Domestic Savings And Economic Growth in South Africa

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DOMESTIC SAVINGS AND ECONOMIC GROWTH

The case of South Africa

Abstract

This paper examines the causal relationship between domestic saving and economic growth in South Africa from the period of 1960 – 2013. The VAR based Johansen co-integration test is employed to check the long-run relationship and the Granger causality test is used to check the causal relationships. The Johansen co-integration test shows that there is one co-integrating vector where gross fixed capital formation (GFCF) is included in the model as an exogenous variable. This implies that having GFCF as exogenous variable in the saving-growth model, at least there should be one direction of causality in the tri-variate model. The granger causality test reveals the existence of 5% statistically significant unidirectional causality that runs from gross saving and economic growth to the gross fixed capital formation in both the second and the third lags of the estimation. This finding recommends economic policy makers of the country to focus on boosting economic growth and domestic savings to enhance the gross capital formation. Further studies should also be conducted to identify the major determinants of economic growth and national savings so that policy makers can work on these factors to encourage the capital formation process.

Domestic Savings and Economic Growth:

The case of South Africa

Abis Getachew[1]

Introduction

Maintaining economic growth is one of the primary goals of any macroeconomic policy of a given nation. To achieve this goal governments take different measures such as promote saving, encouraging investment and promote technical advancement. There exists a consensus among economists that investment improves productivity and hence economic growth. However, the debate continues on whether saving has a positive or negative impact on economic growth.

In most development literatures, the relationship between saving and economic growth is taken obvious. This is because human and physical investment is considered as one of the most influential variables in the growth of a given economy. In a closed economy gross national saving is the only source of investment that leads higher capital formation and hence higher economic growth. It is therefore for this reason that in most literatures the causal direction between saving and economic growth is assumed to run one way from saving to growth (Deaton, 1999).

This assumption however is rejected by those who consider that aggregate spending as the source of economic growth. Adherents of this theory argue that higher aggregate spending leads to higher output and income through better price incentives. The higher income thus will lead to a higher savings. Empirical studies such as Carroll and Weil (1994) recommend that economic growth should come first in order for savings to rise. Such findings encourage economists to further analyse the direction of causality between saving and economic growth.

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Studying the causal relationship between saving and economic growth is important at this moment mainly because if findings suggest that saving causes economic growth then government policy makers should promote saving to enhance the economic growth. On the other hand, if it is the economic growth that causes saving then, policy makers should eliminate all the obstacles for economic growth in order to boost saving.

This study uses variables of Gross Domestic Product (GDP), Gross Domestic Saving (GDS) and Gross Fixed Capital Formation (GFCF) from the year 1960 – 2013 obtained from the World Bank database. To address the objectives, the study employs the Johansen co-integration test and its associated vector error correction model to assess the causal relationships between saving, economic growth and capital formation as well.

This paper is organized into four sections. The second section focuses on the literature reviews on savings and economic growth. The third section discusses about the methodology, the data and the model framework. The fourth section deals with model estimations and discusses the empirical findings. The last section concludes the findings and provides policy recommendations based on the findings of the study.

Literature Review

The Classical economic theory explanation of savings and economic growth states that saving is the major source of economic growth by stimulating investment. To achieve the point of equilibrium in the money market the Classical loanable funds theory states that the aggregate saving which is aggregate supply of the loanable funds, equals the aggregate demand of the loanable funds, investment. In other words, the funds pooled from the savings will be changed to investment spending leading to higher economic growth. Thus, for the classical economics saving enhances the rate of economic growth (Hansen 1937: 430).

On the other hand, the Keynesian economics argues saving is not the source of growth rather it is considered as one of the leakages of the economy. Out of the total income earned by an individual certain percentage of the income is consumed while the remaining amount is saved. If saved, then the current consumption is expected to fall dwindling aggregate demand below the aggregate supply. The fall in prices due to the drop in aggregate demand call suppliers to cut back their production. Hence, investment and economic growth fall while unemployment rises. Therefore, for the Keynesian economics, saving has a negative impact on the growth of the economy (Hansen 1937: 431 – 32).

Likewise, numerous empirical studies have conflicting findings on the casual relationship between the two variables. A panel study among eighty four different groups of countries is carried out by Konya (2005) using Granger causality test. The result shows that one way causality runs from growth to saving in Finland, France, Japan, Switzerland, Saudi Arabia, Sweden and Niger. On the other hand, one way causality from saving to growth exists in Ireland, Mauritania, Trinidad & Tobago and Central African Republic. In all other cases, there is no empirical evidence of Granger causality in either direction.

