Economic Issues, Vol. 13, Part 2, 2008

Financial Development in Kenya: a Dynamic Test of the Finance-led Growth Hypothesis[1]

Nicholas M Odhiambo

ABSTRACT

This study examines the direction of causality between financial development and economic growth in Kenya using a dynamic Granger causality model. The study has been motivated by the current debate on the inter-temporal causal relationship between financial development and economic growth in developing countries. The thrust of this debate has been whether there exists a finance-led growth response or a growth-led finance response between the two variables. To this end the study uses three proxies of financial development against real GDP per capita (a proxy for economic growth). The empirical results reveal that, although the causality between financial development and economic growth in Kenya is sensitive to the choice of measure for financial development, on balance the demand following response tends to predominate. The study, therefore, concludes that the argument that financial development unambiguously leads to economic growth can only be taken with a pinch of salt.

1. INTRODUCTION

THE DEBATE ON THE RELATIONSHIP between financial development and economic growth has recently received attention from numerous empirical studies in both developed and developing countries. The thrust of this debate has been whether financial sector development Granger causes economic growth (supply-leading phenomenon), or whether it is the growth of the real sector which Granger causes financial sector development (demand-following phenomenon). Although conventional wisdom has for a long time been in favour of the supply-leading response, the empirical findings in favour of the demand-following response are steadily growing in number and substance. Whether financial development Granger causes economic growth, as postulated by the proponents of the supply-leading response, thus remains an issue for empirical investigation. Unfortunately, the majority of the previous

studies on this topic have concentrated mainly on Asia and Latin America, affording sub-Saharan African (SSA) countries very little coverage or none at all. Moreover, some of the previous studies have relied mainly on cross-sectional data, thereby failing to address country-specific issues. The present current study attempts to investigate empirically the direction of causality between financial development and economic growth in Kenya using the cointegration-based error-correction model.

By the standards of developing countries, Kenya is considered to have one of the most developed financial systems in sub-Saharan Africa. The Kenyan financial system comprises a number of commercial banks and non-bank financial institutions. In 1993, the country had 32 commercial banks and 55 non-bank financial institutions (of which 25 were subsidiaries of commercial banks), 32 building societies, 10 development finance institutions, and a large Post Office Savings Bank network, among others. By 1999, the financial system comprised 55 commercial banks, 16 non-bank financial institutions, four building societies, 44 foreign exchange bureaus, two mortgage finance companies, a large Post Office Savings Bank and a well-established Nairobi Stock Exchange, among others. Currently, there are about 41 commercial banks, two non-bank financial institutions (NBFIs), two mortgage finance companies and 89 foreign exchange bureaus, amongst others.

Whilst financial sector development in Kenya has shown an upward trend, the growth of real GDP has taken a different path. The GDP growth rate has been very erratic with the lowest, about (-)0.8 per cent, recorded in 1992. During the early years of independence, Kenya achieved commendable economic growth compared to other SSA countries. Between 1975 and 1984, average annual percentage growth in GDP was about 4.7 per cent. During the period 1985 to 1989, average GDP growth increased dramatically to about 5.9 per cent. However, in 1991 the percentage change in GDP growth declined to about 1.4 per cent. In 1992, Kenya recorded a historic low GDP growth rate of about (-) 0.8 per cent — the lowest since independence. However, between 1993 and 1995 GDP growth increased considerably. The GDP growth rate increased from about -0.8 per cent in 1992 to 0.4 per cent in 1993, before further increasing to about 2.6 per cent in 1994. By 1995 the GDP growth rate had reached 4.4%. But this high growth rate did not last long. The GDP growth rate declined again systematically from about 4.4 per cent in 1995 to about 2.1 per cent in 1997 and 1.6 per cent in 1998. In 1999 the GDP growth rate was about 1.3 per cent and by 2000 a negative rate of about (-) 0.2 per cent was recorded. Currently, real GDP growth in Kenya is estimated at about 5.5 per cent.

The rest of the paper is organised as follows: Section 2 gives the theoretical and empirical underpinnings of the finance-growth nexus. Section 3 deals with the empirical model specification, estimation techniques and analysis of the empirical results. Section 4 concludes the study.

