

DETERMINANTS OF PRIVATE FIXED INVESTMENT IN EMERGING COUNTRY

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Abstract

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The neoclassical and Keynesian theories regard private investment not only as a source of economic growth but also as a determinant of the potential extent of the national income. The aim of this research was to examine the determinants of private fixed investment in South Africa by employing the Johansen cointegration technique and the vector error correction model (VECM) analysis. Based on the literature survey it appears that the previous studies mainly focused on private investment in manufacturing and infrastructure sectors therefore this is envisaged to add knowledge to a body of economics literature in this area by focusing more on private fixed investment and its determinants in South Africa. The study concludes that for the period under investigation GDP has the positive sign as expected. This suggests that in the long run it impact positively on private fixed investment. The findings of the study also confirmed that tax rate is a complementary to private fixed investment. Similarly, the real exchange rate coefficient was negative as expected which suggests that the depreciation of the currency stimulates the growth of South Africa private fixed investment. It is obvious that even the best economic model cannot achieve the expected outcomes immediately but these results encourage the study to believe that the South African monetary policy on exchange rate complements private fixed investment. Therefore, the study proposes that both even though both growth and general tax rate are difficult to accomplish simultaneously, they should be used to promote the flow of private fixed investment in South Africa.

Keywords: Private Fixed Investment, Cointegrated Vector Autoregressive and South Africa

1. INTRODUCTION

The neoclassical and Keynesian theories regard private investment not only as a source of economic growth but also as a determinant of the potential extent of the national income (Lund, 1979). That been the case, Bint-e-Ajaz and Ellahi (2012) indicated that there have been little economic models accessible that gives a partial comprehension into the real-world problems fronting the emerging world concerning private fixed investment. Although a heated debate on economic models have come up in academic and policy making spheres concerning the contribution made by the public and private investment in the economic growth processes has been intensified over a number of years. The single major macro one-sector models of the day, starting from Harrod-Domar to Keynesian appeared to have moderate significance for emerging societies.

In terms of this view, it appears to be imperative to investigate private fixed investment as an underpinning determinant needed to achieve sustainable growth rates, especially in developing economies such as South Africa. The Gross Domestic Product (GDP) figure of 62 quarters of uninterrupted economic growth from 1993 to 2007 was an unprecedented success for the economy since GDP grew by 5.1 percent. This was a reflection of the best economic policies implemented by the government that has made South Africa economy stronger and better. That been the case, the global economic crisis (2008-2009) did not spare the South Africa economy. Though the government amplified the country's integration into market, the crisis led the GDP to contract to 3.1 percent (South Africa: economy overview 2016).

Du Plessis and Smith (2007) highlight that for the past years; the real economic growth rate was

more or less around 3.1 percent. This symbolised a large enhancement on the average growth rate of 0.8 recorded from the previous years ago. This improvement was welcomed, but the growth rate of South Africa still endured moderately little behind the world standard.

It has been observed that during the period 1994-2015, the level of private fixed investment as a proportion of GDP has revealed an unpredictable descending development in South Africa. This is confirmed by the data from the South African Reserve Bank (SARB). Similarly, a recent research by Laubscher (2015) indicates that private investment falling cumulatively by approximately 15 percent from its peak in 2008, compared with 25 percent decline in the advanced economies. However private investment has declined from 70 percent of total investment in 2007 to 63 percent in 2014.

Several studies such as Clarke, et al., (2006), du Toit and Moolman (2004), Baxter and Contogiannis (2008) also indicate that there is a low level of investment in South Africa. According to Mlambo and Oshikoya (2001), declining investment ratio and levels is a problem. The challenge is that it matters a lot for growth as low investment leads to low economic growth. This is echoed by Ndikumana (2005) who regards low investment as a leading cause of slow economic growth. In this regard, private investment in South Africa deserves a serious attention. It's against this background that this study seeks to investigate the determinants of private fixed investment in South Africa. The intention is to identify determinants of private fixed investments and to quantify their significance.