The study of Abu Al-Foul (2010) on the casual relationship between saving and GDP growth in (Middle East and North African) MENA countries founds out that there exists a long-run relationship between saving and economic growth while there is no evidence of long-run relationship in the case of Tunisia. Vis-à-vis the causal relationship, bidirectional causality between economic growth and saving exists however, in the case of Tunisia unidirectional granger causality exists that run from saving to economic growth.

The other study on the Arab States of the Gulf by Alomar (2013) shows that in these Gulf States it is economic growth that granger causes the growth in the saving rate. However, in the case of Oman the opposite holds that it is the increase in the saving rate that granger causes the rise in the economic growth. The main finding of this study suggests that the income source of the country is important in determining the causal direction of the two macroeconomic variables. For countries whose income source is the export of natural resources then causality runs from economic growth to saving. While nations that are not highly dependent on natural resources have bidirectional causality or in some cases it runs from saving to economic growth.

The study of Sajid and Sarfraz (2008) investigates the causal relationship between savings and national output in Pakistan using co-integration and vector error correction techniques. The study found out that there exists long-run relationship between savings and output level. The study also indicates that both in the long-run and short-run saving causes the level of economic growth.

The Nigerian case on the study of saving and economic growth by Nurudeen ABU (2010) shows that the two variables saving and economic growth are co integrated and the long-run relationship between them exist. On the other hand, the causality test runs from economic growth to saving, rejecting the dominant belief of the neoclassical growth models that saving causes economic growth.

The study of Tina Romm (2003) uses the Johansen co-integration test in analysing the relationship between saving and economic growth in South Africa over the period of 1946 – 1992. This study finds out that there is both direct and indirect relationship between saving and economic growth. The indirect effect is that saving has a positive effect on investment. On the other hand, growth has a direct positive effect on private saving rate. Thus, the study found out that there exists a virtuous cycle as growth enhances saving and saving in turn enhances growth.

The causal analysis of savings and growth in South Africa by Odhiambo (2009) is the other key study on this area. The study was motivated by low and declining saving rate in South Africa accompanied by the deteriorating economic growth in 1990s. Instead of bivariate causal analysis, this study includes foreign capital inflow in the saving –economic growth model and make the model tri-variate one. Using the data from 1950 – 2005 this study finds out that in the long-run unidirectional causality runs from economic growth to saving and in the short-run, bidirectional causality exists between saving and economic growth. Economic growth further enhances the foreign capital inflow and therefore, the study recommends that saving and economic growth should have to be encouraged in order to attract higher foreign inflow of capital. Also the nation in the long-run should have to focus on achieving higher economic growth to increase savings and foreign capital inflow.

These conflicting findings call for empirical studies on the relationship between savings and economic growth. This study analyses the causal relationship between saving and economic growth in South Africa. Analysing such a relationship is crucial to understand where the South African situation lies in the debate on whether saving causes economic growth or vice versa. It also provides policy makers a clear view on which variable the priority should have to be given on to improve growth of the economy.

This study adds up to the work of Odhiambo (2009) by using the gross fixed capital accumulation (previously known as 'gross domestic fixed investment' in the World Bank dataset) as an exogenous variable rather than the foreign capital inflow. In the study of Odhiambo, the inflow of foreign capital is included in the analysis of saving and economic growth. However, the flow of foreign capital ignores the domestic capital accumulation that helps explain the saving-growth model. On the other hand, the Gross Fixed Capital Formation (GFCF) does not only refer to the capital accumulation that is flowing from overseas but includes domestic capital accumulation as well. Hence, the GFCF can well explain the model in the relationship between domestic savings and GDP growth than the flow of foreign capital. Moreover, this paper adds to the study of Odhiambo (2009), in using the recent year data for the analysis that helps policy makers to understand well the recent dynamics of savings and economic growth in South Africa.

Methodology and Model Estimation

In examining the causal relationship between savings and economic growth the three step procedure is used namely; the unit root test, the co-integration test and the vector error correction model based granger causality test. According to Granger (1969), the causality test has basically two assumptions.

