FINANCIAL SECTOR REFORMS AND INVESTMENT EFFICIENCY IN SOUTH AFRICA

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Abstract: The effect of financial liberalisation on investment in sub-Saharan Africa countries has drawn much attention in the recent literature. The major thrust of the literature has been to understand the mechanism by which interest rate deregulation on one hand and elimination of other forms of financial repression on the other hand; affect the quantity and quality of investment. This study attempts to empirically investigate the relevance of financial reforms on investment efficiency in South Africa using Johansen-Juselius cointegration method. Contrary to the results of other previous studies, the results of this study fail to find a robust positive relationship between real interest rates and investment efficiency in South Africa. The study therefore, concludes that positive real interest rates do not enhance the efficiency of investment in South Africa.

KEY WORDS: South Africa, Financial Liberalisation, Investment Efficiency, and Growth)

INTRODUCTION

Financial liberalisation in South Africa was initiated shortly after the De-Kock commission reports of 1978 and 1985. Interest and credit controls were virtually removed in 1980, while bank's liquidity ratios were reduced substantially between 1983 and 1985.

Credit ceilings were in effect from 1965 to 1972 and 1976 to 1980. The register of cooperation, which limited bank competition, was also eliminated in 1983. Exchange control on non-residents was eliminated in 1995, while those on residents were relaxed in 1995 (Williamson and Mahar, 1998). Although South Africa rapidly removed credit ceilings and interest rate controls as early as 1980, capital controls were later tightened in 1985 in response to capital flight following the worldwide imposition of economic sanctions.

The interest rates remained either negative or slightly positive until 1985. A definite positive interest rate was only achieved in the 1990s. By the standard of developing countries, South Africa is considered to have one of the most developed and sophisticated financial systems in sub-Saharan Africa. The Johannesburg Stock Exchange (JSE), formed in 1887, is ranked as the 18th largest stock exchange in the world in terms of market capitalization (Bureau of Africa Affairs, April, 2000). The South Africa Reserve Bank, which is one of the oldest central banks in the world, performs all central banking functions. The bank is independent and operates in the same way as Western central banks, influencing interest rates, and controlling liquidity through the interest rates on funds provided to the private banks.

By 1997, South Africa had about 51 licensed banks. In addition, there were five mutual (community) banks. Out of the 51 licensed banks, 8 were branches of foreign banks, while 11 were subsidiaries of foreign banks. Today, there are about 60 banks in South Africa, including 13 branches of foreign banks, and four mutual banks.

INTEREST RATE REFORMS IN SOUTH AFRICA

During the 1960s to1980s interest rates in South Africa were largely controlled. The South African Reserve Bank was responsible for determining maximum and minimum deposit and lending rates respectively.

Between 1967-1975, the minimum and prime overdraft lending rates were set at 2% and 2.5% respectively above the Bank rate. As from 1975, banks were allowed to set their lowest overdraft rate within the margins 2.5-3.5% above the Bank rate. This continued until 1980 when the controls on lending rates were dropped. The deposit rate on the other hand had its first upper limits imposed in 1965. Although this restriction was later dropped in 1970, it was re-introduced again in 1972. It was until 1980, when the deposit rates were fully liberalized.

During the period 1960-1980, the lending rate was mainly oscillating between 5 and 12.5%, while the deposit rate remained at a single digit. The average lending rate between 1960-1970 was 7%, while between 1970-1980 it was about 10.5%.

It is worth noting that the period between 1970-1980 recorded mainly a double-digit inflation rate, with highest rate of about 14.5% being recorded in 1980. Given this high inflation, the maintenance of a low and fixed interest rates with minimal adjustment rendered real interest rates negative in most cases. Figure 1.0 shows the trend of lending rates as compared to inflation during the period (1960-1980).

