GEXP to RGDP, RGDP to GEXP. The Granger causality test also reveals that there is unidirectional causation between GOVD and RGDP, as well as RGDP and GOVD.

Table 5: Granger Causality Tests

Null Hypotheses	Obs.	*F*-Statistics	Probability
GFCF does not Granger-Cause RGDP	35	5.32280	0.0105
RGDP does not Granger-Cause GFCF	35	8.750356	5.E-05
GEXP does not Granger-Cause RGDP	35	5.36326	0.0102
RGDP does not Granger-Cause GEXP	35	2.68463	0.0846
GOVD does not Granger-Cause RGDP	35	0.50139	0.6107
RGDP does not Granger-Cause GOVD	35	3.14392	0.0576

Source: Author's Computation

4.5. Error Correction Model (ECM)

Included observations: 39 after adjustments.

$$RGDP = C(1)*RGDP(-1) + C(2)*RGDP(-2) + C(3)*GFCF(-1) + C(4)*GFCF(-2) + C(5)*GEXP(-1) + C(6)*GEXP(-2) + C(7)*GOVD(-1) + C(8)*GOVD(-2) + C(9)$$

The Error Correction Model and its coefficient, as well as their *t*-statistic and *p*-value, are listed in Table 6. In the short run, the estimated lagged GFCF is positive and insignificant with economic growth (RGDP), according to the ECM equation. Sunny and Osuagwa (2016) found a positive association between GFCF and economic growth in Nigeria, and this conclusion is consistent with their prior findings. Similarly, in the short run, the estimated model lagged GEXP is positively associated to economic growth. In the short run, this means that GEXP stimulates economic growth in South Africa. The findings are consistent with those of Agu *et al.* (2015), who discovered a positive relationship between government spending and economic growth in Nigeria. Lastly, the estimated model, lagged GOVD, on the other hand, was shown to be a negative and insignificant driver of RGDP. The findings are consistent with Dao's (2013) paper, which found that the budget deficit has a negative but slight impact on economic growth in Vietnam.

Table 6: Error Correction Model (VAR) Results

	Coefficient	Std. Error	*t*-Statistic	Pro.
ECM_{t-1}	1.141608	0.188438	6.058280	0.0000
ΔRGDP	0.030568	0.248025	0.123246	0.9029
ΔGFCF	-48.87024	176.8681	-2.763090	0.0104
$\Delta GFCF_1$	89.08681	161.0524	0.553154	0.5849
ΔGEXP	-904.4328	306.4158	-2.951654	0.0066
$\Delta GEXP_1$	355.3249	340.7677	1.042719	0.3067
ΔGOVD	25.03967	87.27785	0.286896	0.7765
$\Delta GOVD_1$	-63.32851	88.19524	-0.718049	0.4791
Constant	11355.19	6897.661	1.646238	0.1118
R^2	0.974268		Mean dependent var	48491.20
Adjusted R^2	0.966351		S.D. dependent var	4646.649
S.E. of regression	852.3710		Akaike info criterion	16.55096
Sum squared resid	18889945		Schwarz criterion	16.95090
Log likelihood	-280.6417		Hannan-Quinn criter.	16.68902
F-statistic	123.0523		Durbin-Watson stat	1.659916
Pro(F-statistic)	0.000000			

Source: Authors' computation

Since GFCF and GEXP are vital for economic growth, the findings are in accordance with expectations. The results indicate the impact of GFCF and GEXP on economic growth, with an increase in GFCF and GEXP leading to increases in economic growth of 89.08681 units and 355.3249 units, respectively. Capital formation may aid a country's self-sufficiency and reduce foreign debt burdens. However, because of the high level of government debt, the GOVD was expected to be negatively related with economic growth. When the government's overall expenditures exceed its entire revenue, the result is a government deficit. In this aspect, South Africa is really not expected to perform well. The government debt has risen dramatically since 2009, according to the National Treasury (2019). Economic growth is hindered by rising debt and debt servicing expenses. The government deficit problem is not unique to South Africa; it affects the majority of emerging countries.

An examination of the econometric data reveals that the overall fit is good, with an R^2 of 0.966351, implying that the independent variables explain 0.96% of the systemic variation in the dependent variable. The coefficient of the cointegrated model with RGDP as the dependent variable is ECM_{t-1}, whereas the short run coefficients are RGDP, GFCF, GEXP, and GOVD. The results show that the cointegrating link coefficient in the ECM_{t-1} equation is positive and significant, indicating that there is no adjustment to the equilibrium. The three independent variables GFCF, GEXP, and GOVD have no long-run casualty. As a result, our three independent variables, GFCF, GEXP, and GOVD, have no effect on the dependent variable, RGDP, in the long run. In other words, from GFCF, GEXP, and GOVD to RGDP, there is no long-term casualty run. The diagnostics' DW test was likewise significant at 1.659916. Also, the *F*-statistic value was significant at 123.0523 [0.000000].

4.6. Wald Test

The Wald test will be used to determine the degree of significance of the variables, with the goal of determining if there is any short-run causation between fiscal policy and economic growth.

