DETERMINANTS OF INVESTMENT IN NAMIBIA

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Abstract

This paper presents an analysis of the determinants of investment in Namibia for the period 1971 to 2010. The results indicate that investment in Namibia can be raised by increasing real GDP, openness and financial development, and by decreasing the user cost of capital. Although saving has an expected positive coefficient, it is statistically insignificant. This suggests that saving is necessary, but not sufficient to accelerate investment in Namibia. The positive effect of effect of openness implies that increase in exports generated foreign exchange earnings necessary to purchase the imported capital goods and expand the market for domestic products. Increase in imports enabled the country to have greater access to investment goods in the international market and accelerates investment. A positive impact of financial development suggests that the financial sector is important in facilitating the channeling of resources from savers to investment activities that offer high return. The negative effect of user cost of capital implies that investment in Namibia can be accelerated by reducing the cost of capital.

Keywords: Investment, Cointegration, Error Correction Model, Namibia, Policy Shocks

JEL Classification: E130; E200 ; E270 ; E290

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1. INTRODUCTION

Investment plays a role in driving economic growth and development. It increases the productive capacity of the economy and enables the economy to produce more output. It increases the productivity growth through the introduction of new technology which also accelerates economic growth. Through its effect on demand for capital goods, investment expenditure stimulates shifts in aggregate level of employment and personal income. The economy needs to generate savings or borrow from abroad to finance investment. However, borrowing from abroad carries exchange rate risk and has to be serviced in the future. It is important for the country to have sufficient domestic savings to facilitate economic growth because it provides the resources required to finance investment. The domestic savings of Namibia is sufficient to finance investment required to achieve higher economic growth. This implies that the country can have high investment and generate high economic growth, but Namibia has not been able to absorb all savings generated in the economy. Excess savings over investment as reflected by surpluses on the external current account explains the outflow of savings mainly to South Africa, and this is atypical situation for a developing country. It suggests that a constraint to higher economic growth in Namibia is not shortage of savings, but low investment.

This study develops and applies the neoclassical investment model to Namibia in order to identify factors that determine investment in the economy. The study employs time series econometric techniques to determine the long-run and short run determinants of investment in Namibia. Section 2 discusses investment in Namibia and Section 3 reviews theories and models of investment, while Section 4 presents empirical estimation of the investment model. Section 5 concludes.

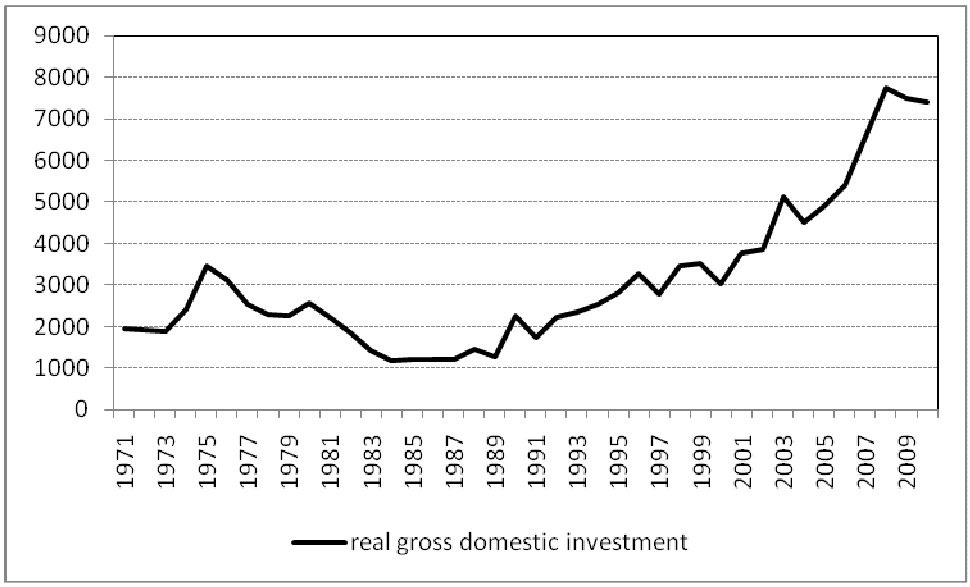
2. INVESTMENT IN NAMIBIA

Investment is a significant indicator of future economic growth. An increase in investment relative to GDP contributes to higher economic growth and redirect resources available for expanding future production. Figure 1 shows that real gross domestic investment (gross domestic fixed capital formation) increased between 1973 and 1976 and this can be attributed to the opening of uranium mine in 1975/1976 by the British-registered Rio Tinto Zinc Corporation which is a major shareholder in Rossing Uranium Limited (Schneider, 1991). Real gross domestic investment decreased from N$ (Namibia dollar) 3.1 billion in 1976 to N$ 1.2 billion in 1989. This sharp decline