Based on the literature survey it appears that the previous studies mainly focused on private investment in manufacturing and infrastructure sectors therefore this is envisaged to add knowledge to a body of economics literature in this area by focusing more on private fixed investment and its determinants in South Africa. The purpose is to guide private investors in investment decision-making, and to assist policy makers in formulating broad investment strategies that will improve business confidence to local and foreign investors with a view to increasing private fixed investment in the South African economy.

This study is organised in segments: segment 2 discusses the review of literature where the theoretical literature of investment and empirical evidence are presented; segment 3 presents the research method, segment 4 the empirical outcomes and their discussion followed and section 5 which concludes the study.

2. LITERATURE REVIEW

Several investment theories were considered in the formulation of the proposed model of this study. As indicated in the introduction section, economic growth is a major concern in South Africa. Its choice as one of the determinants of investment decision is based on Acceleration model. The model postulates that capital stock reaches its desired level in each period of time disregarding the lengthy term prospects (Gezici, 2007). The simple accelerator theory emphasizes that the connection among the preferred capital stock and the predictable production stays the same (Valadkhani, 2004).

Baddeley (2002) acknowledges the accelerator theory to have superior explanatory power in comparison with Jorgen's neoclassical accelerator theory. Parker (2009) declares that among the earliest empirical investment models was the acceleration principle, or accelerator, while Lund (1979) states that the origin of the acceleration principle was coined by Clark (1917).

Furthermore, Gordon (1992) declares that the investment theory of neoclassical equates to the rate of marginal return of investment with rate of interest. Another argument is that in the macroeconomics of the neoclassical, production is an employment function assumed that the stock of capital and production growth is determined in the capital market by the rate of interest. The view that output growth is determined by interest rate contrasts with the view of O'sullivan and Sheffrin (2006) which opines that firms need to take other factors into account besides interest rates in making their investment decisions. However, the neoclassical theory of investment pioneered by Jorgenson and Stephenson (1969) demonstrates the fact that taxes and real interest rates are keys in determining investment spending.

According to Parker (2009), Tobin q theory of investment claimed that investment levels of businesses ought to rest on the present value ratio that connected capital to the capital replacement cost. This Tobin's q. ratio. The q investment theory claims that businesses resolve to upsurge their capital once $q > 1$ and reduce their stock of capital when $q < 1$. If $q > 1$, a business can purchase one dollar's value of capital (at replacement cost) and make profits that have current value in extra of one dollar (Parker, 2009, p17). The ratio of market value of business capital to asset and their value of replacement is affected by the net investment. The q model offers a demanding outline for stating the outcome of the market value of investment (Humavindu, 2002). Chirinko (1993) concurs with Humavindu (2002) that in the Tobin Q investment theory, the market value ratio of the prevailing stock of capital to its cost of replacement (the Q ratio) is the central investment driving force. Consequently, businesses will want to invest if the additional unit increase in the market value surpasses the cost of replacement.

The empirical evidence indicates that the importance of the determinants of private fixed investment differ from each country, from developed countries to developing countries. Mallick (2012) investigated private investment in Information and Communication Technology (ICT) sector of Indian states by means of panel regression methods covering the period from 1999-2000 to 2004-2005. It was found that state wealth in the following items; ICT- sector specific infrastructure per capita income, physical infrastructure, human resource and labour productivity may determine the inflow of private investment inflow to the economy. Similarly, Lokesha and Leelavathy (2012) discovered that some of important determinants of FDI in India are market size, income for the population and GDP growth. They also indicated that extra firms, either domestic or foreign could be accommodated in large markets. This can help producing tradable products to achieve scale and scope because an investment

increase, due to the high growth rate attracts firms in the market.

Other variables are also found to have impact on investment. For instance, the impact of GDP growth on public and private investment was found to be positive. Likewise, the levels of inflation, exchange rates and GDP have impact on public investment and exchange rate, inflation and lending rates also affect private investment. Public investment for the past years financed by external and internal borrowings and exerts crowding out influence on the investment by private the private sector at large (Bint-e Ajaz and Ellahi, 2012).