Interest Rates Behaviour after the 1980 Financial Liberalization

In 1980, the government of South Africa liberalized both its lending and deposit rates. The rationale for this rapid interest rate liberalization was to allow the banks greater flexibility and encourage competition. Since then, Banks were able to vary rates charged to borrowers according to the cost of their funds and according to the credit worthless of different borrowers. Although the monetary authorities expected interest rates to be positive in real terms after its deregulation, the interest rates generally remained negative in real terms. It was not until 1990s that a distinct positive interest rate was attained. The real deposit rate for instance was about 6% in 1981 before increasing to -1.5% in 1982. The highest deposit rate between 1980 and 1990 was about 6.6%, recorded in 1984. However, the interest rates later fell to (-) 7.43% in 1986. Since 1990, the rates remained fairly and consistently positive with the exception of 1992, when the rates fell drastically. The real deposit rate rose to about 4.4% in 1990, declined to 2.4% in 1991 and to -0.13% in 1992. As from 1992, the interest rate remained positive over and above inflation.

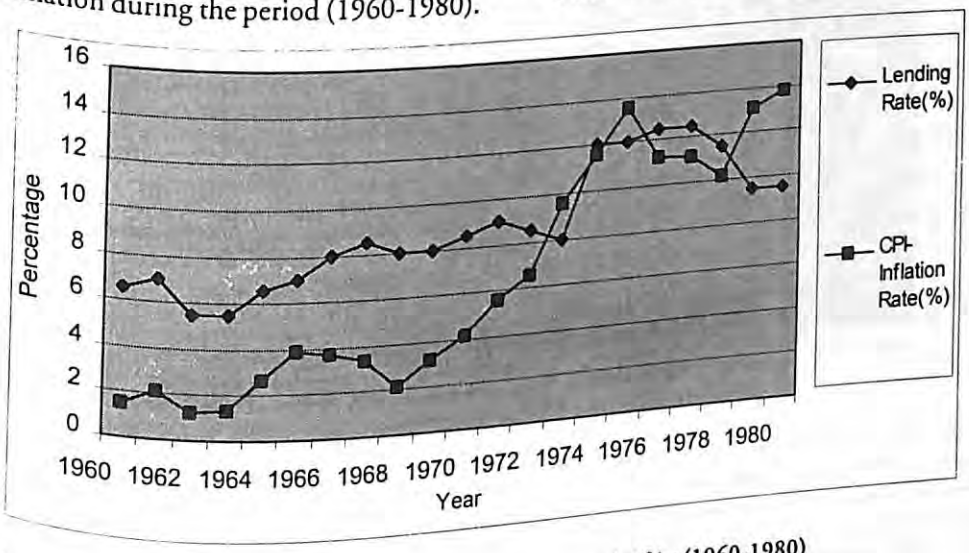

Figure 1.0: *The Trend of Lending Rate and Inflation Rate in South Africa* (1960-1980)
Source: *Computed from IFS Yearbook 1999*

This high interest rate became necessary in order to attain the twin objectives of curbing inflation and maintaining a current account surplus[1].

The lending rate on the other hand remained positive between 1982 and 1985 before falling to about -4% in 1986, where it remained negative for two years. Since 1988, the real lending rates have remained positive with a more or less increasing trend. The real lending rate has been oscillating between 2.45% in 1988 to 14.84% in 1998. Figure 2.0 gives the trend of lending, deposit, discount, and Treasury bills interest rates in South Africa between 1980 and 1998.

LITERATURE REVIEW

McKinnon's Complementarity Hypothesis

McKinnon's explanation on how interest rates impact upon savings, investment, and growth is based on three solid assumptions. The first assumption is that all economic agents are confined to self-finance to undertake investment. The second assumption is that capital is discrete and heterogeneous, making investment expenditure more indivisible than consumption expenditure. Third, it is assumed that the formal financial sector concentrates on giving credit to urban, modem, and export industries. On the basis of the first two assumptions, McKinnon was able to develop his complementary hypothesis, which states that; since economic agents have to accumulate money balances (or save) before investment can take place, money and physical capital are essentially complementary.