in real investment can be attributed to Namibia's liberation struggle and the sanction that were imposed on South Africa (which colonised Namibia from 1919/1920 until 1989). According to the Bank of Namibia (1991: 6), uncertainties about the political settlement in Namibia caused the mining sector to experience a long period of inactivity in terms of investment in new technology and exploration. Exploration for new source of minerals was hampered by the long liberation struggle. The mining sector accounted for a significant share of Namibia's GDP and exports.

Real gross domestic investment increased after independence, from N$ 1.2 in 1989 to almost N$ 8 billion in 2010. The Bank of Namibia (2001) states that after independence prospecting for new minerals was revived. The long-term prospects of the mining industry looked brighter because of increase in investment in new technologies and exploration. After independence, the First National Development Plan emphasised that policies which encourage and facilitate the expansion of productive investment be implemented.

Figure 1. Real gross domestic fixed investment (Namibia dollars millions at 1995 prices)

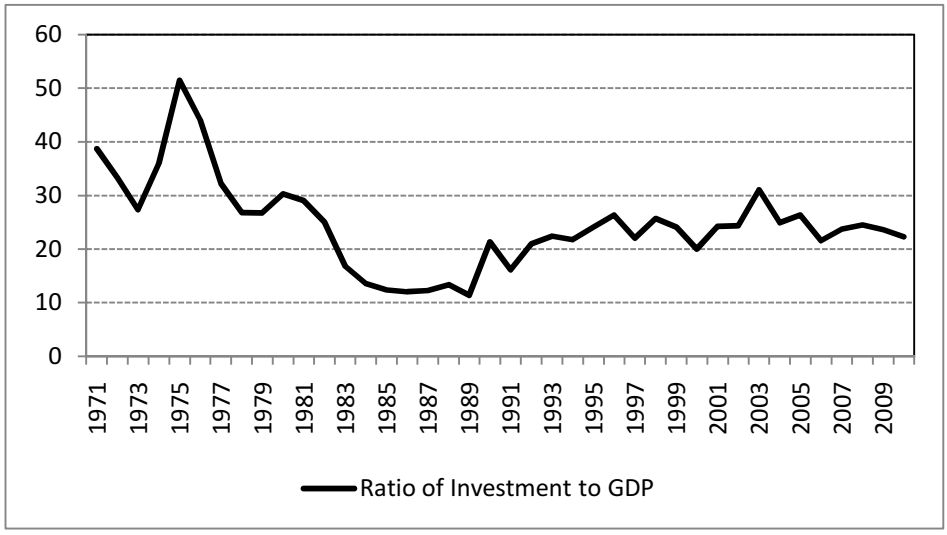


Source: Data for the graph obtained from Cornwell (1991), Bank of Namibia and Central Bureau of Statistics of Namibia.

The ratio of gross domestic investment to GDP which is an important indicator of future economic growth rose from 11 percent in 1989 to 26 percent in 2005 (see Figure 2). The increase in the ratio of gross domestic investment to GDP is attributed to policies implemented after independence. This ratio declined slightly to 24 percent in 2010. Several Annual Reports of Bank of Namibia indicate that, while the ratio of 24 percent is among the highest in Sub-Saharan Africa, it is low when compared to emerging markets such as Singapore and Malaysia where the ratio exceeds 30 percent. The low ratio of gross domestic investment to GDP suggests that resources allocated to future economic growth in Namibia are low.

There is a general consensus that it is important to have adequate savings in order to have higher economic growth. This is based on the fact that savings would be converted into investment which would in turn leads to higher economic growth. Figure 3 presents the relationship between real gross domestic investment and gross domestic savings. During the period 1991 to 2010, real gross domestic savings exceeded real gross domestic investment. This indicates that the country saved more than what it invested. Namibia has a positive saving-investment balance and its shows that even with higher than average savings, the investment recorded is not in line with savings. This suggests that saving is necessary but not sufficient for investment in Namibia. Although there are arguments that there are no enough investment opportunities in Namibia, there could be other factors that constrain savings from being converted into investment.

