Financial sector development and economic growth nexus in South Africa

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Abstract: The study investigated the nexus between financial sector development and economic growth in South Africa using cointegration and error correction modelling and; the Granger causality tests. The results of the study show that economic growth is explained by the financial sector variables and control variables such as inflation, exchange rate, and real interest rates. The Granger causality test results show that there is generally a bidirectional relationship between economic growth and financial sector development which implies that if the economy grows the financial services sector also grows and vice versa.

Keywords: growth; financial development; economic growth; financial sector development; monetary economics; finance; unit root tests; cointegration; error correction; Granger causality; bidirectional; South Africa.

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1 Introduction

Many studies, using various econometric methodologies, have been carried out on the nexus between financial sector development and economic growth in both developed and developing countries. However, very few studies have been carried out on Sub-Saharan

African countries. This study investigates the nexus between financial sector development and economic growth in South Africa using the cointegration and error correction methodology. The Granger causality test will also be applied on the economic growth and financial sector indicators included in the above model.

It should be noted that the South African economy is the largest economy on the African continent in terms of its Gross Domestic Product (GDP). South Africa's GDP is three times greater than the GDP of all the other Southern African Development Community (SADC) countries combined. In addition, South Africa is the main trading partner of all the SADC countries; and this underscores the importance of the South African economy in Southern Africa. If such an economy experiences a recession, the other SADC countries will be affected through the contagion effect. Figure 1 shows the growth rate of the South African Economy from 1977 to 2009.

Figure 1   South Africa economic growth rate (see online version for colours)
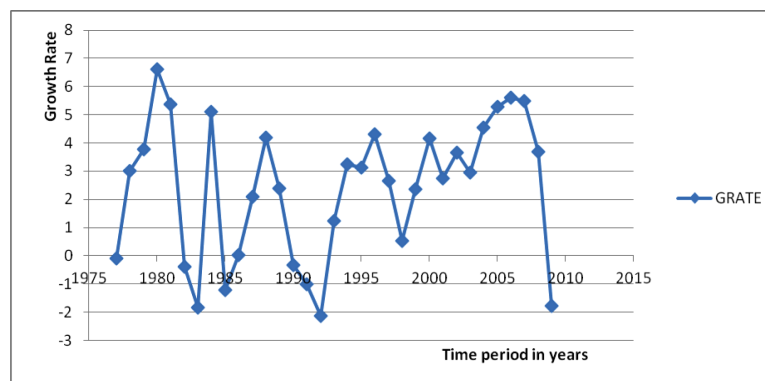
The average growth rate for the South African economy for the period from 1977 to 2009 was 2.4 per annum. This shows that the South African economy has been on increasing trend even if it has had years in which it experienced negative growth rates.

The financial services sector for South Africa is one of the best on the African continent on the basis of its performance and stability. Some of the South African banks have gone international and they have subsidiaries in most Southern African countries, for example, First National Bank, Ned Bank and Standard Chartered Bank.

This study investigates how the financial sector variables are related to economic growth variables. We also go a step further and test using Granger causality the direction of causality between the economic growth indicators and financial indicators (broad money stock as a percentage of GDP and total credit to the private sector as a percentage of GDP). The aim of this study is to contribute empirical literature on the nexus between financial sector development and economic growth in South Africa. Furthermore, this study uses more current statistical data than was used by Allen and Ndikumana (1998) and Aziakpono (2003).

2   Brief literature review

As mentioned in the Introduction section, several studies have been carried out on the nexus between financial sector development and economic growth worldwide.

Some of the studies attempted to determine if economic growth is finance led, while other studies attempted to determine if growth leads to financial sector development.