According to this hypothesis, potential investors must accumulate money balances before their investment and the more attractive the process of accumulating money, the greater the incentive to invest. In this case, the relative lumpiness of investment expenditures implies that aggregate demand for money will be greater, the larger the proportion of investment in total expenditures (McKinnon, 1973; Fry, 1978, 1982; Arrieta, 1988; Mohlo, 1986; and Clarke,

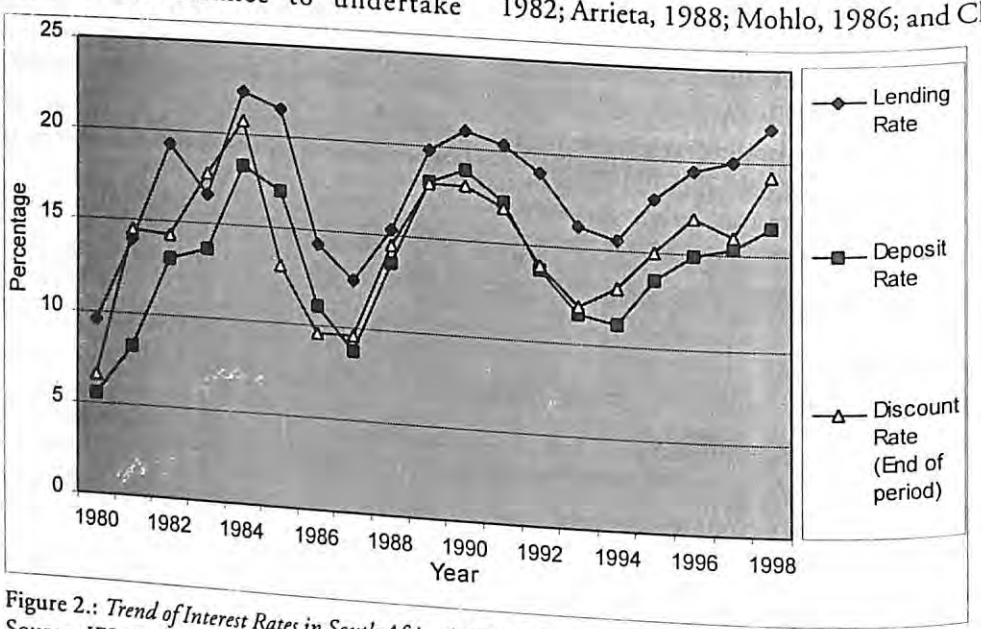

Figure 2.: *Trend of Interest Rates in South Africa (1980-1998)*
Source: *IFS Yearbook; 1999; South Africa Reserve Bank Bulletin (various issues)*

[1] The inflation rate in South Africa has remained a single digit since 1993, compared to 18.4% in 1987.

1996).

McKinnon (1973) in his influential book titled *Money and Capital in Economic Development*, combined both the theoretical analysis and illustration of malfunctioning of capital markets in developing countries. The essential message here is that, at low real interest rates, people would not want to hold much money or other financial assets. As a result, the financial system would not adequately be able to fulfil one of its primary functions of integrating capital and capital markets and equalizing returns to investment (Thornton, 1990).

According to McKinnon, the demand for household firms changes as they shift from consumption to investment because investment is lumpier and requires a longer period of accumulation from a given income stream before disbursement. Therefore, his proposition is that a rise in the rate of interest increases the volume of financial savings through financial intermediaries and thereby raises investment funds, a phenomenon he called the "conduit effect." The realised investment in this case will increase because of the greater availability of funds.

McKinnon further rationalized his complementary relationship between Investment and real assets and real money balances by stating that an increase in real money balances would mean greater efficiency and therefore would raise output sufficiently to offset the declining share of output allocated to investment (McKinnon, 1973: 46; Khatkhate, 1988). Hence, higher positive real interest rates are warranted to build up real money balances, increase financial intermediation and unification of financial markets thereby ensuring an efficient utilization of resources, particularly the scarce capital. The complementarity between money and capital accumulation will therefore continue to exist as long as the real positive interest rate does not exceed the real rate of return on investment.