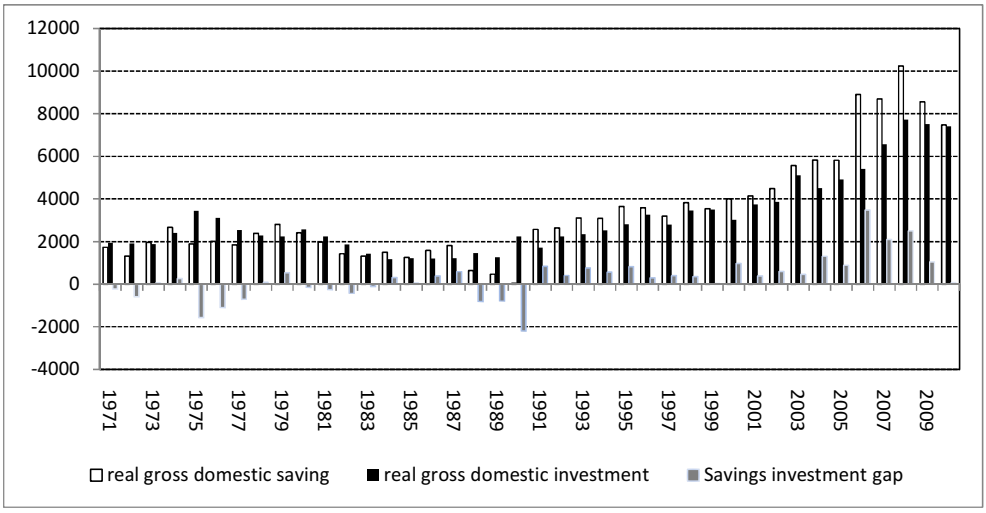
Figure 2. The ratio of investment to GDP



Source: Data for the graph obtained from Cornwell (1991), Bank of Namibia and Central Bureau of Statistics of Namibia.

Excess savings or the balance between domestic saving and investment represents foreign savings position of the country. If there is excess saving, it leads to net lending to other countries, while shortage of savings causes an import of capital through net foreign borrowing. The excess saving in Namibia has been reflected by the continued surpluses on the external current account of the balance of payments, and explains the outflow of savings mainly to South Africa (Bank of Namibia, Annual Reports; Shiimi and Kadhikwa, 1999). This situation is unusual for a developing economy. Most developing economies save less than they invest because of their low income and this result in current account deficit. The deficit in many developing economies is financed by an inflow of savings from abroad. The case of Namibia defies international experience because the country has experienced more savings than investment and has been a net exporter of capital, while investment and economic growth have been relatively low. As shown in Figure 3, the gap between real gross domestic investment and real gross domestic savings decreased slightly between 2001 and 2003 because of increase investment. According to the Bank of Namibia (2002), this reflects investment in Namibia by the new Zinc mine and new Textile Factory. The decline in the saving-investment gap between 2009 and 2010 can be attributed the global economic and financial crisis of 2008-2010.

Figure 3. Real Gross Domestic Fixed Investment and Real Gross Domestic Savings (N$ -Namibia dollars million)



Source: Data for the graph obtained from Cornwell (1991), Bank of Namibia and Central Bureau of Statistics of Namibia.

3. THEORIES OF INVESTMENT

(a) General framework

Assuming depreciation (δ) aggregate capital stock (K) at the end of time t is referred to as the net capital stock. Net capital stock is defined as:

$$K_t = (1-\delta)K_{t-1} + I_t \quad (1)$$

Equation (1) shows that replacement investment is δK_{t-1}. Net investment defined as the net increment in the capital stock since the previous time period, $K_t - K_{t-1}$ equals total investment minus replacement investment, which is $I_t - \delta K_{t-1}$ (see Du Toit, 1999: 81; Du Toit and Moolman, 2004: 649). Gross investment, replacement investment and net investment are replaced by the following identity:

Gross investment = replacement investment +net investment

Du Toit (1999) stated that most theories of investment behaviour relate the demand for new plant and equipment to the gap between desired or optimal amount of capital stock (K^*) and the actual amount of capital *K*. There are two main problems. The first one is concerned about factors affecting (K^*) and how can such factors be modelled and measured. The second one is about why $K \neq K^*$ and does *K* adjust towards K^*, and what are the factors affecting the speed of adjustment.