Pioneering research work is attributed to Schumpeter (1912) who contended that well-functioning banks spur technological innovation by selecting and funding entrepreneurs with the best probability to successfully implement innovative products and production processes. Other researchers had scepticism on the finance–growth relationship as they felt that economists 'badly overstress' the role of financial factors in economic growth (Lucas, 1988; Chandavarkar, 1992). Despite this scepticism, many economists believe that financial intermediation spur economic growth by enhancing resource allocation and investment opportunities (Gurley and Shaw, 1955; Goldsmith, 1969; McKinnon, 1973a, Shaw, 1973). According to McKinnon (1973b) and Shaw (1973), policies that lead to the development of the financial services sector would be expected to increase economic growth. These two researchers are the ones who first carried out research on finance-growth nexus in developing countries. In their studies, they argued that developed countries grow simply because they have well-developed financial services sectors. They, therefore, concluded that if the developing countries financial services sectors are developed, they may also find themselves growing at much faster rates. These conclusions need to be considered cautiously as economic growth is not only caused by financial sector development. This is because there are many other factors like education, health and exports growth, among others, which need to be considered because they also affect economic growth.

Recent studies took the later into consideration and estimated growth models that have both financial sector variables and other factors of growth, namely: education, trade openness, population among others, which they used as control variables (King and Levine, 1993; Levine, 1997; Kilimani, 2009). These studies also do not agree on the exact nature of the relationship between financial sector development and economic growth hence there is the need to investigate the relationship further.

3   Methodological issues

This study makes use of the neoclassical growth model that was used by King and Levine (1993) and Kilimani (2009) in their researches on financial development and economic growth.

King and Levine (1993) study broke down growth into two parts, that is, the rate of physical capital accumulation and other arguments of real per capita GDP. Taking this into account, the model becomes:

$$GY = \omega(GK) + ET \tag{1}$$

where

GY: The real per capita GDP

GK: The growth rate of physical capital stock

ET: The other determinants of real per capita GDP.

This study on the South African economy modifies the King and Levine (1993) model in the following three ways:

- King and Levine used the model on cross sectional data for 77 countries and this study is country specific for the period 1977–2009.

- King and Levine utilised a smaller number of variables than this study, which makes use of the following variables: real GDP growth, broad money as a percentage of GDP, inflation rate, real interest rate, trade openness, dummy for political instability, population and total credit as a percentage of GDP.

- This study makes use of the dummy variable for political instability. The dummy variable takes the value zero (0) for the period before independence and value one (1) for the period after independence.

The growth equation, we use in this study, therefore, follows the following specification:

$$GY_t = \omega_0 + \omega_1 F_{it} + \omega_2 X_{it} + \varepsilon_t \tag{2}$$

where

GY:	The economic growth
F:	Represents the indicators for financial development [MBS (M2 as a percentage of GDP) and TRC (total credit to the private sector as a percentage of GDP)]
X:	A matrix of conditioning variables
ω_0, ω_1 and ω_2:	The estimated parameters
ε_t:	The error term.

The general model that is estimated for the South African economy is, therefore, as follows:

$$GY = f\left(\overset{+}{MBS}, \overset{+}{TRC}, \overset{+}{POP}, \overset{+}{TROP}, \overset{+/-}{INFR}, \overset{-}{RIR}, \overset{-}{ER}, \overset{-}{DPOL}\right). \tag{3}$$

The signs that are above each individual independent variable indicate the a priori relationship between the dependent variable and the respective independent variables. This can be specified linearly as follows:

$$GY_t = \omega_0 + \omega_1 MBS_t + \omega_2 TRC_t + \omega_3 POP_t + \omega_4 INFR_t + \omega_5 RIR_t \\ + \omega_6 TROP_t + \omega_7 ER_t + \omega_8 DPOL + \varepsilon_t \tag{4}$$

where

MBS: M2 as a percentage of GDP
TRC: Total credit to the private sector as a percentage of GDP
POP: Population
TROP: Trade openness
INFR: Inflation rate
RIR: Real interest rate
DPOL: Dummy for political instability.

3.1   Steps in estimation and testing

The first thing that we do is to determine the order of integration of each variable since cointegration requires that the variables be integrated of the same order. To test the stationarity of the series, we use the Augmented Dickey Fuller (ADF) unit root testing procedure (Dickey and Fuller, 1979). The size of the coefficient λ is the one that we want to determine in the following equation:

$$\Delta Z_t = \alpha_0 + \mu t + \lambda Z_{t-1} + \alpha_i \sum_{i=1}^{n} \Delta Z_{t-i} + \varepsilon_t \tag{5}$$

where, t denotes the time trend and Z is the variable of interest that we are testing. If the null hypothesis is accepted in this case, it implies that $|\lambda| = 0$, which would reinforce the presence of a non-stationary process.