1. The future cannot cause the past. Only the past can cause the present and the future

2. A cause contains unique information about the effect where it cannot be found anywhere else.

In the unit root test, the null hypothesis of non-stationarity is tested against the alternative hypothesis of stationarity. There are a number of methodologies in literature that are used to carry out the unit root test however this study employs the Augmented Dickey Fuller (ADF) test and the Phillips – Perron unit root tests. These tests are selected since they are believed to reduce the drawbacks of the Dickey Fuller unit root test. For instance, if the error terms are found to be correlated in the DF test, the ADF test is powerful in eliminating such problems. The equation of the ADF test is given as,

$$\Delta Y_t = \beta_{1t} + \beta_2 + \delta Y_{t-1} + \sum_{i=1}^{n} \Delta Y_{t-1} + \mu_t \quad \dots \dots (1)$$

where, 't' stands for the time period

μt is the white noise error term

$\Delta Y_{t-1} = (Y_{t-1} - Y_{t-2})$, $\Delta Y_{t-2} = (Y_{t-2} - Y_{t-3})$ and so on.

The Lagrangian multiplier (LM) test is used to check that the residuals are well behaved. LM test is recommended than the Durbin Watson statistic for AR(1) errors whenever we expect the error terms to be correlated with each other.

On the other hand, the Phillips-Perron (PP) test is used to deal with the problem of serial correlation in the error term. The PP test, unlike the ADF test, does not use the lag difference terms but it employs non-parametric statistical methods to get rid of serial correlation problem. The PP unit root test will also be employed in this study.

Once the unit root test is carried out and all variables are found to be integrated in the same order, the second step is the co-integration analysis to obtain the long-run relationship between the relevant variables. Co-integration is the statistical implication of the existence of the long-run relationship. According to Johansen (1988), if two variables are co-integrated then the variables move together over the long-run and any short-run disturbances are corrected based on the long-run trend.

The co-integration analysis in this study is carried out using the vector autoregressive (VAR) based Johansen co-integration test which is developed by Johansen (1988) and further extended by Johansen and Juselius (1990).

Having $Z_t = (GDP_t, GDS_t)$, t=1,2,...T, to define the vector of the time series which is generated by a k^{th} order vector autoregressive (VAR) of the co-integration model is given by,

$$\begin{bmatrix} lnGDP_t \\ lnGDS_t \end{bmatrix} = \begin{bmatrix} C_1 \\ C_2 \end{bmatrix} \begin{bmatrix} lnGDP_t \\ lnGDS_t \end{bmatrix} + \dots + \begin{bmatrix} \alpha_{11}^k & \alpha_{12}^k \\ \alpha_{21}^k & \alpha_{22}^k \end{bmatrix} \begin{bmatrix} lnGDP_{t-1} \\ lnGDS_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \quad \dots \quad (2)$$

Since $Z_t = (GDP_t, GDS_t)$ equation 2 can be re-written as

$$Z_t = A_1 Z_{t1} + \dots + A_k Z_{t-k} + \varepsilon_t$$

Or $Z_t = A(L) Z_{t-1} + \varepsilon_t$

where,

$$A(L) = \sum_{i-1}^{k} A_i L^{i-1} \quad \dots\dots\dots\dots\dots\dots. \quad (3)$$

Both the lag operator and the error terms are identically and independently distributed, $iid(0,\sigma^2)$.

Testing for the co-integration using equation 2, can be carried out by the Johansen (1988) approach of co-integration, where the coefficients are estimated using the maximum likelihood. The Johansen co-integration procedure provides two statistic, the trace test value and the maximum eigenvalue of the matrix, to test the null hypothesis of rank 0 to the alternative hypothesis of rank 1.

The third step will be to assess the VECM based trivariate Granger causality test for each pair of variables that includes the gross fixed capital formation. According to Granger (1980), the past and the present may cause the future but not vice versa. Using the Granger causality test the direction of causation between each pair of variables can be estimated as

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \cdots + \alpha_1 y_{t-1} + \beta_1 X_{t-1} + \cdots + \beta_1 x - 1 + \varepsilon_t$$

$$X_t = \alpha_0 + \alpha_1 X_{t-1} + \cdots + \alpha_1 X_{t-1} + \beta_1 y_{t-1} + \cdots + \beta_1 y - 1 + \mu_t \quad \ldots\ldots\ldots\ldots..(4)$$

The reported F-statistics are the Wald statistics for the joint hypothesis:

$$\beta_1 = \beta_2 = \cdots = \beta_i = 0$$

In the first equation the null hypothesis is X does not Granger cause Y and in the second equation Y does not granger X.

All the data relevant to this study are obtained from the World Bank database from the period of 1960 up to 2013. The variables used are Gross Domestic Savings, Gross Fixed Capital Formation and Gross Domestic Product. The Gross Domestic Saving is calculated as the Gross National Income minus the Final Consumption Expenditure (FCE) measured in current USDs. The Gross Fixed Capital Formation formerly referred as Gross Domestic Fixed Investment includes the land improvements, purchases of plants and machineries by the private sector and the construction and provision of public goods as well. On the other hand, the Gross Domestic Product which is measured as the total output in the domestic economy measured in the current USD.

