Interest Rate Deregulation, Bank Development And Economic Growth In South Africa: An Empirical Investigation

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ABSTRACT

In this paper the dynamic relationship between interest rate reforms, bank-based financial development and economic growth is examined – using two models in a stepwise fashion. In the first model, the impact of interest rate reforms on financial development is examined using a financial deepening model. In the second model, the dynamic causal relationship between financial development and economic growth is examined, by including investment as an intermittent variable in the bi-variate setting, thereby creating a simple tri-variate causality model. Using cointegration and error-correction models, the study finds strong support for the positive impact of interest rate reforms on financial development in South Africa. However, contrary to the results from some previous studies, the study finds that financial development, which results from interest rate reforms, does not Granger cause investment and economic growth. In addition, the study finds a uni-directional causal flow from investment to financial development and prima-facie causal flow from investment to growth. The study, therefore, concludes that although interest rate reforms impact positively on financial depth in South Africa, the causal relationship between financial depth and economic growth tends to take a demand-following path. Moreover, given the causal flow from investment to financial development and a prima facie causal flow from investment to growth, it is likely that the economic development in South Africa is driven largely by the growth of the real sector rather than the financial sector.

Keywords: Africa, South Africa, Interest Rate Liberalization, Financial Deepening, Economic Growth

1. INTRODUCTION

Since the re-invention of the financial liberalisation concept in the 1970s, many countries have made attempts to liberalise their financial sectors by deregulating interest rates, eliminating or reducing credit controls, allowing free entry into the banking sector, giving autonomy to commercial banks, permitting private ownership of banks and liberalising international capital flows. However, of these six dimensions of financial liberalisation, interest rate liberalisation has been the main center of attention. Unfortunately, the experience of these countries with regard to interest rate deregulation has been mixed. In some instances, there has been a widespread belief that the original theory of financial liberalisation, which was even supported by the Breton Woods institutions, was oversold to many developing countries. In particular, the preconditions necessary for the implementation of financial liberalization as well as the un-intended consequences of a wholesale financial liberalization were never sold effectively alongside the financial liberalization policy. Previous empirical studies on this topic have concentrated mainly on Asia and Latin America, affording sub-Saharan African (SSA) countries either very little coverage or none at all. Even where such studies have been undertaken, findings on the role played by high interest rates and their effect on financial deepening and economic growth are at best inconclusive. For instance, several studies have found little evidence for the positive role of interest rate on economic growth because of its ambiguous impact on savings. Yet, there has been enormous support for the position that even though interest rates might not significantly affect the savings rate, they do influence economic growth through their effect on financial deepening (Odhiambo, 2008).

The inconclusive nature of the previous empirical studies on the efficacy of financial liberalisation in many developing countries has recently led to a renewed interest in the finance-growth nexus debate. The thrust of this debate has been whether it is the growth of the financial sector that leads the growth of the real sector in the dynamic process of economic development or if it is the growth of the real sector that drives the development of the financial sector. Previous empirical studies in this area suffer from two major limitations. First, the majority of the previous studies on this subject has concentrated mainly on the use of a bi-variate causality test and may, therefore, suffer from the omission-of-variable bias. In other words, the introduction of a third variable affecting both financial depth and economic growth in the bi-variate causality system may not only alter the direction of causality between financial depth and economic growth, but also the magnitude of the estimates. Secondly, some of the previous studies have relied mainly on the cross-sectional data to examine the causal relationship between financial development and economic growth. Yet, it is now clear that the cross-sectional method by lumping countries that are at different stages of financial and economic development, may not satisfactorily address the country-specific effects.

The current study, therefore, attempts to investigate the dynamic linkage between interest rate reforms and economic growth in South Africa - using two models. In the first model the study examines the role of interest rate liberalisation on financial depth by regressing financial depth on interest rate, real income, expected inflation and the lagged value of financial depth variable. In the second model, the direction of the inter-temporal causality between financial depth and economic growth is examined by including a third variable -investment as an intermittent variable - thereby forming a simple tri-variate model. The choice of investment as an intermittent variable in the tri-variate causality framework has been largely influenced by the theoretical links between investment and economic growth, on the one hand, and investment and financial development on the other. The remainder of the paper is organised as follows: Section 2 traces the origin of interest rate liberalisation and the trends of financial development and economic growth in South Africa. Section 3 presents the literature review, while Section 4 presents the estimation technique and empirical results. Section 5 concludes the study.