The next step is to establish whether the non-stationary variables are cointegrated or not. Individual time series can be non-stationary, but their linear combinations can be stationary if the variables have the same order of integration (Engle and Granger, 1987). This is due to the fact that equilibrium forces have a tendency to keep such variables together in the long term. If this is the case, the series are cointegrated, and it implies that an error correction term exists, which suggests that there are short-term deviations from the long-term relationship as implied by cointegration (Harris, 1995). In addition, we difference the non-stationary series to achieve stationarity, and this leads to some loss of long-term properties of the series. We then tested for cointegration among these non-stationary series by using a multi-variate approach propounded by Johansen (1988).

The error correction model is then estimated that tests the adequacy of the estimated equation. The error correction model is specified as follows:

$$\Delta PCGY_t = \alpha_0 + \sum_{i=1}^{k} \alpha_i \Delta PCGY_{t-i} + \sum_{i=0}^{k} \alpha_i \Delta Z_{t-i} + \mu_1 ECM_{-1} + \varepsilon_t \tag{6}$$

where, Z_t, is a vector of cointegrated variables, ECM_{-1}, is the error correction term lagged once and μ_t is a measure of the short-term adjustments toward their long run values. Equation (9) represents the over parameterised error correction model, which may be difficult to interpret and which also leads to a loss of degrees of freedom. Due to these difficulties, Hendry (1986) came up with the general-to-specific econometric modelling technique, which is simple and easy to interpret. This is the technique that we apply in this study.

We also use the Granger causality to test the direction of causality between the key pairs' variables. This is additional empirical information that helps strengthen the findings of this study, which we generated by using equation (5). Model (5) seems to suggest that causality flows from financial variables to economic growth, which implies that the growth in the financial sector leads to overall economic growth. However, it could be that economic growth could also be causing growth in financial sector development and this is where the use of the Granger causality test becomes important as it helps determine the direction of causality.

In the situation where two variables GY and MBS are employed, the Granger causality is unrelated to the normal use of the term since it measures precedence and information given by GY as an argument of the current values of MBS. In line with this

view, MBS is Granger caused by GY if GY helps in the forecast of MBS. Alternatively, this means that the lagged values of GY are statically significant.

A bivariate Vector Autoregressive (bVAR) time series representation for two variables GY and MBS has the following form:

$$
\left\{\begin{array}{c} \mathrm{GY}_t \\ \mathrm{MBS}_t \end{array}\right\} = \left\{\begin{array}{c} d_1 \\ d_2 \end{array}\right\} + \left\{\begin{array}{cc} b_{11}^1 & b_{12}^1 \\ b_{21}^1 & b_{22}^1 \end{array}\right\} \left\{\begin{array}{c} \mathrm{GY}_{t-1} \\ \mathrm{MBS}_{t-1} \end{array}\right\} + \cdots + \left\{\begin{array}{cc} b_{11}^n & b_{12}^n \\ b_{21}^n & b_{22}^n \end{array}\right\} \left\{\begin{array}{c} \mathrm{GY}_{t-n} \\ \mathrm{MBS}_{t-n} \end{array}\right\} + \left\{\begin{array}{c} \varepsilon_{1t} \\ \varepsilon_{2t} \end{array}\right\} \tag{7}
$$

where

t:	The subscript for time
b_{ij}:	The coefficients of the matrices associated with the VAR
$\sum \varepsilon = \varepsilon_{1t}, \varepsilon_{2t}$:	A vector of uncorrelated disturbances
d_1 and d_2:	Constants.

