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Finance-Growth Nexus Revisited: Empirical Evidence from Six Countries

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Abstract

This paper investigates the dynamic causal relationship between bank-based financial development and economic growth, and between market-based financial development and economic growth in six countries during the period from 1980 to 2012. The causal relationship was found to vary largely across countries and over time. In general, bank-based financial development seems to Granger-cause economic growth in the UK and only in the long run in Australia. However, there is a feedback loop in Brazil and Australia, but only in the short run for the latter. In Kenya, South Africa and USA, the results support the neutrality hypothesis. The study results further indicate short-run unidirectional causality from market-based financial development to economic growth in the USA. Evidence of the feedback loop was found in Kenya, while the demand-following hypothesis found support only in South Africa and Brazil. However, the neutrality view was supported in Australia and the UK.

Keywords: bank-based financial development; market-based financial development; economic growth; Granger-causality.

JEL classification: E02; G10; G21; O11.

1. INTRODUCTION

Even though the relationship between financial development and economic growth has been extensively studied, the debate between financial development – both bank-based and market-based – and economic growth has been ongoing for some time, yet with little consensus. Four views exist in the finance-growth causality literature. The first and prominent one is the "supply-leading hypothesis"; also known as the "finance-led growth hypothesis". This view claims that financial development is important, and it leads to economic growth (see, among others, McKinnon, 1973; Shaw, 1973; King and Levine, 1993). The second view is the "demand-following hypothesis" or the "growth-led finance hypothesis", which postulates a causal flow from economic growth to financial

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development. It is this view that considers bank-based and market-based financial development to be demand-driven (see also Robinson, 1952; Gurley and Shaw, 1967; Goldsmith, 1969; Jung, 1986).

The third view is the "feedback hypothesis" or the "bidirectional-causality view", as it is also known. The feedback hypothesis assumes a two-way causal relationship between financial development and growth. Thus, this view ascribes equal importance to both the financial and real sectors of the economy (see Patrick, 1966). Then, there is the fourth and unpopular view that suggests that financial development and economic growth are not causally related; and that neither of the two sectors has a significant effect on the other (see also Lucas, 1988; Graff, 1999). It is the conflicting arguments, supported by these varying views that necessitate further research on the finance-growth causality topic.

Furthermore, the bulk of the existing studies on the causality between financial development and economic growth are mainly concentrated in Asia, Latin America and in selected developed countries. Specific studies addressing the causal link between financial development and economic growth in developing countries, especially those in sub-Saharan Africa are very scant. Even where these studies exist, only a handful of them have compared the casual links between financial development and economic growth in developing countries with the links in the developed countries.

Despite the availability of extensive global pool of empirical work on this subject, very few studies have been conducted on the causality between bank-based financial development and economic growth, on the one hand; and between market-based financial development and economic growth on the other hand. Until recently, most studies on the finance-growth nexus have relied only on bank development, as a proxy for financial development; without paying specific attention to any particular segment of the financial system. Yet, it is now well-known that a financial system is made up of both bank-based and market-based segments.

Additionally, the majority of the studies that have examined the causality between financial development – bank- or market-based – and economic growth have over-relied on a bivariate framework although it is now known that the results of the bivariate causality test may be invalid due to the omission of important variables affecting both financial development and economic growth in the causality model (Odhiambo, 2009b). The introduction of additional variables into the causality framework may not only alter the direction of causality, but it could also affect the magnitude of the estimates (see also in Loizides and Vamvoukas, 2005; Odhiambo, 2009b).

Against this background, the current study attempts to investigate the causal relationship between bank-based financial development and economic growth, on the one hand; and between market-based financial development and economic growth, on the other hand, in selected three developing countries – South Africa, Brazil and Kenya – and selected three developed countries – United States of America (USA), United Kingdom (UK) and Australia. The study also aims to compare the causality results of the two country groups. Thus these countries have been selected to enable the conducting of parallel studies on countries at different stages of development – developing versus developed countries.