Financial Liberalization and the Efficiency of Investment

There exist two channels, through which financial liberalization may lead to an increase in the quantity and quality of investment (Thornton, 1990). One is that higher interest rates increase the availability of domestic credit to finance investment. This channel however, is hard to distinguish from the effect of interest rates on savings. The second potential channel is through McKinnon's (1973) hypothesis of the complementary of money and physical capital. In this hypothesis, it is argued that because investment projects are lumpy, investors must accumulate their investment balances in the form of deposits until the required amount of principal is reached. The more attractive the returns on deposit, the more willing investors are to accumulate them. Specifically, it is argued that under financial repression, the limited supply of credit is likely to be rationed across projects according to Criteria that do not correlate closely with social returns.

De Melo and Tybout (1986) for instance, argue that when interest rates are decontrolled, two types of improvements may be induced. First, a larger volume of investment can be financed because savings have increased. If international capital movements have been also liberalized, additional funding becomes available from abroad in the form of capital inflows as well. Second, projects with expected returns below the new market-clearing rate will drop out, while previously rationed high-return projects are afforded the chance to compete for funds.

In the same vein, Nyagetera (1997) concludes that, "On one hand, an increase in the real rate of interest tends to raise the real loan rates, given a fixed intermediation cost margin. A rising real loan rate therefore rises the firms'

operating costs and lowers profitability, which then lowers their investment efficiency or productivity. On the other hand, an increase in real deposit rate may have a positive influence on investment efficiency if it increases the supply of financial savings and real credit availability from the financial system, which facilitates capacity utilisation of existing investments and in the process improve firms' profitability and capital productivity (Nyagetera, 1997: 342-343).

In a study done by Fry in 12 Asian developing countries, it was found that the ratio of domestic credit to nominal GNP is positively and significantly related to real interest rates (Fry, 1981a). Fry (1981b) gives similar results for seven pacific basin developing countries. In a later study, Fry (1980) found a strong positive and significant relationship between the availability of domestic credit and investment in a pooled time-series study of 61 developing countries. Fry (1986) also reached similar conclusions from a study of 14 Asian developing countries.

However, one question, which has recently emerged from the literature, is whether the mechanisms through which financial liberalization affects economic growth are based on the efficiency or volume of investment. Theoretical studies such as Greenwood and Jovanovic (1990), Bencivenga and Smith (1991), Levine and Renelt (1992), and Saint-Paul (1992) present models in which the gains from increased financial development stem from increased efficiency in the allocation of investment rather than from a larger volume of investment. Gregorio and Guidotti (1992) also estimate that some 75% of the positive correlation between financial intermediation and growth is due to increased investment efficiency, rather than an increased volume of investment. Gelb (1989) finds that most of the positive association between real interest rates and growth stemmed from the efficiency effect rather than the level of investment.

Cho (1988) argues that financial reform has led to an increase in allocative efficiency of investment because the cost of borrowing in different sectors and industries has narrowed sharply since 1980. The author argues that, abstracting from risk and uncertainly, an economy can be said to allocate capital efficiently if the marginal return on investment across secrors in equalized.

The gains in investment efficiency after financial liberalization have also been documented in a number of individual country studies using firm level data. In the case of Ecuador, Jaramillo, *et.al.*, (1992) found that, after controlling for firms' other characteristics, there was an increase in the flow of credit to technologically more efficient firms after financial liberalisation. Specifically, the author found that the flow of credit moved from smaller to larger firms after liberalization. This shows that the small-scale firms had been subsidized during the period prior to reform in Ecuador. The shift in credit toward large firms was therefore a case in which credit shifted to the area that had been discriminated against under the system of financial repression.