The superscripts show the order of the matrix

If we use a system of equations, equation (8) can be written as:

$$
\mathrm{GY}_t = d_1 + \sum_{i=1}^{n} \alpha_{11} \mathrm{GY}_{t-i} + \sum_{j=1}^{n} \alpha_{12} \mathrm{MBS}_{t-1} + \varepsilon_{1t} \tag{8a}
$$

$$
\mathrm{MBS}_t = d_2 + \sum_{i=1}^{n} \alpha_{21} \mathrm{MBS}_{t-i} + \sum_{j=1}^{n} \alpha_{22} \mathrm{GY}_{t-1} + \varepsilon_{2t}. \tag{8b}
$$

According to Gujarati (2003), Granger causality testing between variables GY and MBS involves examination of the significance of the b_{12} and b_{22} coefficients. This implies that if the vector (GY_{t-1}, GY_{t-2}, …, GY_{t-n}) does not have power in forecasting GY, MBS is therefore not Granger caused by GY. Each of the equations represented by equation (2) has to be estimated individually, when testing for Granger causality. The null hypothesis we test is that GY does not Granger cause MBS and also that MBS does not Granger cause GY. It is important that the test statistics for the Granger causality in this system of equations conforms to the standard distributions. This implies determining if the variables in the system have unit roots and if so, we also determine whether they are cointegrated or not. If the variables are cointegrated, we go on to specify and estimate an error correction model. We only consider 32 observations from 1977 to 2009, and the choice of this time period was mainly influenced by the availability of the data.

3.2 Data sources

Statistical data used in this study was sourced from the World Bank Financial Statistics and The Reserve Bank of South Africa. Finding complete statistical data for South Africa is a very difficult task and the data that is available is data for the 1975–2010.

4 Empirical results

The main aim of this study was to establish the relationship between financial sector development and economic growth. To do this, we used arguments that can be

dichotomised as financial variables (MBS and TRC) and control variables (POP, TROP, INFR, RIR, ER and POLY). The theoretical relationship between economic growth and these variables is as indicated above under the methodology.

4.1   Unit root and cointegration tests

We used the ADF test to find out the degree of differencing required to induce stationarity. First, we tested for unit roots in levels and the results are not shown. We then subjected the first differences of the above series to unit root tests to confirm the order of integration; and the results are summarised in Table 1.

Table 1   Unit root tests for variables in first differences

Series	ADF	Order of integration
DGYPC	–6.366490*	I(0)
DMBS	–7.347657*	I(0)
DLNTRC	–8.256216*	I(0)
DLNPOP	–2.799444	I(0)
DLNTROP	–4.396474*	I(0)
DNFR	–5.803980*	I(0)
DRIR	–6.610213*	I(0)
DER	8.216207*	I(0)

D before each variable denotes the first differencing of each series.

The stars *, ** and *** denotes significance at 1%, 5% and 10% levels of significance.

The critical values for the ADF statistic are: –4.0314, –3.4450, and, –3.14471 at 1%, 5% and 10% levels of significance respectively.

The results in Table 1 indicate that the first differences of all the series are integrated of order zero [I(0)]. The variables had to be differenced once to attain stationarity.

As Engle and Granger (1987) argued, if individual time series are non-stationary, their linear combinations could be stationary if the variables were integrated of the same order. To test for cointegration among these 10 variables, we invoke the multi-variate approach coined in Johansen (1988). The results from the cointegration test are given in Table 2, and they include the maximum eigenvalue statistics. The null hypothesis that we test here is that there is no cointegrating relationship against the alternative that there is a cointegrating relationship. The results of the test show that there are six cointegrating equations at the 5% level of significance. In the dependent variable in the model, PCGY is used, and all the other variables are the regressors. Before we established a growth equation with the variables shown, we experimented with many other models and variables that we later dropped out due to the poor performance. The *F*-tests for these other models, long run models (not shown) were insignificant, which suggests that the models were wrongly specified. By applying economic and statistical considerations, we dropped the other five equations.

Table 2   Johansen cointegration tests

No. CE(s)	Eigenvalue	Statistic	5% Critical value	Prob.**
None*	0.978911	396.4562	197.3709	0.0000
At most 1*	0.903228	280.6860	159.5297	0.0000
At most 2*	0.875112	210.6242	125.6154	0.0000
At most 3*	0.824613	148.2140	95.75366	0.0000
At most 4*	0.728670	95.99115	69.81889	0.0001
At most 5*	0.649506	56.85853	47.85613	0.0057
At most 6	0.452203	25.40620	29.79707	0.1474
At most 7	0.172165	7.350703	15.49471	0.5372
At most 8	0.054539	1.682468	3.841466	0.1946

Trace test indicates six cointegrating eqution(s) at the 0.05 level.