The experiences of six countries are investigated in this study in order to re-examine the relationship, and establish the direction of causality, between bank-based and market-based financial development and economic growth. The six countries are South Africa, Brazil, Kenya, the United States of America (USA), the United Kingdom (UK), and Australia. These countries have been selected for the following reasons: first, the selection includes three

'developing' countries (South Africa, Brazil and Kenya) and three countries designated as 'developed' (USA, UK and Australia). Thus these countries have been selected to enable the conducting of parallel studies on countries at different stages of development. Second, since the components of financial development are important in this study, it is of paramount importance that some of the selected countries have more developed financial and stock markets than financial intermediaries when compared to the others – and vice versa. Brazil, South Africa, Australia, the UK and the USA have market-based financial systems, while Kenya has a bank-based financial system (Demirguc-Kunt and Levine, 2001). Third, the availability of long-term historical time-series data, especially stock market data, prompted the selection of these six countries. Overall, the selection is a modest representation of financial systems prevailing in both the developing and the developed countries.

The rest of this paper is organised as follows: Section 2 gives an overview of the financial sector reforms in the study countries while Section 3 reviews literature on the linkages between bank-based financial development and economic growth and between market-based financial development and economic growth. Section 4 presents the empirical model specification, the estimation techniques, and the empirical analysis. Section 5 concludes.

2. FINANCIAL SECTOR REFORMS AND DEVELOPMENT IN THE STUDY COUNTRIES

By any standard, modern or otherwise, the USA, the UK and Australia have highly developed financial systems, which rank very highly in terms of the development and sophistication of their financial institutions and financial markets – as well as the size, depth and access to their financial services. This group of countries has more advanced financial systems than its developing country group counterpart, except for South Africa that has a financial system that compares well with the developed countries. Although Kenya and Brazil's financial systems are behind those of the developing countries and that of South Africa, Kenya's financial system is regarded as one of East Africa's largest and most developed; while the Brazilian financial system is the largest and most sophisticated in Latin America (World Bank, 2007).

While the Kenyan financial system is generally referred to as bank-based financial system because of bank activity prominence; the other five study countries' financial systems are generally referred to as market-based financial systems since financial markets share centre stage with banks in driving economic growth in these countries (Demirguc-Kunt and Levine, 2001). Of the six countries in this study, the USA has the highest number of banks, followed by the UK, then Australia. Behind Australia is Brazil, followed by South Africa, and then Kenya.

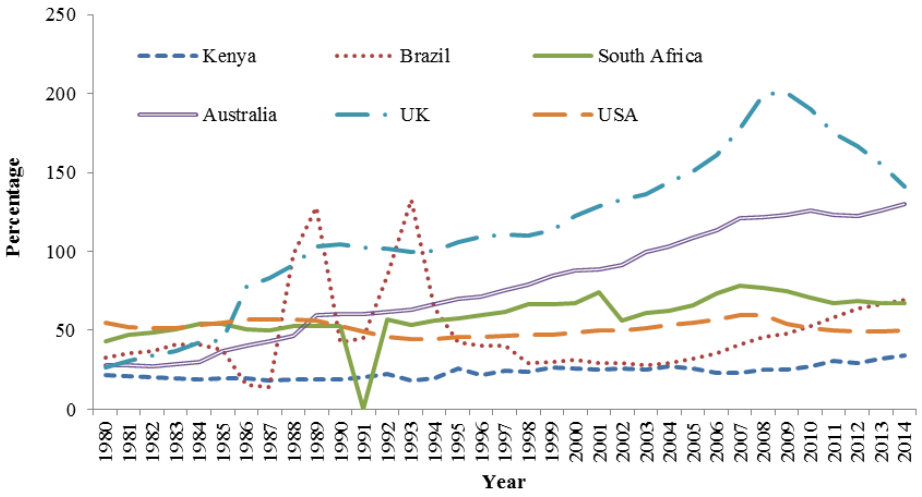
From the stock market side, among the developed countries under study, the USA has the highest number of big stock exchanges; while it is Brazil that has the highest number of stock exchanges from the developing country side. The UK and Australia have one major stock exchange each but Kenya and South Africa each only have one stock exchange.

Just like any other country, the study countries underwent a series of financial sector reforms over the years aimed at modernising their financial systems to match increasing demand for development. In the developing countries, these reforms kicked off in the first half of the 20th Century; with the developing countries only joining towards the end of the second half of the same century. Although these reforms varied from country to country in terms of scope and intensity and approach, they were aimed at achieving common goals. From the bank-based segment of the financial sector, these reforms have concentrated on improving the

legal, regulatory, judiciary and supervisory environments; facilitating financial liberalisation; restoring bank soundness; and rehabilitating the financial infrastructure. These reforms have also included programmes designed to encourage new entrants (Central Bank of Brazil, 2009; Kenya, 2010; International Monetary Fund, 2011; Federal Deposit Insurance Corporation, 2012; Bank of International Settlement, 2012; Australian Bankers' Association, 2013). On the stock market side, the reforms have focused on addressing the legal, regulatory, judiciary and supervisory aspects of the financial markets business. In addition, these reforms have also focused on the general modernisation of the trading environment.