2. INTEREST RATE REFORMS, FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH IN SOUTH AFRICA

South Africa was one of the first developing countries to liberalise its interest rates, which occurred in 1980. However, like many developing countries, South Africa adopted a rather rapid approach to financial liberalisation, with reversal in some instances. For example, the credit ceilings were abolished in 1972, but were later re-introduced in 1976. Between 1977 and 1979, the ceilings were further tightened before being abolished in 1980. During the same year, constraints on mortgage rate were also removed. More reforms were undertaken in the financial sector in 1982 and a substantial number of new banks were allowed to start operation in South Africa. However, in 1985 capital controls were tightened in response to capital flight following the worldwide imposition of economic sanctions. The liberalisation of interest rate in South Africa, however, was initiated in 1980 shortly after the De Kock Commission Report of 1978. During the 1960s and 1970s the South African interest rates, just like other financial prices, were quantitatively controlled. The rationale for this rapid interest rate liberalisation was to allow banks greater flexibility and to encourage competition. After the liberalisation of interest rates, banks were able to vary rates charged to borrowers according to their cost of funds and according to the creditworthiness of different borrowers. Although the monetary authorities expected interest rates to be positive in real terms after their deregulation, interest rates generally remained negative in real terms. This was largely due to the high inflationary pressures during the 1980s. It was not until the 1990s that a distinct positive interest rate was attained. After 1990, the rates remained fairly and consistently positive over and above inflation, with the exception of 1992, when rates fell drastically. High interest rates became necessary in order to attain the twin objectives of curbing inflation and maintaining a current account surplus.

Although the financial sector in South Africa is relatively deep when compared to those of other SSA countries, the M_2/GDP ratio maintained after the liberalisation of interest rates in 1980 is slightly lower than the average M_2/GDP ratio maintained before the liberalisation. For example, during the period 1972 to 1980, the average M_2/GDP ratio was 0.613. Between 1981 and 1989, the average M_2/GDP decreased to 0.549. In 1993, the M_2/GDP ratio reached about 0.469, the lowest since 1973. However, since then the ratio increased phenomenally. The ratio was 0.490 in 1994 and 0.500 in 1995 before increasing further to about 0.540 in 1997 and 0.570 in 1998.

In 1999, the M_2/GDP ratio increased to 0.579 and in 2001 the M_2/GDP ratio reached 0.597, the highest since 1980. Although South African financial depth has improved considerably since 1993, economic growth has consistently shown a mixed trend since the 1980s. For example, during the period 1975 to 1984, the average annual percentage growth in GDP in South Africa was 2.4%, with the highest growth rate of about 9.2% being recorded in 1980. However, this rate decreased dramatically to an average of about 1.4% during the period 1985-1989 (see African Development Indicators 2002). This dramatic decline in economic growth was mainly attributed to trade and financial sanctions, political unrest, and debt crisis, which dumped prospects for substantial capital inflows. Between 1990 and 1992, the GDP growth rate remained negative and systematically declined to –2.1% in 1992. It was only in 1993 that the downward slide in the South African economy was reversed. Between 1993 and 1996, the GDP growth rate maintained a more or less increasing trend (with the exception of 1995). In 1994, the GDP growth rate significantly increased to about 3.2% from about 1.2% in 1993. Although the rate declined slightly to about 3.1% in 1995, the country recorded a record high GDP growth rate of 4.2% in 1996. However, the rate later declined in 1997 and 1998 to 2.5% and 0.7% respectively. Despite dwindling economic growth, which affected South Africa in the 1980s and 1990s, a modest recovery in economic growth was maintained in 1999 and 2000. The rate later increased to 4.2% in 2000, decreased in 2003 to 2.8% and increased again in 2004 to 4.5%. By 2005, the GDP growth rate was 5.0%, the highest rate recorded since 1984. Table 1 shows the trends of selected interest rates vis-à-vis financial development and economic growth during the period 1985-2005 as compared to 1980.

Table 1: Trends of Selected Interest Rates vis-à-vis Financial Development and Economic in South Africa

Year	Real GDP growth rate (%)	Real GDP per capita (Rand)	M2/GDP	Deposit rate (%)	Discount rate (%)
1980		23294	0.560967	5.54	6.54
1990	-0.3	21710	0.538041	18.86	18.00
1991	-1.0	21045	-	17.30	17.00
1992	-2.1	20170	0.504641	13.78	14.00
1993	1.2	19996	0.468614	11.50	12.00
1994	3.2	20214	0.490061	11.11	13.00
1995	3.1	20412	0.500173	13.54	15.00
1996	4.3	20848	0.506600	14.91	17.00
1997	2.6	20955	0.539829	15.38	16.00
1998	0.5	20625	0.570344	16.50	19.32
1999	2.4	20675	0.579498	12.24	12.00
2000	4.2	21104	0.561856	9.20	12.00
2001	2.7	21269	0.596729	9.37	9.50
2002	3.7	21663	0.608751	10.77	13.50
2003	3.1	21991	0.642317	9.76	8.00
2004	4.8	22729	0.664711	6.55	7.50
2005	5.1	23564	0.615214	-	-
2006	5.0	24421	-	-	

Source: South African Reserve Bank Quarterly Bulletin (September 2007); African development Indicators (2006)