*Denotes rejection of the hypothesis at the 0.05 level.

**MacKinnon et al. (1999) *p*-values

The results from Table 2 indicate that the long run model would give spurious results since cointegration is accepted. So all the diagnostic statistics from the long run model are not useful except for the coefficients which we compare with the short run error correction model statistics to show how fast the short run coefficients would adjust to their long run values. From the long run model, we generate the residuals that we then use in the error correction dynamic model lagged once (ECM_{-1}).

4.2   Long run and short run models

Table 3   Long run growth function

Variable	Coefficient	Std. Error
MBS	0.016279	0.007389
TRC	0.014318	0.144168
INFR	−0.066062	0.033511
RIR	−0.052917	0.020802
ER	−0.030465	0.006190
DPOLY	0.1145910	0.106899
C	30.819922	6.031633

Dependent variable is PCGY.

Table 3 shows the long run equation results where we just report the coefficients of the model and the standard errors which we compare with the short run error correction model results. We are not interested in the significance of the variables at this stage because the long run results are spurious.

The error correction model we used had many variables, but we eliminated some of them because of their poor performance. We also started with an ECM with many lags, but in almost all the cases, the higher lags did not perform very well and so we limited

ourselves to just one lag for all the variables included in the model. Even so, the single lag used for all the variables were not significant except for D(INFR(–1)), which, however, had a sign opposite to the sign on D(INFR).

The results from the error correction model show that financial sector development variables explain economic growth in South Africa. This is signified by the D(MBS) and D(TRC), which are significant at 5% and 10% levels of significance. The results also show that the long run parameters of these two variables and the other variables that are significant in explaining growth are lower than the parameters of the same variables on the ECM. This is theoretically and empirically correct because the short run parameter values adjust to their long run values in the following period (year). The results signify that the error correction term in the equation is correctly signed and significant at 5% level of significance. This reinforces the results we obtained earlier that the specified series are cointegrated. The ECM coefficient of –0.33006 denotes that the level of PCGY adjusts by about 33% of the gap between the short run and long run equilibrium level in each period (year). INFR, RIR and ER are the other variables that were identified to be arguments of economic growth in the South African economy.

The error correction model in Table 4 also performed very well because even though we eliminated some variables and some lags we did not lose valuable information to a large extent. The goodness of fit of the model above is satisfactory. The adjusted coefficient of determination is 0.701461, which implies that 70% of the variation in economic growth in South Africa is explained by the variables that have been included in the ECM and the remaining 30% is explained by other variables that were not included in the model. Furthermore, the F-statistic is 12.241531 and the probability of the F-statistic is 0.000453. This means that the overall model is highly significant and robust. The DW statistic of 1.99 also shows that the model does not suffer from any serious autocorrelation.

We also carried out parameter stability tests on our ECM and the results are summarised in Figure 2. There are many tests that are used for the same purpose, and for the purposes of this study, we use the following recursive estimates: the CUSUM and the CUSUM of squares. The CUSUM is within the 5% level of significance and this clearly indicates parameter stability in the error correction equation during the sample period.

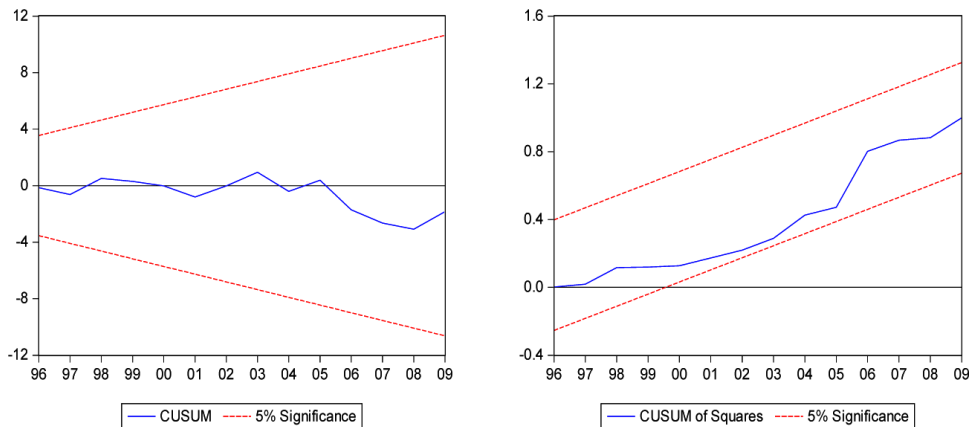**Figure 2** Parameter stability tests (see online version for colours)