According to Du Toit, these two problems of investment behaviour can be combined as: allow net capital stock at the end of period *t-1* be K_{t-1}, K_t^* be the desired capital stock at the end of the current time period and let the speed of adjustment between K_t^* and K_{t-1} be λ_t. If λ_t was zero, *K* would be fixed and there would be no net investment reducing the gap between K_t^* and K. If λ_t was 1 the gap would be closed within one time period, and this implies that the adjustment would be happening immediately. Net investment during time *t*, by definition equals $\lambda_t(K_t^* - K_{t-1})$ and replacement investment equals δK_{t-1}. Because gross investment is the summation of net and replacement investment, it can be expressed as:

$$I_t = \lambda_t(K_t^* - K_{t-1}) + \delta K_{t-1} = \lambda_t K_t^* + (\delta - \lambda_t)K_{t-1} \quad (2)$$

Investment can be modelled using the Keynesian approach or accelerator model which is based on fixed capital output ratio, the cash flow model, the Tobin's q-model and the neoclassical model (Jorgenson approach).

(b) Accelerator model

In the accelerator model, it is assumed that a fixed relationship between the desired capital and the level of output characterises the production technology in the economy (Agenor, 2000: 33). The accelerator model proposes that investment depends on some measures of output and the lagged values of capital stock. The accelerator model defines the desired capital stock, K_t^d as proportion of desired output, Y_t:

$$K_t^d = \gamma Y_t, \quad (3)$$

where γ represents capital-output ratio. It takes time to build and install new equipment, and the capital stock is adjusted always optimally to the difference between the capital stock in the current period and actual capital stock in the previous period:

$$\Delta K = \eta(K_t^d - K_{t-1}) \quad 0 < \eta < 1 \quad (4)$$

This implies that net investment, I_{net} is given by:

$$I_{net} = \Delta K + \delta K_{t-1} \quad 0 < \delta < 1, \text{ or } I_{net} = \eta(K_t^d - K_{t-1}) + \delta K_{t-1} \quad (5)$$

This can also be written as:

$$I_{net} = K_t - K_{t-1} = \gamma(Y_t - Y_{t-1}) \quad (6)$$

It is assumed that the adjustment of capital stock to the desired level is a constant proportion of the gap between the desired capital stock and the actual capital stock. The net investment is therefore:

$$I_{net} = \alpha(K_t^d - K_{t-1}). \qquad (7)$$

According to Agenor (2000:34), if $\delta = 0, \eta = 1$, and the desired future output is best predicted by current output, the net investment becomes:

$$I_{net} = \gamma\Delta Y. \qquad (8)$$

(c) The Cash Flow Model

According to the cash flow model, investment depends on the internal cash flow. This is because internal cash flow is the most convenient source of funds for businesses to finance their investments. As summarised by Du Toit and Moolman (2004), investment spending in the cash flow model is a variable proportion of the internal cash flow. The desired level of capital stock is depended not on the level of output but on the level of profits or the profits expected. This is because the supply of internal cash flow is affected by the level of profits. The cash flow model is also referred to as the internal funds theory of investment. In this model investment is a linear function of the profit or expected profit of the firm, which is represented by the market value, MV_t of the firm as:

$$I_t = \alpha + \beta MV_t \qquad (9)$$

The main criticism of the cash flow model is the absence of the user cost of capital.

(d) The q-model of Investment

The q-model of investment postulates that the desired capital stock and hence investment are positively related to *q* which is the ratio of the market value of business capital assets to their replacement value (see Tobin, 1969). The market value of a business is the sum of the market values of all claims on its earnings in the future. These claims include the business' ordinary and preference shares and its net debt obligations. The logic of the *q*-model is that when the market value of the business increases above the replacement costs of its assets, managers will have an incentive to borrow or issue new shares in order to raise funds for the acquisition of additional plant and equipments. The result will be an increase in the net value of the business. Du Toit and Moolman (2004) state further that the demand price for the entire business is the market value of all its securities, while the cost of producing new capital goods is the supply price. The supply price is proxied by the replacement cost of a business' assets. The demand and supply prices of investment are equal in equilibrium. If the market value of the business's assets is equal to the replacement costs of the assets, *q* will be unity and then there will be no incentives for managers to invest in acquiring additional capital. In the *q*-model, when the marginal *q* is greater than unity, managers will have incentives to invest more in capital goods, but if it is less than unity, the managers will disinvest. The main criticism of this model is that interest rate is not a determinant. There are also problems of measuring the business's replacement value, valuation of outstanding debt obligations and determining a marginal rather than average value for *q* (Du Toit and Moolman, 2004).