3. LITERATURE REVIEW

3.1 Interest Rate Reforms and Economic Growth

The dynamic relationship between interest rate liberalization and economic growth has been an issue of intense debate both from the theoretical and empirical fronts. Until the early 1970s, it was believed that low interest rates would promote investment spending and economic growth in both developed and developing countries alike, in accordance with the Keynesian and neo-classical theories (Molho, 1986). The argument that advocates that interest rate liberalization leads to financial development and eventually to economic growth is based on the theoretical framework and analytical underpinning by McKinnon (1973) and Shaw (1973). According to the financial liberalization theory in which interest rate liberalization is the centerpiece, the liberalization of the financial sector enables savers to switch some of their savings from unproductive real assets to financial assets – hence expanding the supply of credit in the economy. In this way, financial liberalisation impacts on economic growth,

inter alia, through its influence on savings, financial deepening and investment. It is worth noting that while the Keynessain believed in prior-investment, the McKinnon-Shaw school believed in prior-savings. McKinnon (1973), for example, argues that it is the supply rather than the demand for loanable funds which constrains investment in developing countries. This is mainly because the financial sectors in developing countries are highly repressed and the demand for loanable funds exceeds supply. In this way, an increase in interest rate will unambiguously attract deposits (loanable) funds, thereby leading to an increase in financial deepening, investment and economic growth.

On the empirical front, a limited number of studies have been conducted in developing countries to examine the relationship between interest rate liberalisation and economic growth - with varying results. Fry (1980), for example, in a study of 7 Asian countries, concludes that around half a percentage point in economic growth is foregone for every percentage point by which the real rate of interest is set below its equilibrium level. Lanyi and Saracoglu (1983) also find a positive and significant relationship between interest rates and the rate of growth of real GDP. The World Bank also finds a positive relationship between real interest rates and economic growth in 33 developing countries, for the period 1965-85 (World Bank, 1989). Roubin and Sala-I-Martin (1992) use a more sophisticated method to examine the link between financial liberalisation and growth. The authors conclude that financial repression tends to lower growth. However, Gibson and Tsakalotos (1994) cast doubts on the Roubin and Sala-I-Martin (1992) results. The authors argue that, just as in other empirical work in this area, the results of Roubin and Sala-I-Martin (1992) could suffer from omitted variable bias because each measure of financial repression is added individually. Khatkhate (1988) finds, in a sample of 64 developing countries, that there is no difference in average real GDP growth between countries having below-average and above-average real interest rates. Likewise, De Gregorio and Guidotti (1995) conclude that interest rates are not a good indicator of financial repression or distortion. The authors suggest that the relationship between real interest rates and economic growth might resemble an inverted U-curve: "Very low (and negative) real interest rates tend to cause financial dis-intermediation and hence tend to reduce growth", as implied by the McKinnon-Shaw hypotheses. On the other hand, very high real interest rates that do not reflect improved efficiency of investment, but rather a lack of credibility of economic policy or various forms of country risk, are likely to result in a lower level of investment as well as a contraction in excessively risky projects (De Gregorio and Guidotti, 1995:437). Gupta (1984, 1986), however, finds conflicting results between interest rates and economic growth in two studies. On the one hand, Gupta's (1984) cross-section study of 25 Asian and Latin American countries finds an unfavourable effect of higher interest rates on the rate of economic growth. On the other hand, Gupta (1986) finds evidence that higher real interest rates raised economic growth in India and Korea.

3.2 Financial Depth and Economic Growth

There are at least three possibilities in existing literature regarding the causal relationship between financial depth and economic growth. The first possibility is that financial development and economic growth are not causally related (Graff, 1999). This implies that neither of the two has considerable effects on the other, and that the empirically observed correlation between them is merely the result of a historical peculiarity. In other words, even though economies grow as the financial sector grows; the two sectors - financial development and economic growth - follow their own paths. That is to say, the real sector is governed by the real factors; whereas the financial sector is rooted in the history of financial institutions (see Graff, 1999). The second possibility is that financial development follows economic growth. In other words, economic growth causes financial institutions to change and develop. This hypothesis is known as a demand-following response. According to this hypothesis, the development of the real sector induces the demand for financial services, which are passively satisfied by the introduction of new financial institutions (financial development)[1]. The third possibility is known as a supply-leading response. In this case, financial development is considered as a determinant of economic growth, and the line of causation runs from financial development to real development. Under a supply-leading response, the development of financial institutions induces the development of the real sector of the economy. On the empirical front, a number of studies have been conducted on the relationship between financial development and economic growth in developing countries, but with mixed results. The empirical work, which is associated with the supply-leading response in developing countries, includes studies such as: Jung (1986), Spears (1992), King and Levine (1993), De Gregoria and Guidotti (1995), Odedokun (1996), Rajan and Zingale (1998), Ahmed and Ansari (1998), Darrat (1999), Ghali

[1] See Robinson, 1952; Patrick, 1966; Demetriades and Hussein, 1996; Chuah and Thai, 2004.

(1999), Xu (2000), Jalilian and Kirkpatrick (2002), Calderon and Lin (2003), Bhattacharya and Sivasubramanian (2003), Suleiman and Abu-Qaun (2005), and more recently Habibullah and Eng (2006), amongst others, while the empirical studies which contend that economic growth Granger causes financial development include Agbetsiafa (2003), Waqabaca (2004) and Odhiambo (2007), amongst others. Despite the arguments in favour of the supply-leading response and demand-following response, the empirical results from a number of studies have shown that financial development and economic growth can Granger cause one another. These include studies such as Wood (1993), Demetriades and Hussein (1996), Akinboade (1998), Luintel and Khan (1999), Al-Yousif (2002) and Odhiambo (2005), among others.