Table 4 The error correction model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(PCGY(–1))	0.171974	0.221908	0.774981	0.4497
D(MBS)	0.119159	0.052701	2.261040	0.0380
D(MBS(–1))	–0.085013	0.062307	–1.364419	0.1913
D(TRC)	3.092652	1.723815	1.794075	0.0917
D(TRC(–1))	–0.198359	1.815500	–0.109259	0.9144
D(INFR)	–0.829776	0.332865	–2.492832	0.0240
D(INFR(–1))	–0.794196	0.414617	–1.915492	0.0735
D(RIR)	–0.182450	0.104417	–1.747311	0.0997
D(RIR(–1))	–0.094880	0.093093	–1.019191	0.3233
D(ER)	–0.268807	0.153924	–1.746361	0.0999
D(ER(–1))	0.219806	0.164758	1.334116	0.2008
DPOLY	0.286362	0.522377	0.548190	0.5911
RESID02(–1)	–0.33006	1.082446	–2.528442	0.0044
C	–0.120745	0.385486	–0.313229	0.7582

R-squared	0.835289	Mean dependent var	–0.023333	
Adjusted *R*-squared	0.701461	S.D. dependent var	2.566855	
S.E. of regression	1.402496	Akaike info criterion	3.819109	
Log likelihood	–43.28663	Hannan-Quinn criter.	4.028294	
F-statistic	12.241531	Durbin-Watson stat	1.997228	
Prob. (*F*-statistic)	0.000453.			

Dependent variable is PCGY.

4.3 Granger causality tests

In addition to the above estimations, we also carried out the Granger causality tests for the three variables of interest in this study, namely: PCGY, MBS and TRC. The results are shown in Table 5.

Table 5 Pairwise Granger causality tests

Null hypothesis	Obs	F-statistic	Prob.
MBS does not Granger cause PCGY	31	3.64727	0.0402
PCGY does not Granger cause MBS		0.46554	0.6329
TRC does not Granger cause PCGY	31	1.78754	0.1873
PCGY does not Granger cause TRC		0.24408	0.7852

These results suggest that the financial variable, MBS, does not Granger cause economic growth, but economic growth Granger causes MBS. So, the causality is unidirectional meaning that the economy has to grow first before the financial sector responds likewise.

However, the relationship between PCGY and TRC is bidirectional because the two variables Granger cause each other. This means that if the financial sector grows, economic growth will respond likewise and vice versa. These results confirm the results from the error correction model and add additional information by identifying which variable causes the other.

5   Conclusion and policy recommendations

The econometric results show that the major determinants of economic growth are: broad money stock as a percentage of GDP, total credit as a percentage of GDP, inflation rate, real interest rate and the exchange rate. There is no evidence from the results that suggest political instability had a negative influence on economic growth. This could be because during the pre-independence era South Africa was under sanctions and so it adopted import substitution industrialisation, which led to industrial growth. After independence, South Africa adopted the export led strategy that has worked for it very well because the economy has been steadily but surely growing.

On the policy front, this study shows that financial sector development is critical for the growth of the economy. This means that policies that lead to financial sector development should be adopted. Government may use its fiscal policy, especially taxes to give incentives for the development of the financial services sector. Moreover, the Granger causality tests that we carried out seem to suggest that there is bidirectional causality among the three variables used even though we had one case of unidirectional causality. This suggests that if the economy grows, the financial services sector also grows and vice versa. To get a clear picture of the direction of causality, a detailed study needs to be carried out using many growth and financial sector indicators.