Gui-Diby (2014) also investigated the influence of direct foreign investments on economic development in 50 Africa countries during 1980-2009, using two sets of approach. The initial set stood on a precise procedure employed for panel data, whereas the subsequent set used cross-section data by means of ordinary least squares, apparently isolated regressions and cointegration, comprising country-by-country exploration. Surrounded by these methods, the FDI influence on the growth of economic is examined, through and minus conditions or limitations. It was exposed that inflows of FDI towards countries in African have had a substantial influence on the growth of economy during the previous years. Though, the impact was different during the overall period. From 1980 to 1994, its influence on the economic growth was unfavorable while from 1995 to 2009 it showed positive impact. This difference indicates that the implementation of structural adjustment programs of many African countries, comprising denationalisation, the FDI orientation in activities resource-seeking, fragile economic relations among multinational enterprises and domestic firms, and the local enterprises low capacity to organize sufficient means to take-off production was the key element. However, the advancement of the industries atmosphere and the involvement of resource-based businesses to economic growth owing to the commodities export resulted in the positive effect from 1995 to 2009 (Gui-Diby, 2014).

3. RESEARCH METHOD

In order to study the determinants of private fixed investment in emerging county, the study adopts the Johansen technique. This technique is favoured in a sense that it can identify multiple cointegrating vectors. The analysis will include unit root testing by means of Augmented Dickey-Fuller (ADF) and the Phillip-Perron (PP) tests for unit roots. This will be followed by cointegration analysis to determine whether a group of non-stationary series is cointegrated or not. This study employs the Johansen and Juselius (1990) to test for the long run relationship among the selected variables. They propose two different likelihood ratio tests of the significance of these canonical correlations and thereby the reduced rank of the Π matrix; namely the trace test and maximum eigenvalue tests as presented in equations (1) and (2) respectively.

$$J_{trace} = -T \sum_{i=r+1}^n \ln(1 - \hat{\lambda}_i) \quad (1)$$

$$J_{max} = -T \ln(1 - \hat{\lambda}_{r+1}) \quad (2)$$

where T is the sample size and $\hat{\lambda}_i$ is the i th largest canonical correlation. The trace test tests the null hypothesis of r cointegrating vectors against the alternative hypothesis of n cointegrating vectors. The maximum eigenvalue test, on the other hand, tests the null hypothesis of r cointegrating vectors against the alternative hypothesis of $r+1$ cointegrating vectors.

According to Engle and Granger (1987) if cointegration has been discovered in the series, it means there is a long run association between them and hence the VECM is applied in order to evaluate the short run properties of the cointegrated series. The equations for VECM with two variables can be given by:

$$\Delta y_t = \beta_{y0} + \beta_{y1} \Delta y_{t-1} + \dots + \beta_{yp} \Delta y_{t-p} + \gamma_{y1} \Delta x_{t-1} + \dots + \gamma_{yp} \Delta x_{t-p} - \lambda_y (y_{t-1} - \alpha_0 - \alpha_1 x_{t-1}) + v_t^y \quad (3)$$

where $y_{t-1} = \alpha_0 + \alpha_1 x_{t-1}$ is the long run cointegrating association between the two variables and λ_y and λ_x are the error-correction parameters that measure how y and x react to deviations from the long run equilibrium. After performing all the major tests, the model will be taken through a series of both diagnostic and stability testing in order to prove its statistical validity.

3.1. Data

The study used secondary quarterly time series data from 1994: Q1 to 2015: Q4 obtained from the South African Reserve Bank. This period is deemed crucial to this study because it marks the transformation of South Africa from the apartheid government to a democratically elected government. The data covers an extensive variety of macroeconomic variables which include private fixed investment, economic growth proxied by GDP, real interest rates, real exchange rate and general tax rate.