2. Literature review

2.1 Supply-Leading versus Demand-Following Response (A Controversy)

The direction of causality between financial development and economic growth has recently received emphasis from numerous empirical studies in sub-Saharan African countries (see Spears, 1992; Akinboade, 1998; Agbetsiafa, 2003; Odhiambo, 2004a, b, among others). For a long time, it has been assumed that financial development is very important for economic growth and, therefore, leads to economic growth (supply leading phenomenon). Little has been discussed on the alternative, where economic growth can also drive the development of the financial sector, i.e. a demand-following effect.

According to Patrick's hypothesis (see Patrick, 1966: 174-189), the direction of causality between financial development and economic growth changes over the course of development. In his view, financial development is able to induce real innovation of investment before sustained modern economic growth gets under way and, as such growth occurs, the supply-leading impetus gradually becomes less and less important as the demand-following response becomes dominant. As Patrick (1966: 177) puts it, 'this sequential process is also likely to occur within and among specific industries or sectors'. For instance, one industry may initially be encouraged financially on a supply-leading basis and as it develops have its financing shift to demand-following, while another may remain in the supply-leading phase.

This would be related mainly to the timing of the sequential development of industries, particularly in cases where the timing is determined more by government policy than by private demand forces. According to the demand-following phenomenon, a lack of financial growth is a manifestation of lack of demand for financial services. Therefore, as the real side of the economy develops, its demands for various new financial services materialise, and these are met rather passively from the financial side. In the second view, called the supply-leading phenomenon, the financial sector precedes and induces real growth by channeling scarce resources from small savers to large investors according to the relative rate of return (see Jung, 1986; Odhiambo, 2004).

2.2. Selected Empirical Literature

The empirical literature on the causal relationship between financial development and economic growth can be classified conveniently into three groups (Odhiambo, 2004a, b). The first group argues that it is the development of the financial sector that drives the real sector of the economy (supply-leading response). The second group maintains that it is economic growth that drives the development of the financial sector (demand-following response). The third group, however, contends that both financial development and economic growth Granger cause one another (bi-directional causal relationship).

The empirical work consistent with a distinct supply-leading response includes studies such as: Choe and Moosa (1999); Rajan and Zingales (1998); De Gregorio and Guidotti (1995); King and Levine (1993); Crichton and De Silva (1989); and Jung (1986), among others. Choe and Moosa, while examining the relationship between the development of financial systems and economic growth in Korea, conclude that financial development in general leads to economic growth and that financial intermediaries are more important than capital markets in this relationship (Choe and Moosa, 1999). Rajan and Zingales investigate whether financial development facilitates economic growth by scrutinising the rationale that financial development reduces the costs of external finance to firms. The result of their study suggests that financial development has a substantial supportive influence on the rate of economic growth. Specifically, the study finds that industrial sectors that are relatively more in need of external finance develop disproportionately faster in countries with more developed financial markets (Rajan and Zingales, 1998). Likewise, De Gregorio and Guidotti, while examining the empirical relationship between financial development and economic growth conclude that, by and large, financial development leads to improved growth. The authors, however, reiterate that the effects vary across countries and over time (De Gregorio and Guidotti, 1995).

King and Levine used an endogenous growth model to examine how financial systems affect economic growth. According to the findings of this study, better financial systems improve the possibility of successful innovation, thereby accelerating economic growth. Similarly, financial sector distortions reduce the rate of economic growth by reducing the rate of innovation. The study, therefore, concludes that financial systems are important for productivity, growth, and economic development (King and Levine 1993). Crichton and De Silva, while examining the progress of financial intermediation resulting from economic growth in Trinidad and Tobago, find that there is a definite positive correlation between economic growth and financial development, at least during the period 1973-1982. However, the study concludes that 'while changes in the real sector clearly impacted on the financial system, it is not clear to what extent financial intermediaries may have, in turn, aided the growth process through their ability to allocate savings efficiently to the most productive sectors of the economy' (Crichton and De Silva, 1989: 161). Other empirical studies whose results are consistent with the finance-led growth hypothesis include Levine (1997), Levine *et al.* (2000) and Temple (1999).