(e) Neoclassical Theory of Investment

The neoclassical theory of investment has been modified extensively by Jorgenson (1963). According to this theory, the desired capital is determined by output and the price of capital relative to the price of output. The most important part of the Jorgenson theory is that it developed a model of investment spending that incorporates interest rates, volume of output, price of capital and corporate income tax. A change in output or price of capital goods relative to the price of output will cause changes in the level of desired capital stock and investment. The concept of the user cost of capital is the main theoretical feature of the neoclassical theory of investment. The user cost of capital is regarded as the price of capital service. The implication for policy is that any expansionary fiscal and monetary policy will have an effect on investment and leads to increase in output.

To illustrate the production of the firm, the Cobb-Douglass production function can be used (this is summarised by Pretorius, 1998; Du Toit and Moolman, 2004). Assume that the firm produces one product using two inputs, capital (*K*) and labour (*L*), the production function of the firm is expressed as:

$$Y_t = f(K_t, L_t) \qquad (10)$$

where Y_t is output. It is also assumed that the firm aims to maximise profit over the economic life of the project. Profit is defined as the difference between total revenue and the cost of inputs as well as taxes. The cost of labour is wage rate multiplied by the amount of labour employed, and the cost of capital is defined as the unit cost of capital times the quantity of capital. Profit is can then be defined as:

$$\Pi = pY - wL - cK - T \qquad (11)$$

where Π is the profit, p is the price of the product, c is the cost of capital and *T* is taxes. The market value, *MV* of the business in period *t=0* is elucidated as follows (see Pretorius, 1998; Du Toit and Moolman, 2004):

$$MV = \int_0^{\infty} e^{-rt}(pY - wL - cK - T)dt \quad (12)$$

where *r* stands for the discount rate and is not dependent on *t.* The present market value of the business is equal to the discounted value of the expected future net yields. The business aim at maximising its value in Equation (12) subject to the constraints:

$$Y_t = f(K_t, L_t) \text{ and } I_t = \delta K_t + \Delta K \text{ , where } \Delta K = K_t - K_{t-1} \quad (13)$$

Profit is maximised when the following conditions in Equations (14) and (15) hold:

$$p\frac{\partial Y}{\partial L} = w = \frac{\partial f}{\partial L} = MP_L = \frac{w}{p} \quad (14)$$

$$p\frac{\partial Y}{\partial K} = c = \frac{\partial f}{\partial K} = MP_K = \frac{c}{p} \quad (15)$$

Equations (14) and (15) show that profit is maximised when the marginal product of labour, MP_L is equal to the ratio of the price of labour to the price of the product, which is also referred to as the real wage. Similarly marginal product of capital, MP_K must be equal to the ratio of the price of capital or user cost of capital to the price of the product. When the MP_K is equal to the ratio user cost of capital (*ucc*) to the price of the product, the desired capital stock is obtained.

4. EMPIRICAL ESTIMATION OF THE INVESTMENT MODEL FOR THE NAMIBIAN ECONOMY

(a) Empirical Model

The neoclassical model is considered to be the most suitable approach for estimating the domestic fixed investment function. The neoclassical model (Jorgenson approach) will be used in this study. The other three theories have empirical limitation because their estimation requires data which are not covered in time series of many countries such as Namibia. The basic neoclassical model of relates investment to real output and user cost of capital. However, a number of studies extended the neoclassical model by including other variables that have a potential to explain variations in investment. Misati and Nyamongo (2010) argued that financial development variables are important determinants of investment. Misati and Nyamongo (2010) examined the relationship between financial development and private investment in Sub-Saharan Africa and concluded that financial development variables (such as credit to private sector, stock market turnover) are important determinants of investment. Ndikumana (2000) also extended the basic neoclassical investment model by including open economy factors such openness of the economy. Ndikumana (2000) argued that trade volume influence investment positively through import and exports. A rise in the country's export generates foreign exchange necessary to purchase imported capital goods and expands the market for domestic products. If an increase in imports implies greater access to investment goods (such as machinery and equipments) in the international markets, it can accelerate investment. However, if an increase in imports is devoted to the purchase of consumer goods, it can reduce domestic production and discourage investment. This suggests that the impact of openness on investment can be positive or negative. Following a theoretical review of the investment theories the empirical model of investment for Namibia is specified as:

$$I = f(\overset{+}{Y}, \overset{+}{S}, \overset{+/-}{OPEN}, \overset{-}{UCC}, \overset{+}{FINA}), \quad (16)$$

Where *I, Y, S, OPEN, UCC, FINA* are investment, real output, savings, openness of the economy, user cost of capital and financial development. Equation (16) specifies investment as a function of real output, savings, openness of the economy, user cost of capital and financial development. User cost of capital is expected to impact negatively on investment. The impact of real output, savings, and financial development is expected to be positive, while that of openness is ambiguous.