3.2. Model specification

The private fixed investment model is based on Akanbi (2013) and it is presented as follows:

$$PFINV_t = \alpha_0 + \alpha_1 \log GDR_t + \alpha_2 \log RINT_t + \alpha_3 \log REER_t + \alpha_4 \log TAX_t + \varepsilon_t \quad (5)$$

where PFIN is private fixed investment, GDP is gross domestic product, RINT is real interest rate, REER is real effective exchange rate, TAX is general tax rate, ε_t is the error term, α_0 is a constant and $\alpha_{1,2,3,\dots,n}$ is coefficients.

4. EMPIRICAL RESULTS AND DISCUSSION

The section presents the results all the econometric tests mentioned in the previous, their analysis and their interpretations.

4.1. Unit root test results

The literature suggests that the typical and well conventional method of detecting non-stationary is

to inspect the tests for the presence of unit root and their outcomes are presented in table 1.

Table 1. Unit root tests results

Variables	Formula	Augmented Dickey-Fuller		Phillip-Perron	
		Levels	1 st difference	Levels	1 st difference
LOGPFINV	Intercept	-0.848	-3.971***	-1.600	-9.439***
	Intercept & trend	-1.404	-4.007**	-2.121	-9.534***
LOGGDP	Intercept	-1.891	-3.031**	-2.891*	-10.354***
	Intercept & trend	-0.368	-3.595**	-1.269	-11.931***
RINT	Intercept	-1.801	-6.441***	-1.619	-7.436***
	Intercept & trend	-3.339*	-6.440***	-3.459*	-7.373***
LOGTAX	Intercept	-1.709	-15.736***	-5.086***	-36.669***
	Intercept & trend	-0.333	-16.183***	-6.670***	-48.743***
REER	Intercept	-8.864***	-12.142***	-8.866***	-37.128***
	Intercept & trend	-8.811***	-12.076***	-8.813***	-37.849***

Notes: reported values under levels and first difference are ADF t- statistics values
 ***/ 1% statistically significant, **/5% statistically significant, */10 statistically significant

The ADF results show that most of the variables such as LOGPFINV, LOGGDP, LOGTAX and RINT are non-stationary at levels but become stationary after first differencing. However, variable such as REER is stationary at levels and after first differencing. On the other hand, PP test results show that LOGPFINV, LOGGDP and RINT are nonstationary in levels but become stationary after first differencing. In contrast, variables such as LOGTAX and REER are stationary at levels and also after first differencing.

After determining that most of the variables are integrated of the different orders which is I(0) and I(1), it is procedural to determine whether there is any long run relationship among private fixed investment and its determinants. This means that

variables are ready for the cointegration test. Normally, the Johansen procedure requires that a lag order be determined before it could be estimated. The optimal lag length could be identified using different criterions such as the Akaike information criterion (AIC), Schwartz information criterion (BIC) and the Hannan-Quinn criterion (HQ). The perception function differs from criterion to criterion. When choosing an appropriate 'lag length' in a time series, the information criteria could be adopted as initial procedures. Clipping down the 'lag length' using the 'likelihood ratio' test, helps to choose a suitable lag lengths, particularly when the sample size is big. The results are presented in table 2.

Table 2. Lag-length criterion

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-410.932	NA	0.012	9.786	9.930	9.844
1	10.209	782.829	1.100	0.465	1.327*	0.812
2	54.489	77.099	7.010	0.012	1.592	0.647*
3	88.027	54.449*	5.830*	-0.188*	2.110	0.735
# indicates lag order selected by the criterion LR: sequential modified LR test statistic (each test at 5% level) FPE: Final prediction error				AIC: Akaike information criterion SC: Schwarz information criterion HQ: Hannan-Quinn information criterion		

Based on the results on table 2, it can be observed that the optimal lag length is 3 based on LR, FPE and AIC. The next step is to estimate the long run equilibrium using the Johansen cointegration.