In Indonesia, credit was re-allocated from manufacturing and agriculture to other sectors after financial deregulation. Studies by Siregar (1992) and Harris *et al* (1992) found that, after liberalization, the more technologically efficient the firm, the greater the proportion of new credit it received in Indonesia[2]. For Korea, Atiyas (1992) presents evidence that small firms gained improved access to external finance after liberalization. Credit flows in this case, moved from light industrial manufacturing to services, utilities, and construction. In a similar study, Gelos (1997) provides econometric evidence that financial constraints were eased for small

[2] For more details see Caprio *et al* (1994) and Williamson and Mohar 1998.

firms in the Mexican manufacturing sector following financial liberalization. Likewise, Morisset (1993) finds that although the effect of financial liberalization on the quantity of investment was weak (and even negative in some tests) in Argentina, the effect on the quality of investment was consistently positive.

Although the bulk of the evidence seems to argue that financial liberalization has somewhat contributed towards more efficient credit allocation, this argument is not unanimous. De Gregorio (1992), for instance, argues that credit to the private sector was negatively related to growth in the 1970s and 1980s in Latin America.

The authors attribute this negative correlation to inefficient lending by banks in light of poor regulatory incentives. Following liberalization in Australia, firms increased their debt levels and banks took on more risky loans. Even though these outcomes do not in themselves mean that loans were inefficiently allocated, the evidence presented by Lowe (1992) indicates that Australian banks under-invested in effective screening methods in 1980s and therefore lacked the capacity to engage prudently in high-risk lending.

Capoglu (1990) while examining the effect of reforms in Turkey, which began in 1980, found that the reforms had made very little difference to the functional efficiency of the financial sector (as measured by the spread between lending and deposit rates). The author argues that even when Cho's (1988) method of assessing the quality of investment was used, there was still no evidence that financial reforms in Turkey had led to a rise in investment efficiency.

MODEL SPECIFICATION

Investment Efficiency Equation

In this section, we intend to test the hypothesis, which states that a rise in real interest rates (deposit rates) increases the average efficiency of investment (i.e. incremental capital output ratio). In this case, incremental capital output ratio is proxied by the ratio of gross domestic investment to gross domestic product (GDP). The incremental output capital ratio (IOCR) is regressed on the real deposit rate of interest ($d\text{-}P^e$), real exchange rate, and foreign savings.

Real exchange rate variable has been included in the above equation because depreciation of real exchange is expected to improve capacity utilisation of existing investment, which improves firm profitability, and hence efficiency of investment. The coefficient of real exchange rate is therefore expected to be positive. Foreign savings rate on the other hand is expected to ease the foreign exchange constraint, thereby facilitating the fuller utilisation of existing capital equipment. Consequently, its coefficient is expected to be positive (see also Nyagetera, 1997). The investment efficiency (IOCR) equation is therefore, presented as follows:

(1) $IOCR = f(D\text{-}P^e, Sf/Y, Rexr, e_t$

The above model can be specified as:

(2) $IOCR = \psi_o + \psi_1 (d\text{-}Pe) + \psi_2 Sf/Y + \psi_3 LogRexr + \varepsilon_t$

Where: d-Pe = real deposit rate of interest; Sf/Y = foreign savings ratio; Rexr = real exchange rate; ε_t = error term.

The evidence of investment efficiency will be achieved if:

(3) $\delta(IOCR)/\delta(d\text{-}Pe) > 0$.

The expected signs of other variables are as

follows:

(4) $\delta (IOCR) / \delta (Sf/Y) > 0$

(5) $\delta (IOCR) / \delta (Rexr) > 0$

The investment efficiency model specified in equation (1) is adopted from Nyagetera (1997) and is similar to that used by Ikhide (1992), except that in this case variables such real exchange rate and foreign savings rate have been included as determinants of incremental output capital ratio.

Data Source and Definitions of Variables

Data Source

This study utilizes annual time series data, which covers the 1968 and 1999 period. The data used in the study are obtained from different sources, which include; various series of South African Reserve Bank Bulletin, International Financial Statistics (IFS), African Development Indicators and Bureau of Economic Research (BER) Hand-Book of Economic Statistics (University of Stellenbosch).

Definitions of Variables

What follows is the definition of the variables used in the study.

(i) 'Foreign savings' in this study is measured by the current account deficit in the balance of payment account.