4. ESTIMATION TECHNIQUES AND EMPIRICAL ANALYSIS

4.1 Financial Deepening Model

In this section, the relationship between interest rate liberalisation and financial deepening is examined by regressing the financial depth variable on real income, deposit rate, expected inflation and the lagged value of financial depth. The research question in this case is whether real interest rates positively or negatively affect financial depth. The model can be expressed as follows:

$$Log(FD)_t = \beta_0 + \beta_1 \log y_t + \beta_2 \log d_t + \beta_3 \log Pe_t + \beta_4 \log(FD)_{t-1} + E_t \quad (1)$$

Where: $(FD)_t$ = Financial depth variable proxied by M2/GDP; y = real income; d= deposit rate (nominal); Pe = expected inflation; $(FD)_{t-1}$= financial depth lagged once.

The rationale for including different variables in the financial deepening model is based on the following theoretical arguments: The inclusion of deposit rate is expected to capture the impact of interest rate liberalization on financial deepening. The coefficient of deposit rate in the financial deepening model is, therefore, expected to be positive and statistically significant. A positive relationship between real interest rate and financial depth will inevitably corroborate the positive role of interest rate liberalization on economic growth. The inclusion of inflation rate is meant to capture the impact of inflation on the various components of money. There has been an argument that inflation adversely affects the holding of all classes of financial assets and not just a narrow class. In addition, it has been argued that inflation will tend to encourage the holding of currency and discourage the holding of quasi-money (see also Odhiambo, 2005; Ikhide, 1992). According to English (1999), a higher inflation rate encourages households to substitute purchased transactions services for money balances, thereby boosting the financial sector. The coefficient of inflation in this study is, therefore, expected to be positive and statistically significant. The inclusion of real GDP is supported by the life cycle hypothesis and the coefficient of the variable is expected to be positive and statistically significant.

4.2 A Trivariate Granger Causality Model

In this section, a trivarate Granger causality test is used to examine the causal relationship between financial development, investment and economic growth in South Africa. A trivariate causality tests has been used in this study because the causality tests based on a bivariate framework have been found to be very unreliable. The introduction of a third important variable in the causality model can change both the causal inference and the magnitude of the estimates (see also Caporale and Pittis, 1997; Caporale et al., 2004; Odhiambo, 2008). Given the weakness associated with the bivariate causality tests, the current study uses a trivariate causality framework to examine the causality between financial development, investment and economic growth in South Africa. The trivariate Granger causality test based on error-correction model can be expressed as follows:

$$y/N_t = \lambda_0 + \sum_{i=1}^{m} \lambda_{1i} y/N_{t-i} + \sum_{i=1}^{n} \lambda_{2i} FD_{t-i} + \sum_{i=1}^{n} \lambda_{3i} Inv_{t-i} + \lambda_4 ECT_{t-1} + \mu_t \quad (2)$$

$$FD_t = \varphi_0 + \sum_{i=1}^{m} \varphi_{1i}\, y/N_{t-i} + \sum_{i=1}^{n} \varphi_{2i} FD_{t-i} + \sum_{i=1}^{n} \varphi_{3i}\, Inv_{t-i} + \varphi_4 ECT_{t-1} + \varepsilon_t \quad (3)$$

$$Inv_t = \delta_0 + \sum_{i=1}^{m} \delta_{1i}\, y/N_{t-i} + \sum_{i=1}^{n} \delta_{2i} FD_{t-i} + \sum_{i=1}^{n} \delta_{3i}\, Inv_{t-i} + \delta_4 ECT_{t-1} + \nu_t \quad (4)$$

Where

ECT_{t-1} = error correction term lagged one period.
Y = economic growth (real GDP per capita).
FD = financial depth variable (M2/GDP).
Inv = Investment (a third important variable affecting finance-growth relationship).
μ, ε and ν = mutually uncorrelated white noise residuals.

It is worth noting that in the error-correction-based causality test, the short-run causal impact is measured through the F-statistics and the significance of the independent variables, while the long-run causal impact is measured through the error-correction term.

4.3 Data Source and Definition of Variables

4.3.1 Data Source

Annual time series data, which covers the 1969 to 2006 period, is utilised in this study. The data used in the study are obtained from different sources, including various issues of the South African Reserve Bank reports, International Financial Statistics (IFS) Yearbooks published by the International Monetary Fund and World Bank Statistical Yearbooks.