4.2. Cointegration analysis

Table 3 presents the Johansen cointegration analysis results of the unrestricted cointegration rank test

(Trace) and unrestricted cointegration rank test (maximum eigenvalue) results. The test helps to determine the long run equilibrium amongst the variables and the results show the presence of two cointegrating vectors. The existence of cointegration was also confirmed by comparing the trace and maximum statistics with the critical values and the p-values closer to zero.

Table 3. Long run cointegration results

Hypothesized No. of CE(s)	Trace			Maximum Eigenvalue		
	Trace Statistic	0.05 Critical Value	P-value	Max-Eigen Statistic	0.05 Critical Value	P-value
None *	95.169	60.061	0.000	50.498	30.439	0.000
At most 1 *	44.670	40.174	0.016	28.803	24.159	0.010
At most 2	15.867	24.275	0.389	10.037	17.797	0.481
At most 3	5.829	12.320	0.457	5.653	11.224	0.390
At most 4	0.175	4.129	0.728	0.175	4.129	0.728
Both the Trace and Max-eigenvalue tests indicate 2 cointegrating eqn(s) at the 0.05 level * denotes rejection of the hypothesis at the 0.05 level **MacKinnon-Haug-Michelis (1999) p-values						

5. VECM ANALYSIS

Since cointegration was established amongst the variables, the VECM was estimated as visualised in equation 6.

$$\Pi z_{t-1} = \alpha \beta' z_{t-1} = \begin{bmatrix} \alpha_{11} & \alpha_{12} \\ \alpha_{21} & \alpha_{22} \\ \alpha_{31} & \alpha_{33} \\ 0 & 0 \\ \alpha_{51} & \alpha_{52} \\ \alpha_{61} & \alpha_{62} \end{bmatrix} \begin{bmatrix} 1 & 0 & \beta_{31} & \beta_{41} & \beta_{51} & \beta_{61} \\ 0 & 1 & \beta_{32} & \beta_{42} & \beta_{52} & \beta_{62} \end{bmatrix} \begin{bmatrix} \ln PFINV_{t-1} \\ RINT_{t-1} \\ \ln GDP_{t-1} \\ \ln LTAX_{t-1} \\ REER_{t-1} \\ Constant_t \end{bmatrix} \quad (6)$$

where β_i and α_i represent the parameters for long run and short run of the VECM respectively. The study applied restrictions in both the short and the long run therefore; the private fixed investment

function and real interest rate function are specified and the restricted long run results are presented in table 4.

Table 4. Long run cointegration parameters

Cointegrating Equation	Dependent Variables	
	CE1: LPFINV	CE2: RINT
LPFINV(-1)	1.000	0.000
RINT(-1)	0.000	1.000
LGDP(-1)	-0.700 (0.052) [-13.423] ***	-11.800 (5.715) [-2.064] ***
LTAX(-1)	-0.819 (0.220) [-3.723] ***	50.041 (24.118) [2.074] ***
REER(-1)	0.077 (0.016) [4.664] ***	-8.753 (1.808) [-4.840] ***