Contrary to the above, there are a number of studies that contend that economic growth Granger causes financial development. Shan et al (2001), for example, while examining the relationship between financial development and economic growth in nine OECD countries and China, using the VAR framework, find little support for the hypothesis that finance 'leads' economic growth and cautions against making such a general conclusion. Waqabaca

(2004), while examining the relationship between financial development and economic growth in Fiji, finds a positive relationship between financial development and economic growth, but with the causation running from economic growth to financial development. Agbetsiafa (2003), while examining the causal relationship between financial development and economic growth in a sample of eight (8) emerging economies in sub-Saharan Africa (SSA), finds a unidirectional causality from growth to finance dominate in Ivory Coast and Kenya.

In a recent study, Zang and Kim (2007) examine the causal link between financial development and economic growth in East Asian countries. By applying the Sims-Geweke causality technique on a large panel data set provided by Levine *et al* (2000), the authors — in sharp contrast to Levine *et al* (2000) — find no evidence of any positive unidirectional causal link from financial development indicators to economic growth. On the contrary, the authors find substantial evidence that economic growth precedes financial development.

Despite the overwhelming arguments in favour of supply-leading and demand-following hypotheses, a number of studies found that financial development and economic growth can Granger cause one another. Studies, whose results are consistent with the bi-directional causality test, include Jung (1986), Wood (1993), Akinboade (1998), Kar and Pentecost (2000), Calderon and Liu (2003), and Chuah and Thai (2004), among others. Jung (1986), for example, investigates the international evidence on the causal relationship between financial development and economic growth using annual data from 56 countries. Using both simple and uni-directional concepts of causality, the author finds that while less developed countries are characterised by the causal direction running from financial development to economic growth, developed countries are characterised by the reverse causal direction, regardless of which causality concept is employed.

Likewise, Wood (1993) examines the causal relationship between financial development and economic growth in Barbados during the 1946-1990 period. Using Hsiao's (1979) test procedure, the author finds a bi-directional causal relationship between financial development and economic growth. The study, however, finds no support for Patrick's hypothesis. Akinboade (1998), while examining the direction of causality between financial development and related growth in Botswana during the period 1972-1995, finds evidence of bi-directional causality between financial development and per capita income. The author concludes that economic growth and financial development in Botswana appear to complement each other.

Kar and Pentecost (2000) examine the causal relationship between financial development and economic growth in Turkey. The authors find that the direction of causality between financial development and economic growth is sensitive to the choice of measurement for financial development in Turkey. Calderon and Liu (2004), while using the Geweke decomposition test on

pooled data for 109 countries, find some evidence of bi-directional Granger causality. Likewise, Chuah and Thai (2004), while investigating the causal relationship between financial development and economic growth in six (6) GCC countries, using ECM and VAR models, find that there is evidence of bi-directional causality in five of the six study countries.

3. Empirical model specification and estimation technique

3.1 Empirical model specification

In this section, a dynamic causality technique is used to examine the causal relationship between financial development and economic growth in Kenya. The study uses annual time series data, which covers the 1968 and 2002 period. The data used in the study are obtained from the Quarterly Bulletins published by the Central Bank of Kenya and the International Financial Statistics (IFS) Yearbook published by the IMF. The Granger causality test method has been chosen in this paper over other alternative techniques because of its favourable response to both large and small samples. Guilkey and Salemi (1982), and Geweke et al (1983), for example, have all shown that the Granger test outperforms the other methods in both large and small samples. Other alternative test procedures that have been suggested in the literature include: Sims (1972), Pierce and Haugh (1977), and Geweke (1982), among others. The conventional Granger causality test involves the testing of the null hypothesis that financial development does not cause economic growth and vice versa by simply running the following regressions:

Monetisation variable (M2/GDP) and economic growth (y/N)

$$\Delta y/N_t = a_0 + \sum_{i=1}^{n} a_{1i}\Delta y/N_{t-i} + \sum_{i=1}^{n} b_{1i}\Delta M2/GDP_{t-i} + u_t$$

$$\Delta M2/GDP_t = b_0 + \sum_{i=1}^{n} a_{2i}\Delta y/N_{t-i} + \sum_{i=1}^{n} b_{2i}\Delta M2/GDP_{t-i} + \varepsilon_t$$