(b) Data and Estimation technique

The estimation covers the period 1971 to 2010 and uses annual data. Detailed description of the data, their univariate characteristics and sources are presented in the Appendix.

Cointegration methodology is used to analyse the data because many economic variables are non-stationary. The Engle-Granger two step estimation procedure is used despite its potential defects. The Engle-Granger two steps has potential defects in the sense that it assumes that there is one cointegrating vector. However, it is possible to have more than one cointegrating vector when the equation has

more than one explanatory variable. If the equation has more than one explanatory variable, multivariate cointegration techniques (such as VAR or Johansen) must be applied. Multivariate cointegration techniques require high frequency data.

It is for that these reason that this study applies the Engle-Granger two step estimation technique instead of multivariate methodologies. This procedure entails the determination of the long-run cointegration relationship through testing for stationarity of the residuals using Augmented Dickey Fuller (ADF) test. Univariate characteristics of the variables which involves unit root test is the first step before the estimation of Equation (16).

(c) Estimation Results

The unit root test results in Table A2 shows that variables are nonstationary in levels, but become stationary on first difference form. This means that they are I(1). The long-run results are presented in Equation (17) and t-statistics are in parentheses:

$$\begin{aligned}\ln I = &-7.04 + 1.441\ln Y + 0.04\ln S + 0.93\ln OPEN - 0.23\ln UCC \\ &(-3.94)\quad (6.424)\quad (1.00)\quad (3.72)\quad (-3.95) \\ &+0.44 FINA \\ &(5.66)\end{aligned} \tag{17}$$

$$Adjusted\ R-Squared\ 0.87$$

Equation (17) shows that an increase in output (GDP) and savings by one percent causes investment to increase by 1.44 and 0.04 percent. However, the coefficient of savings is statistically insignificant. Openness of the economy is associated with an increase in investment. An increase in openness by one percent causes investment to increase by 0.93 percent. Financial development is also associated with an increase in investment. A one percent increase in financial development causes investment to increase by 0.44 percent. The user cost of capital has a negative and statistically significant coefficient and shows that an increase in the user cost of capital by one percent causes investment to decrease by 0.23 percent. An insignificant coefficient of savings suggests that savings is necessary but not sufficient to accelerate investment in Namibia. The positive effect of openness implies that increase in trade generated foreign exchange necessary for the purchase of imported capital goods and expanded the economy. This stimulated investment. A negative user cost of capital suggests that investment in Namibia can be increased by also by lowering the user cost of capital though expansionary monetary and fiscal policies.

The residuals from Equation (17) are tested for stationarity using the ADF test statistic and the results show that the ADF statistic of -4.65 rejects the null hypothesis of non-stationarity. This means that the residuals are stationary. This indicates that variables in Equation (17) are cointegrated. Since the residual from the long-run relationship is stationary, it allows for the specification of the error correction model (ECM) which represents the short-run dynamics of the system. The results of the ECM are presented in Equation (18):

$$\begin{aligned}\Delta\ln I = &-0.44 RESIDUAL(-1) + 0.68\Delta\ln Y + 0.41\Delta\ln FINA + 0.66\ln OPEN + 0.08\Delta\ln S \\ &(-3.06)\quad (1.84)\quad (2.23)\quad (2.83)\quad (2.09)\end{aligned} \tag{18}$$