(ii) 'Incremental output capital ratio' (IOCR) is estimated as follows:

IOCR = y/I/Y

where;

y is the growth rate in real income and I/Y is gross domestic investment as a ratio of GDP.

(iii) The real exchange rate is computed as:

$Rexr = NExr * CPI(US)/CPI(SA)$

Where:

REXr = Real exchange rate;

NEXr = Nominal exchange rate;

CPI(US) = Consumer Price Index of United States of America;

CPI(SA) = Consumer price index of South Africa.

(iv) Real interest rate is computed as a residual of nominal deposit rate less expected inflation. Where, unobservable expected rate of inflation was generated from the actual inflation rate.

Unit Root and Co-integration Tests

Unit - Root Tests

In order to test for the stationarity of the data used in this study, the Dickey-Fuller and Augmented-Dickey Fuller class of tests are used. The first step in this case is to test for the stationarity of the variables at level, with and without trend. If the variables are non-stationarity, then the next step is to difference the variables once and test for the stationarity of differenced variables. If the variables become stationary after first difference, then it is concluded that the variables are integrated of order one [i.e. I(1)] .

In this case, all the variables except foreign savings ratio (SFN) were found to be stationary only after being differenced once. The results of stationarity tests are presented in Table 1.

Table 1: *Stationarity Tests of Variables on first Difference*

Variables	DF	ADF	Order of
Dp-Pe	-3.809	-4.003	I(I)
DFS/Y	-8.226	-4.275	I(I)
DIOCR	-6.140	-3.938	I(I)
DLREXr	-6.245	-3.410	I(I)

Note:

1) Critical value for DF: 1 %=-2.652, 5%= -1.954;
2) Critical value for ADF: 1%=-2.66, 5%= -1.955;
3) ** = Stationary at 1 %.

As seen in Table 1, the DF and ADF tests applied to the first difference of the data series reject the null hypothesis of the non-stationarity. It is therefore concluded that the variables are integrated of order one. This also suggests that with exception of foreign savings, the regressions for all the variables have to be done on first difference and not at levels.

Co-integration Test

The theory of co-integration was first introduced in the literature by Granger (1981) and further popularised and formalised by Engle and Granger (1987)[3]. Later, a system based cointegration test using vector autoregressions (V AR) was introduced by Johansen (1988), Johansen and Juselius (1990), and Johansen (1991).

The theory of co-integration is based on the argument that although economic time series exhibit trending behaviour (i.e. non-stationary), an appropriate linear combination between trending variables could remove the trend component and hence time series could be co-integrated. The importance of co integration is that it allows for the use of error-correction mechanism (ECM), which enables the model to adjust from the short-run to long-run solution suggested by the theory. The research on co-integration tests has developed into two main directions: tests based on the residuals from a co integration regression (i.e. Engle and Granger, 1987), and the system based tests using the vector auto-regressions (V AR). The latter, which the current study intends to use, is based on tests suggested by Johansen (1988, 1991), and Johansen and Jeselius (1990).

Johansen and Juselius Approach

The multivariate cointegration test by Johansen (1988) can be expressed as:[4]

$$(2)\ Xt = \Gamma_0 + \Gamma_1 \Delta X_{t-1} + \Gamma_2 \Delta X_{t-2} + \ldots\ldots\ldots + \Gamma_{p-1} \Delta X_{t-p} + \Pi X_{t-p} + \varepsilon_t$$

Where:

X_t= [IOCR, d-pe, Sf/Y, RExr];

X = is a 4 x 1 vector of variables that are integrated of order one [i.e. 1(1)];

Γ = is a 4x4 matrix of coefficients;

Π = 4x4 matrix of parameters; and

ε_t = is a vector of normally and independently distributed error term.

The presence of r co-integrating vectors between the elements of X, implies that n is of the rank r ($O<r<4$) and hence n can be decomposed as:

$$(3)\ \Pi = \alpha \beta'$$

where:

α = is the matrix of co integrating vectors.
β = is the adjustment matrix
α and β are 4xr matrices.