Currency ratio (CC/M1) and economic growth (y/N)

$$\Delta y/N_t = a_0 + \sum_{i=1}^{n} a_{1i}\Delta y/N_{t-i} + \sum_{i=1}^{n} b_{1i}\Delta CC/M1_{t-i} + u_t$$

$$\Delta CC/M1_t = b_0 + \sum_{i=1}^{n} a_{2i}\Delta y/N_{t-i} + \sum_{i=1}^{n} b_{2i}\Delta CC/M1_{t-i} + \varepsilon_t$$

Domestic credit to the private sector (DCP/GDP) and economic growth(y/N)

$$\Delta y/N_t = a_0 + \sum_{i=1}^{n} a_{1i}\Delta y/N_{t-i} + \sum_{i=1}^{n} b_{1i}\Delta DCP/GDP_{t-i} + u_t$$

$$\Delta DCP/GDP_t = b_0 + \sum_{i=1}^{n} a_{2i}\Delta y/N_{t-i} + \sum_{i=1}^{n} b_{2i}\Delta DCP/GDP_{t-i} + \varepsilon_t$$

where: y/N_t = per capita income (proxy for economic growth); $M2/GDP$ = the ratio of broad money supply to GDP; $CC/M1$ = the ratio of currency in circulation to M1; DCP/GDP = the ratio of private sector domestic credit to GDP; u_t, ε_t = white noise error process; n = denote the number of lagged variables.

The null hypothesis that financial development does not Granger cause economic growth is rejected if b_is are jointly significant. Likewise, the null hypothesis that economic growth does not Granger cause financial development is rejected if ais are jointly rejected. However, the traditional causality tests suffer from two methodological deficiencies (see also Odhiambo, 2004a, b). First, these standard tests do not examine the basic time series properties of the variables. If the variables are cointegrated, then these tests incorporating differenced variables will be mis-specified unless the lagged error-correction term is included (Granger, 1988). Second, these tests turn the series stationary mechanically by differencing the variables and consequently eliminating the long-run information embodied in the original form of the variables. As opposed to the conventional Granger causality method, the error-correction based causality test allows for the inclusion of the lagged error-correction term derived from the cointegration equation. By including the lagged error-correction term, the long-run information lost through differencing is reintroduced in a statistically acceptable way. The error-correction model used in the current study is based on the following equations.

Monetisation variable (M2/GDP) and economic growth (y/N)

$$\Delta y/N_t = a_0 + \sum_{i=1}^{n} a_{1i}\Delta y/N_{t-i} + \sum_{i=1}^{n} b_{1i}\Delta M2/GDP_{t-i} + c_1 Z_{t-1} + u_t \quad (4a)$$

$$\Delta M2/GDP_t = b_0 + \sum_{i=1}^{n} a_{2i}\Delta y/N_{t-i} + \sum_{i=1}^{n} b_{2i}\Delta M2/GDP_{t-i} + c_2 Z_{t-1} + \varepsilon_t \quad (4b)$$

Currency ratio (CC/M1) and economic growth (y/N)

$$\Delta y/N_t = a_0 + \sum_{i=1}^{n} a_{1i}\Delta y/N_{t-i} + \sum_{i=1}^{n} b_{1i}\Delta CC/M1_{t-i} + c_1 Z_{t-1} + u_t \quad (5a)$$

$$\Delta CC/M1_t = b_0 + \sum_{i=1}^{n} a_{2i}\Delta y/N_{t-i} + \sum_{i=1}^{n} b_{2i}\Delta CC/M1_{t-i} + c_2 Z_{t-1} + \varepsilon_t \quad 5(b)$$

Domestic credit to the private sector (DCP/GDP) and economic growth

$$\Delta y/N_t = a_0 + \sum_{i=1}^{n} a_{1i}\Delta y/N_{t-i} + \sum_{i=1}^{n} b_{1i}\Delta DCP/GDP_{t-i} + c_1 Z_{t-1} + u_t \quad (6a)$$

$$\Delta DCP/GDP_t = b_0 + \sum_{i=1}^{n} a_{2i}\Delta y/N_{t-i} + \sum_{i=1}^{n} b_{2i}\Delta DCP/GDP_{t-i} + c_2 Z_{t-1} + \varepsilon_t \quad (6b)$$

where Z_{t-1} is a one period lagged error correction term captured from the cointegration regression.