$$Adjusted\ R-squared : 0.54$$

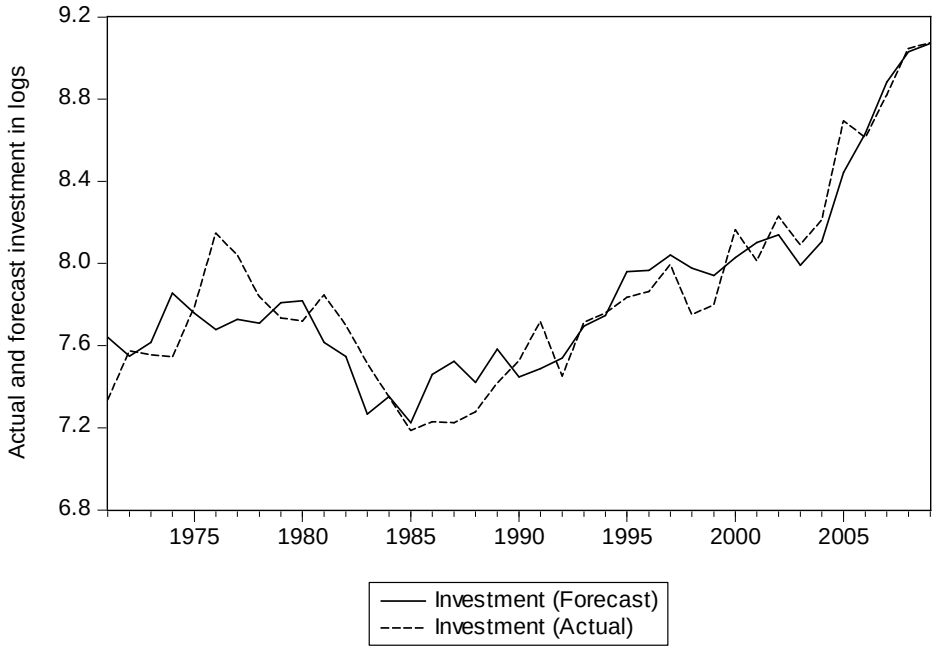
Diagnostic statistics (probabilities in squared brackets)

Normality:	JB(2)	=4.32	[0.11]
Serial correlation:	LB(6)	=4.53	[0.61]
	LM(2)	=0.51	[0.60]
Heteroscedasticity:	ARCH(1)	=0.07	[0.79]
	White(1)	=0.475	[0.92]
Stability:	RESET(2)	=7.659	[0.11]

The t-statistics are in parentheses. The coefficient of the lagged residual is negative and statistically significant and this means that the dynamics adjust into the long-run equilibrium

instead of moving away from the equilibrium path. It shows that 44 percent of disequilibrium is corrected every year. The ECM was diagnosed for possible violation of the Gaussian or classical linear regression assumptions at 5 percent. The results show that the equation is well-specified and no violation of the Gaussian assumption. The result of the simulation of the investment function is presented graphically in Figure 4. The dynamic simulation of the model shows that the model is a good fit and illustrate that the estimated model provides a good representation of the actual investment of the Namibian economy.

Figure 4. The overall dynamic fit of gross domestic fixed investment



5. CONCLUSION

This paper reviewed theories of investment, developed an investment model in order to identify factors that determine investment in the Namibian economy. Four theories of investment were discussed and among them, the neoclassical investment model was applied to explain the investment behaviour of the Namibian economy. A review of the investment and saving data for Namibia show that since independence, the country had excess savings over investment. This resulted in outflow of capital because the country could not use all the savings to invest. This suggests that there could be some factors that prevents saving generated in the economy from being converted into investment. The neoclassical model was estimated using annual data for the period 1971 to 2010.

The results from the estimated model are in line with theoretical expectations. An increase in output or GDP, savings, openness of the economy and financial development has a positive impact on investment. However, the coefficient of savings is not statistically significant. This insignificance of the coefficient suggests implies that saving is necessary but not sufficient for accelerating investment in Namibia. Hence, it is not surprising that Namibia had excess savings over investment for the entire estimation period. The positive effect of openness on investment suggests that an increase in trade (export) generates the foreign exchange earnings necessary to purchase the imported capital goods (machinery and equipments) and increased the market for domestic products. The increase in imports enabled the country to have greater access to investment goods in the international capital market and this accelerated investment. The positive effect of financial development on investment indicates that the financial sector facilitated the channelling of resources from savers to investment activities which offer high return. This made funding available and accelerated investment in Namibia.

Investment responds negatively to increase in the user cost of capital. This suggests that investment in Namibia can be raised by reducing the user cost of capital. The user cost of capital can be reduced by pursuing expansionary monetary and fiscal policies.