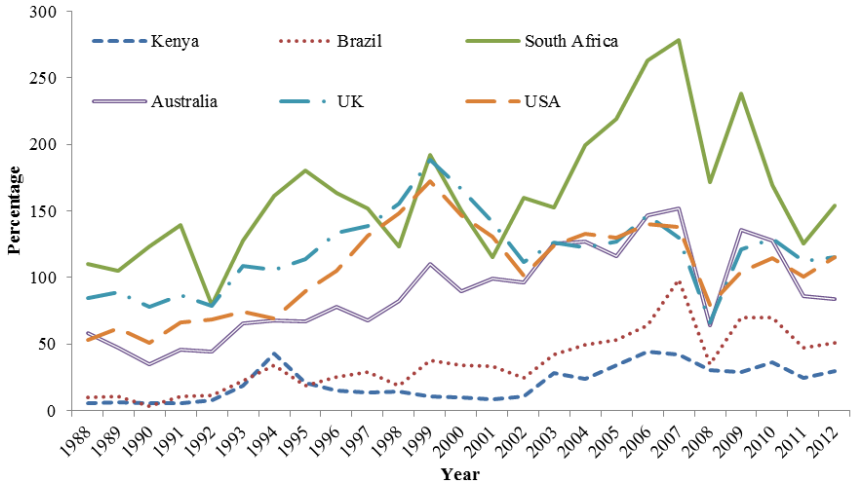
Although all the countries under study responded positively to the reforms, the speed and magnitude of this positive response differed from one country to another due to differences in initial country conditions, approaches and consistence in driving the reforms. Overall, the rigorous reforms over time have given rise to a developed and well-regulated financial system in the developed countries as well as South Africa; with Brazilian standards trailing behind those of South Africa, and the Kenyan standards trailing behind the Brazilian developmental standards.

The development of the bank-based segments of the financial systems in the countries of study is demonstrated by the growth in private sector credit, the increasing number of Automated Teller Machines (ATMs), strong legal rights as well as decreasing levels of non-performing loans (see World Bank, 2015). On the other hand, the development of the market-based segments is shown by an increased number of listed companies, an increase in stock market capitalisation, total value traded and turnover ratio up to the early 2000s (World Bank, 2015). Overall, Kenya has the smallest and most inactive stock market in all respects – in terms of the number of listed companies, stock market capitalisation, total value of stocks traded and turnover ratio – while the USA has the biggest and the most liquid stock market in general. Figure no. 1 illustrates the trends in banking sector growth, as measured by credit extension to the private sector as ratio of GDP, in the six study countries during the period 1980-2014; while Figures no. 2 – 4 show and compare trends in stock market development in the six countries during the period 1988 to 2012.



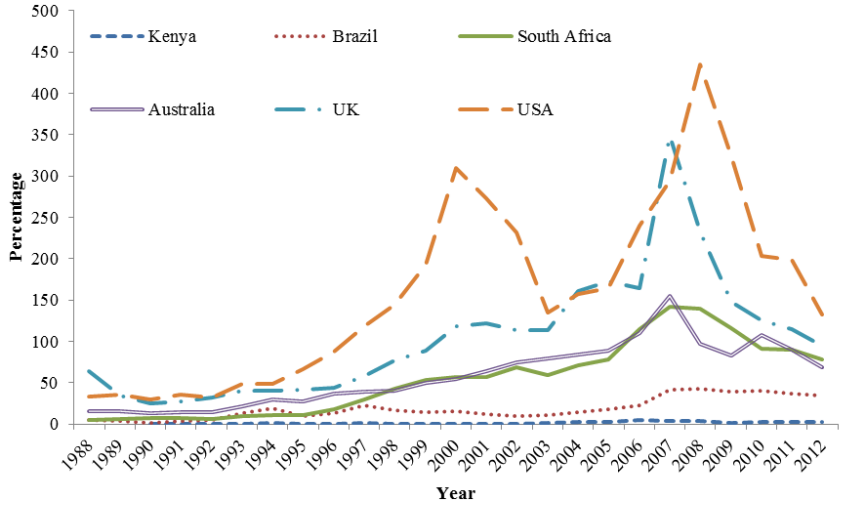
Source: World Bank (2015)