The error-correction model has an interesting temporal causal interpretation in the sense that a bivariate cointegrated system must have a causal ordering in at least one direction (Engle and Granger, 1987: 259). In the error-correction based causality model presented in (4a)-(6b), financial development does not Granger cause economic growth if b_{1i}s = 0 and c_1s = 0. Likewise, economic growth does not Granger cause financial development if a_{2i}s = 0 and c_2s = 0.

3.2 Stationarity tests

Just as in other time series data, the variables *y/N*, *M2/GDP*, *CC/M*1 and *DCP/GDP* must be tested for stationarity before running the causality test. For this purpose, the current study uses the Dickey-Fuller (DF) test, the Augmented Dickey-Fuller (ADF) test, the Phillips-Perron test and the newly developed Ng-Perron test proposed by Ng and Perron (2001). The results of the stationarity tests at level (not presented here) show that all such variables are non-stationary. Having found that the variables are not stationary at level, the next step is to difference the variables once in order to perform stationarity tests on differenced variables. The results of the stationarity tests on differenced variables are presented in Tables 1 and 2.

The results reported in Tables 1 and 2 show that after differencing the variables once, all were confirmed to be stationary. The DF, ADF, Phillips-Perron and Ng-Perron 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.

Table 1: Stationarity tests of variables on first difference
DF, ADF and Phillips-Perron tests

KENYA	*DF and ADF tests*		*Phillips-Perron (PP) test*		*Stationarity*
Variable	*DF*	*ADF*	*No trend*	*Trend*	*status*
DLM2/GDP	-4.946***	-3.465**	-5.3825***	-5.3004***	Stationary
DLCC/M1	-4.851***	-3.294**	-6.8415***	-6.8267***	Stationary
DLDCP/GDP	-4.122**	-3.322**	-5.2648***	-5.2799***	Stationary
DLy/N	-4.045**	-3.311**	-5.7329***	-5.8130***	Stationary

Notes:
1) Critical values: 1% level: DF= -4.32, ADF = -4.12; 5% level: DF= -3.67, ADF = -3.29; 10% level: DF = -3.28, ADF = -2.90
2) The truncation lag for the PP tests is based on Newey and West (1987) bandwidth.
3) *** denotes significance at 1%.

Table 2: Stationarity tests of variables on first difference, Ng -Perron test

	Ng-Perron Test Statistics (without Trend)				*Stationarity*
Variable	*MZ*	MZ_t	*MSB*	*MPT*	*status*
DLM2/GDP	-19.0906	-3.08898	0.16181	1.28537	Stationary
DLCC/M1	-16.9246	-2.89815	0.17124	1.48750	Stationary
DLDCP/GDP	-19.4349	-3.0812	0.15854	1.38817	Stationary
DLy/N	-17.9253	-2.9910	0.16686	1.37681	Stationary
Asymptotic Critical Values - (Ng -Perron, 2001, Table 1)					
1%	-13.8000	-2.5800	0.17400	1.7800	
5%	-8.1000	-1.9800	0.23300	3.1700	
10%	-5.7000	-1.6200	0.27500	4.4500	

3.3 Cointegration analysis

Having confirmed that all variables included in the causality test are integrated of order one, the next step is to test independently for the existence of cointegration relationship between each of the proxies of financial development (*M2/GDP*, *CC/M1*, and *DCP/GDP*) and real GDP per capita (*y/N*). For this purpose, the study uses the Johansen (1988, 1991) and Johansen and Juselius' (1990) cointegration test procedure. If cointegration is detected between these variables, then the existence of Granger causality in either direction cannot be ruled out. The results of the Johansen-Juselius cointegration tests are presented in Table 3.

Table 3: Maximum Likelihood cointegration test

Trace Test				*Maximum Eigenvalue Test*			
Null	*Alternative*	*Statistics*	*95% critical value*	*Null*	*Alternative*	*Statistics*	*95% critical value*
Cointegration between *Ly/N* and *LM2/GDP*							
$r = 0$	$r \geq 1$	20.35	15.4	$r = 0$	$r = 1$	18.7	14.1
$r \leq 1$	$r = 2$	1.652	3.8	$r \leq 1$	$r = 2$	1.652	3.8
Cointegration between *Ly/N and LCC/M1*							
$r = 0$	$r \geq 1$	20.43	15.4	$r = 0$	$r = 1$	16.87	14.1
$r \leq 1$	$r = 2$	3.565	3.8	$r \leq 1$	$r = 2$	3.565	3.8
Cointegration between *Ly/N and LDCP/GDP*							
$r = 0$	$r \geq 1$	17.64	15.4	$r = 0$	$r = 1$	17.57	14.1
$r \leq 1$	$r = 2$	0.06734	3.8	$r \leq 1$	$r = 2$	0.06734	3.8