The above equation can now be written as:

$$(4)\ Xt = \Gamma_0 + \Gamma_1 \Delta X_{t-1} + \Gamma_2 \Delta X_{t-2} + \ldots\ldots\ldots + \Gamma_{p-1} \Delta X_{t-p} + \alpha(\beta' X_{t-p}) + \varepsilon_t$$

The rows of β are interpreted as distinct cointegrating vectors such that $\beta' X_t$ form linear stationarity process and α's are the vector correction coefficients. The problem with the β' presented in equation (4) is that they are unrestricted and hence this system cannot identify typical long-run economic relationships. Each vector therefore, requires at least r restrictions, one of which is the normalisation restriction. These normalisation restrictions must be motivated by economic theory so that the identified cointegrating vectors can be intepretated as long-run economic relationships.

[3] See also Dutta and Ahmed, 1997.

[4] See also Kar and Pentecost (2000); Kogar (1995).

Trace Test and Maximum Eigenvalue Test

The Johansen and Juselius method uses two tests to determine the number of co-integrating vectors, namely the Likelihood Ratio Trace test- LRT" and the "Maximum Eigen Value test – ME". The likelihood trace statistics can be expressed as:

$$(5)\quad LRT = -T\sum_{i-i+1}^{n} In\,(1-\mu_i)$$

The null hypothesis in this case is that the number of cointegrating vectors is less' than or equal to r, where r is 0, 1, or 2.., etc. In each case, the null hypothesis is tested against the general hypothesis. That is, the full rank r = n. The maximum Eigenvalue test on the other hand is expressed as:

$$(6)\quad ME = -T\,In\left[1-\hat{\mu}_r\right]$$

In this case, the null hypothesis of the existence of r cointegrating vector is tested I against the alternative of r+ 1 co integrating vectors. If there is any divergence of results between the trace test and the maximum eigenvalue test, it is advisable to rely on the evidence based on the maximum eigenvalue test because the latter is more reliable in small samples (see Dutta and Ahmed, 1997; Banerje et al, 1993).

Table 2: *Johansen-Juselius Maximum Likelihood Cointegration Tests*

Trace Test				Maximum Eigenvalue Test			
Null	Alternative	Statistics	95% Critical value.	Null	Alternative	Statistics	95% Critical value.
r = 0	r = 1	82.43**	47.2	r = 0	r ≥ 1	56.79**	27.1
r ≤ 1	r = 2	25.64	29.7	r ≤ 1	r ≥ 2	15.73	21.0
r ≤ 2	r = 3	9.905	15.4	r ≤ 2	r ≥ 3	6.651	14.1
r ≤ 3	r = 4	3.254	3.8	r ≤ 3	r ≥ 4	3.254	3.8

Note: r stands for the number of cointegrating vectors

EMPIRICAL RESULTS

The results of co integration test based on Johansen and Juselius are presented in Table 2.[5]

Based on the Trace test, there is at most one co integrating vector. Starting with the null hypothesis of no co integration (r=0) among the variables, the trace test is 82.43, which is well above the 95% critical value of 47.2. The Trace statistics rejects the null hypothesis of r = 0 in favour of the general alternative hypothesis of r>= 1.

However, the null hypothesis of r<= 1, r<=2, and r<=3 could not be rejected. It is therefore concluded that there is at most one cointegrating vector.

On the side of maximum eigenvalue test, the null hypothesis of no cointegration (r=0) is rejected at 1 % level of significance in favour of a specific alternative, that there is one cointegrating vector, r= I. However, the null hypothesis that r<= 1, r<=2, and r<=3 could not be rejected.

It is therefore, worth noting that, both the trace and maximum eigenvalue test statistics reject the null hypothesis of r = 0 at 1 % level of significance respectively. This therefore, implies that there exists a unique co integrating

[5] The Akaike and Schwarz criteria was used to determine the number of lags for the cointegration test.

vector. Consequently, we conclude that there exist a stable long-run relationship between investment efficiency (IOCR) and interest rate. Similarly, the co integration test shows that there is a stable long-run relationship between investment efficiency (IOCR) and other determinants such as real exchange rate and foreign savings.