Figure no. 1 – Trends in the Banking Sector Growth in the Six Countries (1980-2014)



Source: *World Bank (2015)*

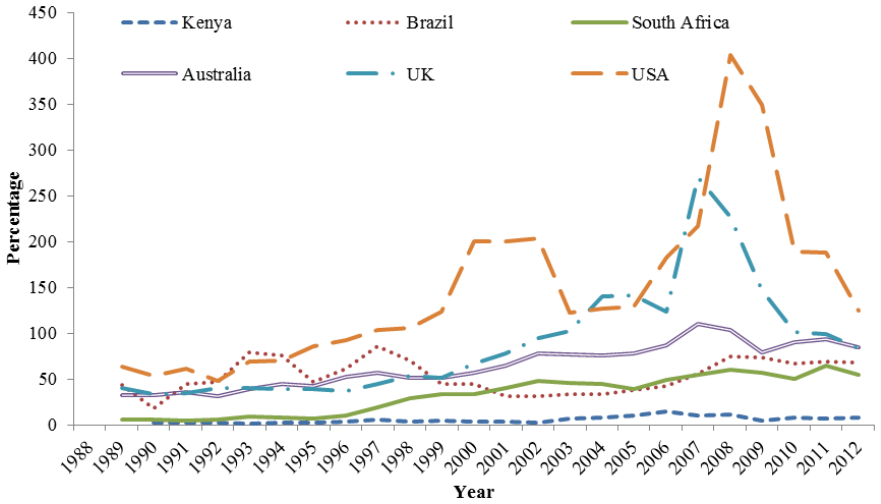
Figure no. 2 – Trends in Stock Market Capitalisation in the Six Countries (1988-2012)



Source: *World Bank (2015)*

Figure no. 3 – Trends in Total Value of Stocks Traded in the Six Countries (1988-2012)

Despite this growth, these countries' financial systems still face some challenges. Although these challenges differ in dimension and magnitude, financial stability and Eurozone contagion seem to top the list among the developed countries; while financial inclusion, reduced bank profitability and stock market liquidity, seem to top the list among the developing countries.



Source: *World Bank (2015)*

Figure no. 4 – Trends in Turnover Ratio of Stocks Traded in the Six Countries (1988-2012)

3. BANK-BASED FINANCIAL DEVELOPMENT, MARKET-BASED FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH

The debate regarding the direction of causality between financial development and economic growth has been ongoing since the 19th century (see Bagehot, 1873). The thrust of the debate centres on whether it is bank-based and market-based financial development that drives economic growth, or vice versa. To date, four views exist in the literature regarding the relationship between financial development – whether bank-based or market-based – and economic growth. These views are the "finance-led growth hypothesis" or the "supply-leading hypothesis"; the "growth-led finance hypothesis" or the "demand-following hypothesis"; the "bidirectional causality view"; and the "independent hypothesis" or the "neutrality view".

The supply-leading hypothesis has found support from studies on bank-based financial development and economic growth, as well as those on market-based financial development and economic growth. From the bank-based financial development and economic growth front, the studies include: Beck (2002); Christopoulos and Tsionas (2004); Odhiambo (2009b); Enisan and Egbetunde (2010); Pradhan *et al.* (2017). On market-based financial development and economic growth, these studies include those of Choong *et al.* (2005); Adjasi and Biekpe (2006); Deb and Mukherjee (2008); Enisan and Olufisayo (2009); Enisan and Egbetunde (2010); Osuala *et al.* (2013); Bayar *et al.* (2014); Pradhan *et al.* (2017).

The demand-following hypothesis has also found support in the finance-growth causality literature. Studies on the causality between bank-based financial development and economic growth that support this view are those of Odhiambo (2004); Ang and McKibbin (2007); Odhiambo (2009a); Enisan and Egbetunde (2010); Arayssi and Fakih (2017), among others. From the market-based financial development and economic growth side, studies by Shan *et al.* (2001); Shan and Morris (2002); Enisan and Olufisayo (2009); Athanasios and Antonios (2012) support the demand-following hypothesis.

From the bank-based financial development and economic growth side, the feedback response is supported by the following studies, among others: Wood (1993); Akinboade (1998); Abu-Bader and Abu-Qarn (2008); Enisan and Egbetunde (2010). On the other hand, Arestis and Demetriades (1997); Hondroyiannis *et al.* (2005); Carp (2012); Cheng (2012); Marques *et al.* (2013); Arac and Ozcan (2014), among others, support the bidirectional causality from the market-based financial development and economic perspective.