4.3.2 Definitions of Variables

i) Financial depth

Financial depth = M2/GDP

where: M2 = broad money stock; and GDP = gross domestic product.

ii) Nominal deposit rate (d) = interest rate on 6 to 12 months deposit in commercial banks.

iii) Expected inflation (P^e) = The unobservable expected inflation is generated from the actual inflation rate using adaptive expectations theory.

iv) Real GDP per capita

The real per capita GDP is computed as follows

Real GDP per capita (y/N) = Real GDP (y)/Total Population (N)

v) Investment rate (Inv/GDP)

Investment rate (Inv/GDP) is computed as the ratio of private investment to GDP.

4.4 Empirical Analysis

4.4.1 Stationarity Test

A number of unit root tests have been employed in order to examine the order of integration of the variables used in the study. These include the Phillips-Perron following Phillips and Perron (1988) and the Dickey-Fuller generalised least square (DF-GLS) de-trending test proposed by Elliot et al. (1996). The results of the stationarity tests at level (not presented here) show that all variables are non-stationary at level. Having found that the variables are not stationary at level, the next step is to difference the variables once in order to perform stationary tests on differenced variables. The results of the stationarity tests on differenced variables are presented in Tables 2 and 3.

Table 2: Stationarity Tests of Variables on first Difference - PHILIP-PERRON (PP) TEST

Variable	NO TREND	TREND	Stationarity Status
DLM2/GDP	-4.9607***	-4.9687***	Stationary
DLy-growth	-10.4788***	-10.4245***	Stationary
DLd	-5.12196***	-5.3788***	Stationary
DLy/N	-3.81895***	-3.87502**	Stationary
DLInv/GDP	-5.26033***	-5.14156***	Stationary
DLPe	-4.665691***	-6.107106**	Stationary

Note: The truncation lag for the PP tests is based on Newey and West (1987) bandwidth.
*** denotes significance at 1%.

Table 3: Stationarity Tests of Variables on first Difference - DF-GLS TEST

Variable	NO TREND	TREND	Stationarity Status
DLM2/GDP	-3.491182***	-3.90526***	Stationary
DLy-growth	-5.65554***	-5.30213***	Stationary
DLd	-5.14809***	-5.46994***	Stationary
DLy/N	-3.511414***	-3.87301***	Stationary
DLInv/GDP	-5.07167***	-5.166741***	Stationary
DLPe	-3.90354***	-5.88517***	Stationary

Note: Critical values are based on Elliot-Rothenberg-Stock (1996, Table 1).
***, **, and * denote 1% , 5% and 10% level of significance, respectively.

The results reported in Tables 2 and 3 show that after differencing the variables once, all the variables were confirmed to be stationary. The Phillips-Perron and DF-GLS tests applied to the first difference of the data series reject the null hypothesis of non-stationarity for all the variables used in this study. It is, therefore, worth concluding that all the variables are integrated of order one.

4.4.2 Empirical Analysis of Model 1 - Financial Deepening Equation

Cointegration Test

Having established that the variables included in the financial deepening equation are integrated of the same order (order one), the next procedure is to test the possibility of cointegration among the variables used. For this purpose, the study uses the Johansen-Juselius (Maximum-Likelihood) technique. The results of cointegration tests are presented in Table 4[2].

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

Table 4: Johansen-Juselius Maximum Likelihood Cointegration Tests: Financial Depth Model

Null hypothesis	Trace Test			Maximum Eigenvalue Test		
	Alternative Hypothesis	Statistic	95% Critical value	Alternative Hypothesis	Statistics	95% Critical value
r = 0	r ≥ 1	75.45	47.2	r = 1	50.73	27.1
r ≤ 1	r ≥ 2	24.72	29.7	r = 2	13.32	21.0
r ≤ 2	r ≥ 3	11.4	15.4	r = 3	8.707	14.1
r ≤ 3	r ≥ 4	2.691	3.8	r = 4	2.691	3.8

Note:
1) r stands for the number of cointegrating vectors
2) The lag structure of VAR is determined by the highest values of the Akaike information criterion and Schwartz Bayesian Criterion.

The results of the trace tests indicate that there is at most one cointegrating vector. The trace and Eigenvalue tests statistics reject the null hypotheses of r=0 in favor of the general alternative hypotheses of r ≥ 1 and r=1, respectively. However, the null hypothesis of r≤1, r≤2 and r ≤ 3 could not be rejected by the two maximum likelihood tests. It is, therefore, worth concluding that there is at least one cointegrating vector in the financial deepening model.

Error-correction Modelling

Having confirmed that all variables in the financial deepening equations are cointegrated, the next step is to estimate the error-correction model by including an error-correction term lagged once (ECM_{-1}) in the set of explanatory variables. The results of the over-parameterized error-correction models (not reported here) are difficult to interpret and many variables are not significant. The model is therefore reduced until the preferred model is obtained. The results of the preferred model are presented in Table 5.