Notes:
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 Johansen-Juselius cointegration tests reported in Table 3 indicate the existence of a stable long-run relationship between the various proxies of financial development indicators and real GDP per capita. The trace statistics reject the null hypotheses of $r = 0$ between *y/N* and *M2/GDP*; *y/N* and *CC/M1* and *y/N* and *DCP/GDP* 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 at 5 per cent level of significance. Likewise, the maximum eigenvalue test rejects the null hypothesis of no cointegrating vector ($r = 0$) at 5 per cent level of significance in favour of a specific alternative hypothesis that there is one cointegrating vector ($r = 1$). However, the null hypothesis of $r = 1$, $r = 2$, and $r = 3$ could not be rejected at the 5 per cent level of significance. It is, therefore, concluded that there is one cointegrating vector between the economic growth variable (*y/N*) and each of the three proxies of financial development. This confirms the existence of a stable long-run relationship between economic growth variable (*y/N*) and the three proxies of financial development.

3.4 Analysis of causality test based on the 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 (see

Table 4: Error-correction model

Causality test between *DLy/N* and *DLM2/GDP*

Variables in equation	*Dependent variables*	
	ΔLy/N	*ΔLM2/GDP*
ΔLy/N-1	0.424 (1.75)*	-
ΔLy/N-5	-	0.648 (2.07)**
ΔLM2/GDP-1	-	0.620 (2.15)**
ΔLM2/GDP-4	0.419 (1.93)*	-
ECM $_{t-1}$	-2.44**	-3.08***
F-Test	1.317 (0.317)	1.604 (0.219)
Diagnostic Tests		
R^2	0.45	0.55
DW	1.90	2.28
AR	0.06229[0.8071]	0.48685[0.4998]
ARCH	0.26198[0.6189]	0.13622[0.7198]
Normality Test	2.7944[0.2473]	0.07471[0.9633]

Causality test between *DLy/N* and *DLCC/M1*

Variables in equation	*Dependent variables*	
	ΔLy/N	*ΔLCC/M1*
ΔLy/N-1	1.129 (2.21)**	7.157 (2.83)**
ΔLCC/M1–1	0.514 (3.76)***	-
ΔLCC/M1–3	-	-0.382 (-1.23)
ECM $_{t-1}$	-0.750	-2.390**
F-Test	4.57 (0.029)	0.690 (0.580)
Diagnostic Tests		
R^2	0.74	0.17
DW	2.02	1.93
AR	0.1889[0.6769]	0.8702[0.4197]
ARCH	0.1096[0.7519]	0.0057[0.9463]
Normality Test χ^2 (2)	1.8402[0.3985]	1.3136[0.5185]

cont...

...cont

Causality test between *DLy/N* and *DLDCP/GDP*

Variables in equation	*Dependent variables*	
	ΔLy/N	*ΔLDCP/GDP*
ΔLy/N-1	-	1.111 (1.97)*
ΔLy/N-2	1.08 (3.25)***	-
ΔLDCP/GDP-1	-	1.39 (2.28)**
ΔLDCP/GDP-3	0.228 (1.11)	-
ECM_{t-1}	-0.133	-3.09**
F-Test	2.865 (0.090)	2.201 (0.180)
Diagnostic Tests		
R^2	0.64	0.72
DW	2.09	2.32
AR	0.11826[0.7410]	0.4496[0.5323]
ARCH	0.2638[0.6259]	0.3947[0.5639]
Normality χ^2 (2)	1.9558[0.3761]	0.48496[0.7847]

also Odhiambo, 2004b). The direction of the Granger causality can only be detected through the error-correction model (VECM) derived from the long-run cointegrating vectors. In addition to indicating the direction of causality amongst variables, the ECM enables us to distinguish between short-run and long-run Granger Causality. The F-test 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. The results of the error-correction model between the three proxies of financial development and economic growth are displayed in Table 4.