Residual Based Cointegration

The co integration test based on Engle-Granger (1987) involves two stages. In the first stage, the investment efficiency equation (IOCR) is estimated using OLS method. In the second stage, the residual obtained from the first stage is tested for stationarity. If the residual is stationary then the variables are co integrated and vice versa. Table 3.0 shows that both the DF and ADF reject the null hypothesis of no cointegration at 1 % level of significance.

Table 3: *Residual based Cointegration Test for Investment Efficiency (IOCR) Function (Multivariate)*

Variables	DW	DF	ADF	Co-intergration status
ECM	1.85	-4.835	-2.812	Co-integrated

Critical Values for DF: 1%=-2.652, 5%=-1.954.
ADF: 1%=-2.66, 5%=-1.955

Error Correction Modeling

Having confirmed that variables in the investment efficiency equation (IOCR) are cointegrated, the next step is to estimate an error-correction model (ECM) in order to determine the dynamic relationship between the IOCR, financial liberalisation (proxied by real deposit rate - d-pe), real exchange rate, and foreign savings (FSN). In this model, an error-correction term (ECM-1) is estimated alongside the first difference of the non-stationary variables. The ECM-1 term in this case is a residual from cointegration regression lagged once.

Over-parameterised and Preferred Model for Savings Function

The results of the general over-parameterized error-correction model for investment efficiency (IOCR) function (not presented here) are difficult to interpret and as expected, many variables are not significant. The model is therefore reduced until a preferred model is obtained. Table 4.0 gives a summary of the preferred (parsimonious) model.

Table 4.0: *Modelling of DIOCR by OLS (1969-1998)*

Variable	Coefficient	Standard Error	T -Value	T - Probability	Partial R2
constant	-19.978	10.748	-1.859	0.0828	0.1872
DIOCR-1	0.33198	0.17617	1.884	0.0790	0.1914
DIOCR-3	0.019329	0.13044	0.148	0.8842	0.0015
D-Pe-1	-0.33524	3.3202	0.101	0.9209	0.0007
D-Pe-3	0.19914	3.2729	0.061	0.9623	0.0002
DSf/Y	92.530	93.451	0.990	0.3378	0.0614
DSf/Y-3	522.17	344.63	1.515	0.1505	0.1327
DLRExr-2	69.505	37.578	1.850	0.0842	0.1857
DLRExr-3	-24.139	26.502	-0.911	0.3768	0.0524
ECM-1	-0.64230	0.18308	-3.508	0.0032	0.4507

$R^2 = 0.62$, $F(9,15) = 2.6839(0.0440)$, $\delta = 51.3259$, DW=2.58, RSS= 39515.20555

Preferred (Parsimonious) Model

The battery of tests reported for the IOCR equation above suggest that the equation does not suffer from serial correlation, nor is the model mis-specified nor the choice of functional form incorrect. The normality of the residuals are not rejected, and therefore, the reliability of the "t" values are ascertained. The residuals are also confirmed to be homoscedastic.

Analysis of the Results

In the foregoing section, the impact of financial liberalisation on investment efficiency in South Africa was examined. The empirical analysis of investment efficiency (IOCR) function was based on the assumption that the average investment efficiency is monotonically related to the incremental output capital ratio (IOCR). Contrary to the expectation of this study, the coefficient of real deposit rate though positive, failed to reach the traditional level of significance. This shows that the financial system in South Africa has an insignificant influence on the quality of investment in South Africa during the study period.

A rise in real interest rates therefore, does not influence the efficiency of investment in South Africa. The finding of this study, though contrary to the results of previous studies such as Ikhide (1992), is consistent with Nyagetera (1997) for the case of Tanzania.

The co-efficients of the first lag of IOCR and the second lag of real exchange rate however, are both positive and statistically significant as predicted by the study. The co-efficient of the third lag of foreign savings is also positive as expected, and statistically significant, which indicates that an increase in foreign savings increases the average efficiency of investment in South Africa.

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