6. References

1. Agenor, P.R. (2000), *The Economics of Adjustments and Growth*, London: Academic Press, New York, Boston.

2. Bank of Namibia. (Various Issues), *Annual Report*, Bank of Namibia, Windhoek.
3. Bank of Namibia. (Various Issues), *Quarterly Bulletin*, Bank of Namibia, Windhoek.
4. Cornwell, R., Leistner, E. and Esterhuysen, E. (1991), *Namibia 1990: An African Institute Country Survey*, Africa Institute of South Africa Pretoria.
5. Dickey, D. A. and Fuller, W. A. (1981), "Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root", *Econometrica*, Vol. 49 No. 4, pp. 1057 - 1072.
6. Du Toit, C.B. (1999), *A Supply-Side Model of the South African Economy: Critical Policy Implications*, Unpublished D.Com Thesis, University of Pretoria, Pretoria.
7. Du Toit, CB. and Moolman, E. (2004) "A Neoclassical Investment Function of the South African Economy", *Economic Modelling*, Vol. 21, pp. 647-660.
8. Enders, W. (2004), *Applied Econometric Time Series*, John Wiley and Sons, USA.
9. Jorgenson, D.W. (1963), "Capital Theory and Investment Behaviour", *American Economic Review*, Vol. LIII No. 2, pp. 247-259.
10. Misati, R.N. and Nyamongo, E.M. (2010), "Financial Development and Private Investment in Sub-Saharan Africa", *Journal of Economics and Business*, Vol. xxx, pp. 1-13.
11. Ndikumana, L. (2000), "Financial Determinants of Domestic Investment in Sub-Saharan Africa: Evidence from Panel Data", *World Development*, Vol. 28 No. 2, pp. 381 – 400.
12. Pretorius. C.J. (1998), "Gross Fixed Investment in the Macro-econometric Model of the Reserve Bank", *Quarterly Bulletin*-March 2002, No. 2. South African Reserve Bank, Pretoria.
13. Schneider, G.I.C. (1991), "Minerals and Mining", In Cornwell, R., Leistner, E. and Esterhuysen, P. (Eds), *Namibia 1990: An Africa Institute Country Survey*, Africa Institute of South Africa, Pretoria.
14. Shiimi, I.W. and Kadhikwa, G. (1999), "Savings and Investment in Namibia", *BON Occasional Paper* No.2, Bank of Namibia, Windhoek.
15. Tobin, J. (1969), "A General Equilibrium Approach to Monetary Theory", *Journal of Money, Credit and Banking*, Vol. 1 No. 1, pp. 15-29.

Appendix

Data

The estimation covers the period 1971 to 2010 and uses annual data. The data were sourced from various issues of the Annual Report and Quarterly Bulletin of the Bank of Namibia; the Central Bureau of Statistics of Namibia and Cornwell *et al*. (1991).

Table A1. List of variables

Series	Natural logarithm	Variable
Y	lnY	Real gross domestic product at 1995 prices
I	lnI	Real gross domestic fixed investment (gross fixed capital formation) at 1995 prices.
S	lnS	Real gross domestic savings (gross national disposable income minus consumption) at 1995 prices
UCC	lnUCC	User cost of capital. It is computed as: $UCC = price\ of\ capital\left(\frac{\text{int}\ erest\ rate + depreciation\ rate}{1 - tax ratio}\right)$
OPEN	lnOPEN	Openness of the economy computed as the sum of import and export divided by GDP.
FINA	luFINA	Financial development proxied by credit extended to the private sector as ratio of GDP.

Table A2. Unit root test

Series	Model	Lags	ADF	$\Phi_3 \Phi_1$
lnI	Trend	0	-1.069	0.983
	Constant	0	-0.580	0.337
	None	0	1.223	
lnY	Trend	0	-2.718	3.695
	Constant	0	-0.601	0.3609
	None	0	3.461	
lnS	Trend	0	-2.629	3.559
	Constant	0	-2.480	6.153
	None	0	0.040	

lnOPEN	Trend Constant None	0 0 0	-2.235 -2.182 -0.998	3.559 6.153
lnUCC	Trend Constant None	0 0 0	-0.867 -1.494 1.813	1.264 2.233
ΔlnI	Trend Constant None	0 0 0	-5.499*** -5.394*** -5.285***	15.689*** 29.102***
ΔlnY	Trend Constant None	0 0 0	-5.248*** -5.486*** -4.052***	14.735*** 30.093***
ΔlnS	Trend Constant None	0 0 0	-7.749*** -7.839*** -7.925***	30.029*** 61.443***
ΔlnUCC	Trend Constant None	0 0 0	-6.058*** -5.641*** -4.408***	18.384*** 31.817***

Notes: */**/* Significant at 10%/5%/1% level

At 10/5/1 percent significance level the critical values are -3.209/-3.552/-4.262 when trend and constant are included, and -2.615/-2.954/-3.646 when only a constant is included and -1.610/-1.951/-2.636 when none is included.

The Dickey-Fuller critical values at 10/5/1 percent level are 5.91/7.24/10.61 when trend and constant (Φ_3) are included, and 4.12/5.18/7.88 when only a constant is included (see Dickey and Fuller, 1981; Enders, 2004: 440).