Table 5: Modelling Financial Deepening equation

Variable	Coefficient	t-value
Constant	0.00101	0.147
DLM2/GDP_3	0.44327	2.554**
Dy-growt	0.00140	0.676
DLM2/GDP_1	0.40982	2.109**
DLD-rate	0.06988	2.014**
DLPe_1	0.05163	1.168
DLPe_2	-0.02140	-0.518
ECM_1	-0.33144	-2.576**
R^2 = 0.41287 F(7, 25) = 2.5114 [0.0422] δ = 0.0390072 DW = 2.16		
RSS = 0.0380389904 for 8 variables and 33 observations		

Diagnostic Tests

AR 1- 2F(2, 23)	=	1.1723 [0.3275]
ARCH 1 F(1, 23)	=	2.0538 [0.1653]
Normality $X^2(2)$	=	0.7339 [0.6928]
RESET F(1, 24)	=	0.14584 [0.7059]

** denotes 5% level of significance

The regression results reported in Table 5 show that the coefficient of the deposit rate in the financial deepening model is positive and statistically significant as expected. Likewise, the coefficient of the error-term is negative and statistically significant as expected. This shows that interest rate reforms have a positive impact on financial deepening in South Africa. The results also show that the lagged financial depth has a positive and significant impact on financial deepening in South Africa. The remaining variables were found to be statistically insignificant in this study.

4.4.3 Empirical Analysis of Model 2 – Long run Causality Test between Financial Development, investment and Economic Growth

Cointegration Test

The results of Johansen-Juselius cointegration tests between financial depth (M2/GDP), investment (Inv/Y) and economic growth (y/N) are presented in Table 6.

The results of Johansen-Juselius cointegration tests reported in Table 6 indicate the existence of a stable long-run relationship between financial depth, investment and economic growth. Both the trace test and the maximum eigenvalue statistics reject the null hypothesis of no cointegration. Specifically, the results show that there is a unique cointegrating vector between financial development, investment and economic growth.

Table 6: Johansen-Juselius Maximum Likelihood Cointegration Tests: Causality Model

	Trace Test			**Maximum Eigenvalue Test**		
Null hypothesis	Alternative hypothesis	Statistic	95% Critical value	Alternative Hypothesis	Statistics	95% Critical value
Cointegration between M2/GDP, Inv/GDP and Ly/N						
r = 0	r ≥ 1	38.98	29.7	r = 1	32.47	21.0
r ≤ 1	r ≥ 2	6.513	15.4	r = 2	8.716	14.1
r ≤ 2	r ≥ 3	0.7977	3.8	r = 3	0.7977	3.8

Note:
1) r stands for the number of cointegrating vectors
2) The lag structure of VAR is determined by the highest values of the Akaike information criterion and Schwartz Bayesian Criterion.

4.4.4 Analysis of Causality Test Based on Error Correction-Model

Although cointegration indicates presence of Granger causality, at least in one direction, it does not indicate the direction of causality between variables. The direction of the Granger causality in this case can only be detected through the error-correction model (ECM) derived from the long-run cointegrating vectors. In addition to indicating the direction of causality amongst variables, the ECM enables us to distinguish between the short-run and the long-run Granger causality. The F-statistics and the explanatory variables indicate the "short-run" causal effects, whereas the "long-run" causal relationship is implied through the significance of the t-test of the lagged error-correction term. A summary of the results of the preferred model of the causality test between financial depth (M2/GDP), investment (Inv/GDP) and economic growth (y/N) are summarised in Table 7.

Table 7: Causality Test between DLy/N, DInv/GDP and DLM2/GDP

Variables in equation	**Dependent Variables**		
	ΔLy/N	ΔLM2/GDP	ΔInv/GDP
Constant	0.0042 (0.965)	-0.2527(-2.236)	0.4588(0.825)
ΔLy/N-1	0.3323(1.631)	0.9459(2.162)**	0.6149(0.408)
ΔLy/N-3	-	0.9326(2.246)**	-
ΔLM2/GDP	0.1325 (1.325)	-	0.3206(0.411)
ΔLM2/GDP-1	-	0.0276(0.149)	-
ΔLM2/GDP-2	-	-0.2628(-1.427)	1.0641(1.142)
ΔLM2/GDP-4	-	-	0.6170(0.849)
ΔLInv/Y-3	-	0.1317(1.840)*	0.29163(0.699)
ΔLInv/Y-4	0.1435 (2.038)**	-	-
ECM $_{-1}$	-0.1300 (-0.924)	-0.4390(-2.252)**	0.2933(0.878)
F-Test	2.228[0.0737]	2.008(0.0842)	0.7041(0.7475)
R^2	0.35	0.56	0.41
DW	1.82	1.60	2.10

Notes: * and ** denote 10% and 5% level of significance respectively. The numbers in parentheses represent t-statistics.

The empirical results reported in Table 7 reject the causal flow from financial depth to economic growth but accept a prima-facie (short-run) causal flow from investment to economic growth. The causal flow from financial depth to economic growth has been rejected by the lagged error-correction term and the lagged financial depth variable in the financial depth equation, which are both statistically insignificant. The prima-facie causal flow from investment to economic growth, on the other hand, has been supported by the lagged investment variable and F-statistic in the economic growth equation, which are both statistically significant. The results also show that there is a distinct causal flow from economic growth (y/N) and investment (In/GDP) to financial depth. This is supported by the lagged error-correction term, the lagged economic growth and investment variables, as well as the F-statistic in the financial depth (M2/GDP) equation – which are all statistically significant. Finally, the results show that neither financial development nor economic growth Granger causes investment in South Africa. This is confirmed by the error-correction term, the lagged financial development and economic growth variables, as well as the F-statistic - which are all statistically insignificant. A summary of the causality test between the three variables is presented in Table 8.