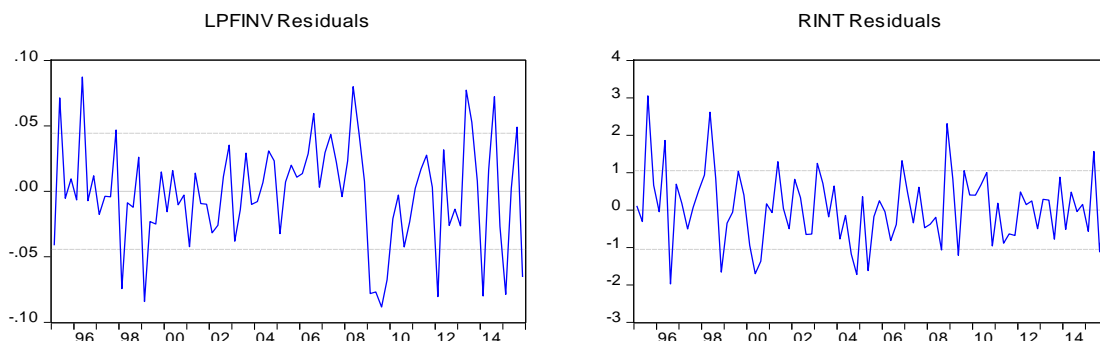
Based on equation (6), in the long run for first cointegrating equation, zero restriction is imposed on real interest rate (RINT) as it has now become the dependent variable of the second equation. Restrictions were also imposed on private fixed investment in the second equation because it's an endogenous variable in the first equation. The imposed restrictions imply that the said variable does not play part in determination of the dependent variable. The long run parameters for both equations can be interpreted as follows: The first cointegrating vector (PFINV) designates that there is a positive association between private fixed investment and GDP. The results show that a 1% increase in GDP will lead to 0.70% increase on private fixed investment. Furthermore, when PFINV increases by 0.81%, tax rate will increase with 1% which indicates a positive association between the two variables in the long run. In line with the economic theory, the outcomes show a negative association between real effective exchange rate and private fixed investment. This is based on the

indication that a 1% increase in real exchange rate leads to 0.07% decrease on private fixed investment.

Similarly, the second cointegrating vector (RINT) displays that there is a positive association between real interest rate and GDP. A 1% increase in GDP will lead to 11.80% increase on real interest rate. The results also show that there is negative association between tax rate and real interest rate. The coefficient of tax rate is 50.04 and is statistically significant. The coefficient for real exchange rate is -8.75 and is statistically significant. This implies that there is positive relationship between real exchange rate and real interest rate.

It should be noted that the interpretation of second cointegrating vector is not the interest of the study but was interpreted based on econometrics purpose. The most crucial results are the ones interpreted in the first cointegrating equation. The residuals for cointegrating vectors are plotted in figure 1 and they were found to be appropriate, since the residuals appear to be reverting around zero.

Figure 1. The residuals for cointegrating vectors



Since the estimation of the long run equilibrium was established the error correction parameter is estimated by employing the weak exogeneity test and short run adjustment mechanism and the results are presented in table 5 shows the dynamic adjustment towards long run equilibrium path.

Table 5. Short run adjustment process

	<i>Cointegrating Equation 1</i>	<i>Cointegrating Equation 2</i>
D(LPFINV)	-0.059 (0.026) [-2.252]	-0.001 (0.0003) [-2.320]
D(RINT)	-0.685 (0.618) [-1.108]	-0.019 (0.007) [-2.66]
D(LGDP)	-0.069 (0.010) [-6.914]	-0.001 (0.0001) [-4.011]
D(LTAX)	0.000 (0.000) [NA]	0.000 (0.000) [NA]
D(RER)	1.834 (3.108) [0.590]	0.131 (0.035) [3.656]
LR test for binding restriction (rank = 2): $\chi^2 = 4.265$ Probability = 0.118		

This study imposes restrictions on the short run VECM model for South Africa since the trace and maximum eigenvalue statistics showed two cointegrating vectors. From cointegrating equation 1, zero restrictions were imposed tax rate. This implies that the study of private fixed investment can

function without tax rate helping to bring back to equilibrium in the long. The results for likelihood ratio for binding restrictions of LR = 4.265 and probability of (0.118) imply that since the LR does not reject the restrictions it means that the equations are well specified. For first cointegrating vector, the error correct term is negative with the coefficient of -0.059 and is statistically significant with the t-statistics of (-2.252). This result implies that 5.9% of the gap between private fixed investment and its equilibrium value is eliminated in the short run. In the second cointegrating vector, the error correction term is -0.001 with a t-statistics of (-2.320) implies that almost 0.1% is adjusted in the long run.