The results reported in Table 4 reveal that for the causality between *DLy/N* and *DLM2/GDP*, there is bi-directional causality between financial development and economic growth. As reported in Table 4, the error-correction terms and the lagged independent variables in both the *DLy/N* and *DLM2/GDP* equations are statistically significant. Regarding causality between *DLy/N* and *DLCC/M1*, the error-correction term in the *DLy/N* equation rejects causality from *DLCC/M1* to *DLy/N*. The error-correction term is positive and statistically insignificant. However, the causality from *Ly/N* to *DLCC/M1* is accepted in the *DLCC/M1* equation. This is supported by the lagged error-correction term and the lagged economic growth variable in the *DLCC/M1* equation, which are both statistically significant. Finally, the causality test between *DLy/N* and *DLDCP/GDP* shows that the direction of causality is from *DLy/N* to *DLDCP/GDP*. The error-correction term in the *LDCP/GDP* equation is negative and statistically significant. Likewise, the lagged economic growth variable (*DLy/N-1*) in the *LDCP/GDP* equation is positive and statistically significant. A

summary of the long-run causality tests between the three proxies of financial development and economic growth are presented in Table 5.

Table 5: Summary of causality test

Variables	*Long-run causality*	*General response*
$\Delta Ly/N$ and $\Delta LM2/GDP$	There is a bi-directional causality between financial development and economic growth.	Supply-leading and demand-following response.
$\Delta Ly/N$ and $\Delta LCC/M1$	Economic growth Granger causes financial development.	Demand-following response.
$\Delta Ly/N$ and $\Delta LDCP/GDP$	Economic growth Granger causes financial development.	Demand-following response.

4 Conclusion

In this study, the direction of causality between financial development and economic growth in Kenya is investigated using cointegration and error-correction models. Three proxies of financial development are incorporated in the study against real GDP per capita, a proxy for economic growth. The three proxies of financial development are the ratio of broad money M2 to gross domestic product (*M2/GDP*), the ratio of currency to narrow definition of money (*CC/M1*), and the ratio of bank claims on the private sector to nominal GDP (*DCP/GDP*). The empirical results of this study reveal that the causality between financial development and economic growth in Kenya is sensitive to the choice of measurement for financial development.

When the ratio of broad money to GDP (*M2/GDP*) is used as a proxy for financial development, bi-directional causality evidence is found to prevail. However, when the ratio of currency to narrow definition of money (*CC/M1*) and the ratio of bank claims on the private sector to GDP (*DCP/GDP*) are used, a distinct demand-following response seems to prevail. On balance, the study finds a demand-following response to be stronger than a supply-leading response in Kenya. This shows that, for Kenya, it is the economic growth, which Granger causes financial development. In other words, it is the growth in the real sector that induces the expansion of the financial system by stimulating active participation in the financial markets. This result, though contrary to the majority of the previous studies, is consistent with Waqabaca (2004), Odhiambo (2004a) and Zang and Kim (2007).

Accepted for publication: 23 August 2007

ENDNOTE

1 Nicholas M Odhiambo, Economics Department, University of South Africa (UNISA), P. O Box 392, UNISA, 0003, Pretoria, South Africa. Email: nmbaya99@yahoo.com

REFERENCES

Agbetsiafa D K (2003) 'The Finance Growth Nexus: Evidence from sub-Saharan Africa', *Savings and Development*, 28(3), 271-288.

Akinboade O A (1998) 'Financial Development and Economic Growth in Botswana: A Test for Causality', *Savings and Development*, 22(3), 331 -348.

Calderon C and Liu L (2003) 'The Direction of Causality between Financial Development and Economic Growth', *Journal of Development Economics*, 72, 321-334.

Choe C and Moosa I A (1999) 'Financial System and Economic Growth: The Korean Experience', *World Development*, 27(6), 1069-1082.

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 (Fall).

Crichton N and De Silva C (1989) 'Financial Development and Economic Growth: Trinidad and Tobago, 1973-1987', *Social and Economic Studies*, 38(4), 133-162.

De Gregorio J and Guidotti P E (1995) 'Financial Development and Economic Growth', *World Development*, 23(3), 433-448.

Engle R F and Granger C J (1987) 'Cointegration and Error-correction - Representation, Estimation and Testing', *Econometrica,* 55(2), 251-78.