The results also imply that a stable macroeconomic environment is critical for the growth of the economy. For the greater part of the period considered, South Africa was enjoying a relatively stable macroeconomic environment with inflation, real interest rates and exchange rates not fluctuating by big margins. All these three macroeconomic variables were significant in explaining economic growth and they also had the correct signs. What this implies is that if there is macroeconomic instability, which leads to large changes (variability) in these macroeconomic variables economic growth is impacted on in a big way. So, rapidly depreciating exchange rate, high inflation and high variability in real interest rates need to be avoided at all costs as these could hurt the economy. However, South Africa appears to have done very well as far as stabilising its macroeconomic environment is concerned as it has one of the most stable currencies in Africa and relatively low inflation levels.

More studies need to be carried out on the nexus between economic growth and financial sector development in South Africa, especially, studies that give a detailed account of the direction of causality. Although this study attempted to test for causality on three variables, there is still need to carry out comprehensive causality tests to unravel the true nature of the direction of causality.

References

Allen, D.S. and Ndikumana, L. (1998) *Financial Intermediation and Economic Growth in South Africa*, Working Paper Series 1998–004, The Federal Reserve Bank of St. Louis.

Aziakpono, M.J. (2003) 'Explaining the behaviour of financial intermediation in the Southern African Customs Union Countries: evidence from a panel data analysis', Paper presented at the *Eighth Annual Conference on Econometric Modelling in Africa by the African Econometric Society* held at Stellenbosch, South Africa, 1–4 July.

Chandavarkar, A. (1992) 'Of finance and development: neglected and unsettled questions', *World Development*, Vol. 20, No. 1, pp.133–142.

Dickey, D.A. and Fuller, W.A. (1979) 'Distribution of estimators for autoregressive time series and unit roots', *Journal of American Statistical Association*, Vol. 74, No. 2, pp.427–431.

Engle, R. and Granger, C. (1987) 'Cointegration and error correction: representation, estimation and testing', *Econometrica*, Vol. 55, No. 2, pp.251–278.

Goldsmith, R.W. (1969) *Financial Structure and Development*, Yale University Press, New Haven.

Gujarati, D.N. (2003) *Basic Econometrics*, 4th ed., McGraw-Hill International Editions, New York, USA, pp.696–703, 814–830.

Gurley, J.E. and Shaw, E.S. (1955) 'Financial aspects of economic development', *American Economic Review*, Vol. 4, pp.515–538.

Harris, R. (1995) *Cointegration Econometric Modelling*, Pearson Education, UK.

Hendry, D.F. (1986) 'Econometric modelling with integrated variables', *Oxford Bulletin of Economics*, Vol. 48, pp.199–211.

Johansen, S. (1988) 'Statistical analysis of cointegration vectors', *Journal of Economic Dynamics and Control*, Vol. 12, pp.231–254.

Kilimani, N. (2009) *The Link between Financial Development and Economic Growth in Uganda: A Causality Test*, Paper Presented at the CSAE Conference 22–24 March.

King, R.G. and Levine, R. (1993) 'Finance and growth: schumpeter might be right', *The Quarterly Journal of Economics*, August.

Levine, R. (1997) 'Financial development and economic growth: views and agenda', *Journal of Economic Literature*, Vol. XXXV, pp.688–726.

Lucas, R.E. (1988) 'On the mechanics of economic development', *Journal of Monetary Economics*, Vol. 22, pp.3–42.

MacKinnon, J.G., Haug, A.A. and Michelis, L. (1999) 'Numerical distribution functions of the likelihood tests for cointegration', *Journal of Applied Econometrics*, Vol. 14, pp.563–577.

McKinnon, R.I. (1973a) *Money and Capital in Economic Development*, Brookings Institution, Washington DC, USA.

McKinnon, R.I. (1973b) *Critical Values for Cointegration Tests*, Discussion Paper, University of California, San Diego.

Schumpeter, J.A. (1912) *The Theory of Economic Development, Leipzig: Dicker and Humblot*, Translated by Redvers Opie, Harvard University Press, Cambridge, MA.

Shaw, E.S. (1973) *Financial Deepening in Economic Development*, Oxford University Press, New York.