Table 7 (a) and (b) show the Wald test findings, which were used to see if lnGFCF and lnGEXP have any short-run effects on lnRGDP. The lnGFCF and lnGEXP have a short-run casualty effect on the lnRGDP, according to the findings. Table 7(c) shows the findings of the Wald Test, which was used to see if lnGOVD had any short-term effects on lnRGDP.

Table 7: Wald Test Results

(a) Short-term impact of gross fixed capital formation (lnGFCF) on economic growth (lnRGDP)			
Test Statistic	**Value**	**df**	**Probability**
F-statistic	4.084528	(2, 26)	0.0287
Chi-square	8.169056	2	0.0168
Null Hypothesis: C(3)=C(4)=0			
Null hypothesis Summary			
Normalized Restriction (=0)	Value	Std. Err.	
C(3)	-488.7024	176.8681	
C(4)	89.08681	161.0524	
Restrictions are linear in coefficients.			
(b) Short-term impact of government expenditure (lnGEXP) on economic growth (lnRGDP)			
Test Statistic	**Value**	**df**	**Probability**
F-statistic	4.384147	(2, 26)	0.0229
Chi-square	8.768295	2	0.0125
Null Hypothesis: C(5)=C(6)=0			
Null hypothesis Summary			
Normalized Restriction (=0)	Value	Std. Err.	
C(5)	-904.4328	306.4158	
C(6)	355.3249	340.7677	
Restrictions are linear in coefficients.			

Table 7 (Cont.)			
(c) Short-term impact of government debt (lnGOVD) on economic growth (lnRGDP)			
Test Statistic	Value	df	Probability
F-statistic	1.129289	(2, 26)	0.3414
Chi-square	2.240578	2	0.3262
Null Hypothesis: C(7)=C(8)=0			
Null hypothesis Summary			
Normalized Restriction (=0)	Value	Std. Err.	
C(7)	25.03967	87.27785	
C(8)	-68.32851	88.19524	
Restrictions are linear in coefficients.			

The findings reveal that there is no short-run causation between lnGOVD and lnRGDP. This suggests that lnGOVD has no significant influence on lnGDP in the short run.

4.7. Residual Analysis

Table 8: Residual Analysis Results		
Tests	**Values**	***P*-values**
Breusch-Godfrey Serial LM	4.511677	0.1048
Breuch-Pagan Godfrey Heteroskedasticity	8.750356	0.3638
Jarque-Bera Normality	2.048293	0.359103
Source: Author's Computation.		

4.8. Variance Decomposition

The variance decomposition in VAR models demonstrates how much information each variable offers to the other variables. It demonstrates how much of a sequence's motion is generated by its own shock as well as additional shocks that may be identified (Enders, 2004).

Table 9: Variance Decomposition of RGDP					
Period	**S.E.**	**RGDP**	**GFCF**	**GEXP**	**GOVD**
1	852.3710	100.0000	0.000000	0.000000	0.000000
2	1403.798	87.49193	1.366723	11.04904	0.092310
3	1789.304	79.16457	6.011075	14.12379	0.700565
4	2079.941	70.97127	11.01906	14.76435	3.245319
5	2331.985	64.06881	15.27393	13.91573	6.740429
6	2563.513	58.66652	18.61184	12.92974	9.791895

Table 9 (Cont.)

Period	S.E.	RGDP	GFCF	GEXP	GOVD
7	2778.473	54.51794	21.41626	12.04379	12.02201
8	2976.461	51.25495	23.92676	11.26469	13.55359
9	3157.387	48.64165	26.24172	10.54040	14.57623
10	3322.485	46.54002	28.38680	9.859870	15.21331

Source: Author's Computation

Variance decomposition, according to Lutkepohl (2007), defines how much information each variable provides to the other variables in the auto regression. Table 6 shows the variance decomposition for economic growth (RGDP) and the contribution of the independent variables during the next ten years. Economic growth accounted for 100% of the changes in the first year. GFCF accounts for 1.37% of economic growth in the second year, GEXP 11.05%, and GOVD 0.09%. This shows a considerable rise in GFCF from the third to the tenth year, demonstrating a major influence on economic growth during the projection period. Government debt, on the other hand, has risen, although at a decreasing rate, as seen in the table. There is extremely little variation in GEXP.

5. Conclusion

Fiscal policy, in general, may be regarded as one of the most significant economic policies pursued by selected economic policymakers. The study uses annual time series data from the SARB from 1980 to 2020 to assess the relative effectiveness of fiscal policy on economic growth in the context of South Africa. All four variables were stationary at levels or first difference, according to the results of the ADF and PP unit roots. At Maximum Eigenvalue, the four variables are not cointegrated. The Error Correction Model estimated using VAR demonstrates that our two independent variables, GFCF and GEXP, have a short-term influence on the dependent variable, RGDP. In other words, in South Africa, there is a positive association between fiscal policy and economic growth. GOVD, on the other hand, has a negative relationship with RGDP. The residuals of the VAR test for adequacy show that they are homoskedastic, have no serial correlation, and are normally distributed, indicating that the model is good.

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