Geweke J (1982) 'Measurement of Linear Dependence and feedback Between Multiple Time series', *Journal of the American Statistical Association*, 77, 304-313.

Geweke J, Meese R and Dent W (1983) 'Comparing Alternative Tests of Causality in Temporal Systems: Analytical Results and Experimental Evidence', *Journal of Econometrics*, 21, 161-194.

Granger C W (1988) 'Some Recent Developments in a concept of causality', *Journal of Econometrics*, 39, 199-211.

Guilkey D K and Salemi M (1982) 'Small Sample Properties of Three Tests for Granger-Causal Ordering in a Bivariate Stochastic System', *Review of Economics and Statistics*, 64, 668-681.

Hsiao C (1979) 'Autoregressive Modelling of Canadian Money and Income Data', *Journal of American Statistical Associations*, 74, 553-560.

Johansen S (1988) 'Statistical Analysis of Cointegration vectors', *Journal of Economic Dynamics and Control*, 12, 231-254.

Johansen S (1991) 'Estimation and Hypothesis Testing of Cointegration vectors in Gaussian vector Autoregressive Models', *Econometrica*, 59, 1551-1580.

Johansen S and Juselius K (1990) 'Maximum Likelihood Estimation and Inference on Cointegration with Applications to the Demand for Money', *Oxford Bulletin of Economics and Statistics*, 52, 169-210.

Jung Woo (1986) 'Financial Development and Economic Growth: International Evidence', *Economic Development and Cultural Change*, 34, 333-346.

Kar M and Pentecost E J (2000) 'Financial Development and Economic Growth in Turkey: Further Evidence on the Causality Issue', Economic Research Paper No.00/27, Department of Economics, Loughborough University.

King R G and Levine R (1993) 'Finance and Growth: Schumpeter Might Be Right', *Quarterly Journal of Economics*, 108(3), 713-737.

Levine R (1997) 'Financial Development and Economic Growth', *Journal of Economic Literature*, 35(2), 688-727.

Levine R, Loayza N and Beck T (2000) 'Financial Intermediation and Growth: Causality and Causes', *Journal of Monetary Economics*, 46, 31-77.

Newey W K and West K (1987) 'A Simple, Positive Semi-Definite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix', *Econometrica*, 55, 703-708.

Ng S and Perron P (2001) 'Lag Length Selection and the Construction of Unit Root Test with Good Size and Power', *Econometrica*, 69, 1519-1554.

Odhiambo N M (2004a) 'Is Financial Development Still a Spur to Economic Growth? A Causal Evidence from South Africa', *Savings and Development*, 28(1), 47-62.

Odhiambo N M (2004b) 'Financial Liberalisation and Economic Growth in sub-Saharan African countries: Dilemmas and Prospects', unpublished PhD thesis, University of Stellenbosch, South Africa.

Patrick H T (1966) 'Financial Development and Economic Growth in Underdeveloped countries', *Economic Development and Cultural* Change, 14(1), 174-189.

Pierce D and Haugh L (1977) 'Causality in Temporal System: Characterisation and a Survey', *Journal of Econometrics*, 5, 265-293.

Rajan R and Zingales L (1998) 'Financial Dependence and Growth', *American Economic Review*, 88 (3), 559-586.

Shan J, Morris A and Sun F (2001) 'Financial Development and Economic Growth: An Egg-and-Chicken Problem?', *Review of International Economics*, 9, 443-454.

Sims C (1972) 'Money, Income and Causality', *American Economic Review*, 62, 540-552.

Spears A (1992) 'The Role of Financial Intermediation on Economic Growth in SSA', *Canadian Journal of Development Studies*, 13, 361-380.

Temple J (1999) 'The New Growth Evidence', *Journal of Economic Literature*, 37(1), 112-156.

Waqabaca C (2004) 'Financial Development and Economic Growth in Fiji', Working Paper 2004/03, Economics Department, Reserve Bank of Fiji.

Wood A (1993) 'Financial Development and Economic Growth in Barbados: Causal Evidence', *Savings and Development*, 17(4), 379-390.

Zang H and Kim Y C (2007) 'Does Financial Development Precede Growth? Robinson and Lucas Might Be Right', *Applied Economics Letters*, 14, 15-19.