Estimation and Interpretation of the Results

The estimation process starts from the unit root tests. Table 1, below provides the results of the unit root tests of the relevant variables using the Augmented Dickey Fuller (ADF) test and the Phillips-Perron (PP) tests. The null hypothesis that the individual variable has a unit root is tested at their first differences where the constant and the linear trend are included into the test equation. With maximum of 10 lag, automatic Schwartz Information Criteria (SIC) lag length selection mechanism is used to carry out the test.

Table 1: ADF unit root test results

Variables	Critical values at 5%	Critical Values at 1%	ADF test statistic	Conclusion
lnGDP	-3.500495	-4.148465	-5.797875	I(1)
lnGDS	-3.498692	-4.144584	-5.936697	I(1)
lnGFCF	-3.498692	-4.144584	-5.972192	I(1)

Based on the findings of the table 1, the absolute value of the ADF test statistic is higher than the critical values implying that the null hypothesis that the variables understudy lnGDP, lnGDS and lnGFCF has a unit root can be rejected both at 5% and 1% level of significance.

Table 2: PP unit root test results

Variables	Critical values at 5%	Critical Values at 1%	PP test statistic	Conclusion
lnGDP	-3.498692	-4.144584	-5.055213	I(1)
lnGDS	-3.498692	-4.144584	-5.849056	I(1)
lnGFCF	-3.498692	-4.144584	-5.868882	I(1)

The Phillips Peron unit root test given on table 2 reveals the same results to that of the ADF unit root test. The unit root test uses the first difference of the variables where both intercept and trend are included in the test equation. Bartlett Kernel spectral estimation method is used and Newey-West bandwidth selection method is employed. With such a procedure, the absolute value of the test statistic for all variables is higher than the critical values at 5% and 1%. From table 1 and 2, it is clear that all the variables are found to be integrated to the same order I(1) which makes it possible to continue the co-integration test.

The next step, which is the Johansen co-integration approach, employs the trace test and the maximum eigen-value test to determine the co-integrating relations. The trace test is based on the likelihood ratio test about the trace of the matrix. The trace test checks if the null hypothesis of the number of the co-integrating vectors is less than or equal to r. The trace statistic is used to check whether additional eigen-value beyond the r^{th} eigen-value increases the trace.

The results obtained from table 3 shows that there is one co-integrating equation at 5% level of significance. The null hypothesis of no co-integrating vector is rejected because the calculated trace statistic 49.08219 is higher than the 5% critical value 15.49471 proving the significance of the result at 5% level of significance. When the number of the hypothesized number of co-integrating equation is zero, the trace statistic is higher than the 5% critical value implying the long-run relationship between domestic savings and economic growth. Table 3 shows the trace statistic/ the co-integration rank.

Table 3: Unrestricted cointegration rank test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.607730	49.08219	15.49471	0.0000
At most 1	0.044803	2.291902	3.841466	0.1300

Trace test indicates 1 co-integrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

Similarly, the other component of the Johansen co-integration, the maximum eigen-value test checks for the number of characteristic roots (eigen-values) that are significantly different from zero. The results for the maximum-eigen value are given in table 4.

Table 4: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.607730	46.79029	14.26460	0.0000
At most 1	0.044803	2.291902	3.841466	0.1300

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

Like the trace test, the maximum-eigen value test also reveals that there exists co-integrating relationship between savings and economic growth. The interpretation of the numerical figures in table 4 is similar to that of the trace test. The calculated maximum eigen value statistic, 46.79029 being higher than the 5% critical value which is 14.26460 implies the statistical significance of the result at 5% level of significance.

In carrying out the co-integration test using the trace test and the eigen-value tests, the variable Gross Fixed Capital Formation (GFCF) transformed into its natural logarithmic form is used as an exogenous variable. This is because as mentioned in section one above GFCF is highly believed to affect the behavior of the relationship between saving and economic growth. One of the main reasons that drive GFCF to be included in the model as an exogenous variable is the Classical and Keynesian theoretical framework regarding the relationship between savings and economic growth. As indicated in the work of Hansen (1937), for Classical economists, in a closed economy saving positively contributes to the economic growth by providing more funds for investment spending. The Keynesians on the other hand, suggest the initial capital accumulation as the main drive of the economic growth, though saving is considered as a leakage from the economy. In both cases capital accumulation plays a key role in the relationship between saving and economic growth. It is this circumstance that encourages this study to include GFCF as an exogenous variable in this model.