Table 8: Summary of Causality Tests

Variables	Causality	General Conclusion
ΔLy/N (dependent variable), ΔLM2/GDP and ΔLInv/GDP	- No uni-directional causal flow from financial depth to economic growth is found, but a prima facie (short-run) causal flow from investment to economic growth has been detected.	- There is a prima facie (short-run) causal flow from investment to economic growth.
ΔLM2/GDP (dependent variable), ΔLy/N and ΔLInv/GDP	- There is a uni-directional causal flow from both economic growth and investment to financial development.	- Both economic growth and investment Granger cause financial depth in South Africa.
ΔLInv/GDP (dependent variable) , ΔLy/N and ΔLM2/GDP	- There is no causal flow from either financial depth or economic growth to investment.	- Neither financial depth nor economic Granger causes investment.

5. CONCLUSION

In the current study, attempts have been made to examine the impact of interest rate reforms on economic growth in South Africa through its influence on financial depth. Two models have been employed to examine this linkage in a stepwise fashion. In the first model, the impact of interest rate reforms on financial depth is examined using a financial deepening model. In the second model, the dynamic causal relationship between financial development and economic growth is examined by including investment as an intermittent variable in the bi-variate setting – thereby creating a simple tri-varaite causality model. The empirical results of the study show that there is a positive and significant relationship between interest rate reforms and financial deepening in South Africa. In addition, the study results show that lagged financial depth in South Africa also leads to further financial deepening in the country. However, contrary to the results from some previous studies, the study finds that financial development, which results from interest rate reforms, does not Granger cause investment and economic growth. Instead, the study finds that there is a uni-directional causal flow from economic growth and investment to financial development. The study, therefore, concludes that although interest rate reforms impacts positively on financial depth in South Africa, the causal relationship between financial depth and economic growth tends to take a demand-following path. Moreover, given the causal flow from investment to financial development and a prima facie causal flow from investment to growth, it is likely that the economic development in South Africa is driven largely by the growth of the real sector rather than the financial sector.

AUTHOR INFORMATION

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REFERENCES

1. Agbetsiafa, D.K. (2003), "The Finance Growth Nexus: Evidence from sub-Saharan Africa", *International Advances in Economic Research* 9(2).
2. Ahmed S. and Ansari M. (1998), "Financial Sector Development and Economic Growth: The South Asian Experience", *Journal of Asian Economics* 9(3): 503-17.
3. Akinboade, O.A, "Financial Development and Economic Growth in Botswana: A Test for Causality", *Savings and Development*, Vol. 3, 1998, pp. 331-348.
4. Al-Yousif, Y.K. (2002), "Financial Development and Economic Growth: Another Look at the Evidence from Developing Countries" *Review of Financial Economics* 11: 131-150.
5. Bhattacharya, P. and Sivasubramanian, M. (2003), "Financial Development and Economic Growth in India: 1970-1971 to 1998-1999", *Applied Financial Economics* 13(12).
6. Calderon, C., and Lin, L. (2003), "The Direction of Causality between Financial Development and Economic Growth", *Journal of Development Economics* 72, 321-334.
7. Caporale, G. and Pittis, N. (1997), "Causality and Forecasting in Incomplete System", *Journal of Forecasting* 16: 425-437.
8. Caporale, G.M, Howells, P.G. and Soliman, A.M. (2004), "Stock Market Development and Economic Growth: The Causal Linkages" *Journal of Economic Development* 29(1): 33-50.
9. Chuah, H.L and Thai, V. (2004), "Financial Development and Economic Growth: Evidence from Causality Tests for the GCC Countries", *IMF Working Paper*, Wp/04/XX.
10. Darrat, A.F. (1999), "Are Financial Deepening and Economic Growth Causally Related? Another Look at the Evidence", *International Economic Journal* 13(3): 19-35.
11. De Gregorio, J. and Guidotti, P.E. (1995), "Financial Development and Economic Growth", *World Development* 23 (3): 433-448.
12. Demetriades, P.O and Hussein, K.A (1996), Does Financial Development Cause Economic Growth? Time Series Evidence from 16 Countries" *Journal of Development Economic (December):* 387-411.
13. Elliot, G., Rothenberg, T., Stock J. (1996), "Efficient Tests for an Autoregressive Unit Root", *Econometrica* 64, 813-36.
14. English, W.B. (1999), "Inflation and Financial Sector Size", *Journal of Monetary Economics* 44(1999): 379-400.
15. Fry, M.J. (1980), "Savings, Investment, Growth and the Cost of Financial Repression" *World Development* 8 (4): 317-27.
16. Ghali, K.H. (1999), "Financial Development and Economic Growth: The Tunisian Experience", *Review of Development Economics* 3(3): 310-322.
17. Gibson, H. and Tsakalotos, E. (1994),"The Scope and Limits of Financial Liberalisation in Developing Countrie: A Critical Survey", *The Journal of Development Studies* 30 (3): 578-628.
18. Graff, Michael (1999), "Financial Development and Economic Growth – A new Empirical Analysis". *Dresden discussion paper series in Economics*, Nr. 5/99 (Technische Universitat Dresden).
19. Gupta, K.L.(1984), *Finance and Economic Growth in Developing Countries*, Croom Helm Ltd, London.
20. Habibullah, M.S. and Eng, Y. (2006), "Does Financial Development Cause Economic Growth? A Panel Data Dynamic Analysis for the Asian Developing Countries*", Journal of the Asia Pacific Economy* 11(4): 377-393.
21. Ikhide, sylvanus (1992), "Financial Deepening, Credit Availability and the Efficiency of Investment:- Evidence of Selected African Countries", *Development Research Paper Series*, Research Paper No:2.
22. Jalilian, H. and Kirkpatrick, C. (2002), "Financial Development and Poverty Reduction in Developing Countries", *International Journal of Finance and Economics* 7(2): 97-108.
23. Jung, Woo (1986), "Financial Development and Economic Growth: International Evidence", *Economic Development and Cultural Change* 34 (January): 333-46.
24. Khatkhate, Deena (1988), "Assessing the Impact of Interest Rates in Less Developed Countries", *World Development* 16 (5): 577-588.