5.1. Diagnostic and stability testing

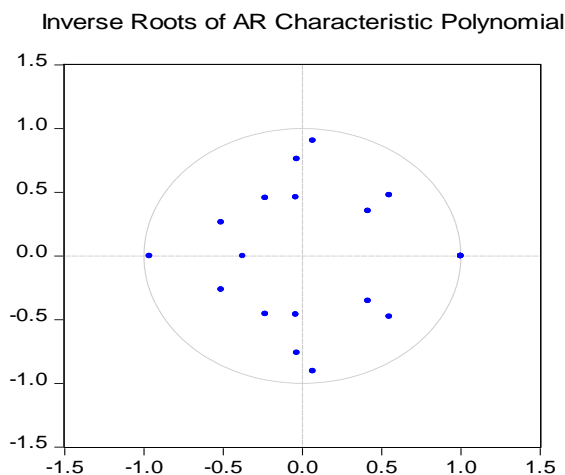
The residual diagnostic tests process yields each or together of finite F-distribution or Chi-square asymptotic statistic output and their associated probability numbers (p-values). The p-values indicate the likelihood of finding an examination statistic whose complete value is more than or equal to that of the sample statistic if the null hypothesis is true. Thus, low p-value leads to the rejection of the null hypothesis. Residual analytical examinations on the model outcome comprise of tests such as normalcy test, serial correlation, and heteroscedasticity (King’Ori, 2007). Table 6 presents the results of the diagnostic tests.

Table 6. Diagnostic test results

<i>Test</i>	<i>Statistics</i>	<i>Probability</i>	<i>Decision</i>
Heteroscedasticity	544.8151	0.1385	No heteroscedasticity
Serial correlation	34.36493	0.1003	No serial correlation
Normality(Kurtosis)	2.180537	0.8236	Residuals are normally distributed

The results show that the model has passed all the tests, meaning that there are no heteroscedasticity and serial correlation problems and the residuals are normally distributed. Finally, to determine the dynamic stability of the model, the inverse root was tested. As illustrated in figure 2, all the points are within the unit circle and this implies that the estimated VAR model is stable.

Figure 2. Inverse Root polynomial



6. CONCLUSION AND RECOMMENDATIONS

The principal aim of this study was to investigate the determinants of private fixed investment in South Africa since 1994 by employing the Johansen cointegration technique and the VECM analysis. The study concludes that for the period under investigation GDP has the positive sign as expected. This suggests that as it has a positive impact on private fixed investment in the long run. The findings of the study also confirmed that tax rate is a complementary to private fixed investment. It appears that since 1994, tax rate doesn't discourage the South African private fixed investment. Similarly, the real exchange rate coefficient was negative as expected which suggests that the depreciation of the currency stimulates the growth of private fixed investment in South Africa.

It is apparent that even the best economic model cannot achieve the expected outcomes immediately but these results encourage the study to believe that the South African monetary policy on exchange rate complements private fixed investment. Therefore, the study proposes that both even though both growth and general tax rate are difficult to accomplish simultaneously, they should be used to promote the flow of private fixed investment in South Africa. This means that the

policy makers will have to make a trade-off between them.

7. LIMITATIONS

The study focused only on private fixed investment in South Africa and some of its determinants which are gross domestic product, general tax rate, real interest rate and real effective exchange rate. The study found that there is a short term and long term relationship between the selected determinants and private fixed investment. Except for the selected determinants there are other determinants that have been excluded in the study, because of time constraints. When inflation is low, consumers and businesses are able to make long-term plans because they know that the purchasing power of their money will hold and will not be steadily eroded year after year.

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8. AREAS FOR FURTHER RESEARCH

Further research focusing more specifically on each specific determinants such as inflation, user cost, gross capital formation for public sector, financial development and saving may likely discover interesting findings about separate determinants is recommended. The inclusion of these determinants can be interesting for further studies on the factors of private fixed investment in the South African economy. The impact of savings on private fixed investment is the area that needs to be researched. Another area of interest of research that needs to be investigated is the explanation between private fixed investment and gross capital formation on public sector. Further research could be done to investigate the impact of corporate tax on private fixed investment.

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