The last step will then be to investigate the causal relationship between each pair of variables. Granger (1988) suggests that if co-integrating vector exists between the two variables, then there should be at least one direction of causality. In undertaking the causal relationships between each pair of variables understudy, it is suggested to run the causality test for few different lags in order for the results not to be sensitive to the choice of the lag length. As pointed out in Pyndick and Rubinheld (1991), alternative lag length should be used instead of selecting an optimal lag in order to make better estimation by comparing the results. Hence, lag length that ranges from 1 to 3 is used in this study to make sure for the results obtained are proper.

From the results given in table 5, one can conclude that there is neither unidirectional nor bidirectional causal relationship between gross domestic savings and gross domestic product in all the alternative lags given. However, a unidirectional causality that runs from lnGDP to lnGFCF exists in both the second and the third lags of the granger causality tests. This implies that economic growth granger causes the Gross Fixed Capital Formation in South Africa. On the other hand, from the result of the above table it is shown that the gross domestic saving granger causes the Gross Fixed Capital Formation in both the second and third lags of the test, implying the strength of the result. The table 5 given below shows the result of the Granger causality tests with alternative lag lengths for each pair wise tests.

Table 5: Results of Granger Causality Tests

Lag	Null Hypothesis	Causality Direction	F-Statistics	Probability
1	lnGDS does not granger cause lnGDP	NO	1.28513	0.2624
	lnGDP does not granger cause lnGDS	NO	0.01322	0.9089
2	lnGDS does not granger cause lnGDP	NO	0.81233	0.4500
	lnGDP does not granger cause lnGDS	NO	0.10384	0.9016
3	lnGDS does not granger cause lnGDP	NO	0.39284	0.7587
	lnGDP does not granger cause lnGDS	NO	0.25753	0.8556
1	lnGFCF does not granger cause lnGDP	NO	0.17689	0.6759
	lnGDP does not granger cause lnGFCF	NO	1.73361	0.1940
2	lnGFCF does not granger cause lnGDP	NO	2.14922	0.1279
	lnGDP does not granger cause lnGFCF	lnGDP → lnGFCF	6.91721	0.0023
3	lnGFCF does not granger cause lnGDP	NO	0.88094	0.4583
	lnGDP does not granger cause lnGFCF	lnGDP → lnGFCF	4.39548	0.0086
1	lnGDS does not granger cause lnGFCF	NO	3.70297	0.0600
	lnGFCF does not granger cause lnGDS	NO	0.40801	0.5259
2	lnGDS does not granger cause lnGFCF	lnGDS → lnGFCF	5.43573	0.0075
	lnGFCF does not granger cause lnGDS	NO	2.87453	0.0664
3	lnGDS does not granger cause lnGFCF	lnGDS → lnGFCF	3.00247	0.0405
	lnGFCF does not granger cause lnGDS	NO	1.52469	0.2214

The Gross Domestic Saving (GDS) Granger causes the Gross Fixed Capital Formation (GFCF) on one hand and the capital accumulation does not Granger cause the GDP growth is expected for a country that is highly dependent on mineral trade. As mentioned in the study of Rodrick (2006), the South African economy is highly dependent on the export of minerals. Hence, if saving granger causes capital accumulation and on the other hand capital formation does not granger cause the level of GDP it is acceptable.

Similarly, the findings of Alomar (2013) on saving and economic growth, states that countries that their national income is dependent on export of natural resources, saving does not Granger cause productivity. Hence, the finding of this study that, economic growth and aggregate savings granger cause the capital accumulation and not vice versa, is coherent to other studies as well.

Conclusion and Policy Implications

This study empirically examines the causal relationship between savings and economic growth in South Africa. The granger causality test points out that economic growth granger cause the Gross Fixed Capital Formation (GFCF). To this end, it is recommended that government policy makers should encourage economic growth so that investment can be promoted.

The study also finds out that Gross Domestic Saving (GDS) granger causes the Gross Fixed Capital Formation (GFCF). This finding also alerts government policy makers to focus on rising the national saving in order to boost the overall level of investment of the country.

The finding of this paper that the non-rejection of the null hypothesis that neither saving nor investment do not Granger cause economic growth calls for further studies to identify the major determinants of growth in South Africa. By identifying these factors that determine economic growth, it is then possible to work on those factors and enhance economic growth again to boost the level of investment.

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