25. King, R.G. and Levine, R. (1993), "Finance and Growth: Schumpeter Might Be Wright", *Quarterly Journal of Economics*108 (3): 713-37.
26. Lanyi, A. and Saracoglu, R. (1983), "Interest Rate Policies in Developing Countries", IMF Occassional Paper 22
27. Luintel, R and Khan, M. (1999), "A Quantitative Re-assessment of the Finance-Growth Nexus: Evidence from a Multivariate VAR", *Journal of Development Economics* 60: 381-405
28. McKinnon, R.I.(1973), *Money and Capital in Economic Development*, The Brookings Institution, Washington D.C.
29. Molho, Lazarus (1986), "Interest Rate, Savings and Investment in Developing Countries: A Re-Examination of the McKinnon-Shaw Hypothesis", *IMF Staff Papers*33 (1): 90-111.
30. Newey, W. and West, K (1987), "A Simple Positive Semi-definite, Heteroskedasticity and Autocorrelation Consistent Convariance matrix", *Econometrica*, 51.
31. Odedokun, M.O.(1996), "Alternative econometric approaches for analyzing the role of the financial sector in economic growth: Time-series evidence from LDCs", *Journal of Development Economics* 50(1), 119-146.
32. Odhiambo, N.M. (2005), "Financial Development and Economic Growth in Tanzania: A Dynamic Causality Tests", *African Finance Journal*, Vol. 7, Issue 1.
33. Odhiambo, NM (2007), "Supply-Leading versus Demand-Following Hypothesis: Empirical Evidence from Three SSA Countries", *African Development Review*, Vol. 19, Issue 2.
34. Odhiambo, N.M. (2008), "Financial Depth, Savings and Economic Growth in Kenya: A Dynamic Casual Relationship", *Economic Modelling* 25: 704-713.
35. Patrick, H.T. (1966), "Financial Development and Economic Growth in Underdeveloped Countries", *Economic Development and Cultural Change* 14 (1): 174-189.
36. Phillips, P.C.B. and P. Perron (1988), "Testing for a Unit root in Time Series regression", *Biometrika* 75: 335-346.
37. Rajan, Raghuram and Zingales, L. (1998), "Financial Dependence and Growth", *American Economic Review* 88 (3).
38. Robinson, J. (1952), *The Generalization of The General Theory in: The Rate of Interest and Other Essays*, McMillian, London.
39. Roubini, N. and Sala-i-Martin, X. (1992), "Financial Repression and Economic Growth", *Journal of Development Economics* 39: 5-30.
40. Shaw, E.S. (1973), *Financial Deepening in Economic Development*, New York, Oxford University Press.
41. Spears, A. (1992), "The Role of Financial Intermediation on Economic Growth in SSA", *Canadian Journal of Development studies* 13: 361-80.
42. Suleiman, A. and A. Abu-Qaun (2005), 'Financial Development and Economic Growth: Time series Evidence from Egypt', Forthcoming in the *Journal of Policy Modelling.*
43. Waqabaca, C. (2004), "Financial Development and Economic Growth in Fiji", Working Paper 2004/03 (December), Economics Department, Reserve Bank of Fiji.
44. Wood, Anthony (1993), "Financial Development and Economic Growth in Barbados, Causal Evidence" *Savings and Development 17 (4):* 379-390.
45. World Bank (1989), *World Development Report*, Washington D.C.
46. Xu, Z. (2000), "Financial Development, Investment and Economic Growth", *Economic Inquiry* 38 (2): 331 - 344.