Finally, the unpopular view that bank-based and market-based financial development and economic growth do not cause each other is echoed by Shan *et al.* (2001); Shan and Morris (2002); Arac and Ozcan (2014); Nyasha and Odhiambo (2015).

Based on the literature reviewed in this study, it can be noted that due to the complexity and delicacy of the finance-growth causality subject, the empirical literature on the direction of causality between financial development – both bank- and market-based – and economic growth varies largely across countries and over time. It also varies depending on the empirical approach used and the proxies of bank-based and market-based financial development used. As such, a single study may support one view, or two views, or three, or all four views – depending on the proxies used or the countries covered in the study.

Despite being there four conflicting views, the popular view from the empirical literature front is in favour of the supply-leading response, where the development of the banking sector/stock markets is expected to precede the development of the real sector.

4. ESTIMATION TECHNIQUES AND EMPIRICAL ANALYSIS

4.1 Empirical model specifications

To address the shortfalls of bivariate Granger-causality, this study utilises a trivariate Granger-causality model within an autoregressive distributed lag (ARDL) bounds-testing framework initially proposed by Pesaran and Shin (1999) and as later extended by Pesaran *et al.* (2001) to examine the causal relationship between bank-based financial development and economic growth, on the one hand; and the causal relationship between market-based financial development and economic growth, on the other hand.

Savings was chosen at the intermittent variable forming a trivariate Granger-causality model. The choice for savings was based on the theoretical links between savings and economic growth and between savings and financial development. Traditional theories emphasise the role of savings in the economic growth process (see Solow, 1956; Romer, 1986; Lucas, 1988). On the one hand, Solow (1956), in his exogenous growth model, argues that an increase in savings leads to higher growth in the short run during the transition between steady states (see Odhiambo, 2009b). On the other hand, according to endogenous growth models developed by Romer (1986) and Lucas (1988), a permanent increase in growth can be determined by higher savings and capital accumulation. The theoretical link between financial development and savings is also, to a large extent, influenced by the work done by McKinnon (1973) and Shaw (1973), which emphasised that a well-developed financial sector is expected to increase savings through efficiency improvement during the intermediation process (see also Odhiambo, 2009b). Thus, a deeper financial system should be able to provide alternative savings instruments that sufficiently match individual preferences, risk appetite and income profile (Schmidt-Hebbel and Serven, 2002). Based on this argument, savings as a share of GDP (SAV) is chosen to be the intermitting variable.

The ARDL is the preferred technique because of the numerous advantages it has over other conventional estimation techniques (see also Pesaran and Shin, 1999; Duasa, 2007; Majid, 2008; Odhiambo, 2008). The ARDL procedure: i) Does not impose the restrictive assumption that all the variables under study must be integrated of the same order; ii) allows for inferences on long-run estimates, and it provides unbiased estimates of the long-run model and valid t-statistics – even when some of the regressors are endogenous; iii) takes a sufficient number of lags to capture the data-generating process in a general-to-specific modelling framework, in order to obtain optimal lag length per variable; iv) uses a single reduced-form equation; and v) has superior small sample properties. Therefore, the ARDL approach is considered most suitable for the analysis in this study.

The ARDL test for cointegration is conducted by taking in turn each variable as a dependent variable. The ARDL model used in this study can be expressed as follows (see also Odhiambo, 2010):

Model 1 – Bank-based financial development and economic growth:

$$\Delta y_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta y_{t-i} + \sum_{i=0}^{n} \alpha_{2i} \Delta BFD_{t-i} + \sum_{i=0}^{n} \alpha_{3i} \Delta SAV_{t-i} + \alpha_4 y_{t-1} + \alpha_5 BFD_{t-1} + \alpha_6 SAV_{t-1} + \mu_{1t} \quad (1)$$

$$\Delta BFD_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta BFD_{t-i} + \sum_{i=0}^{n} \beta_{2i} \Delta y_{t-i} + \sum_{i=0}^{n} \beta_{3i} \Delta SAV_{t-i} + \beta_4 y_{t-1} + \beta_5 BFD_{t-1} + \beta_6 SAV_{t-1} + \mu_{2t} \quad (2)$$

$$\Delta SAV_t = \theta_0 + \sum_{i=1}^{n} \theta_{1i} \Delta SAV_{t-i} + \sum_{i=0}^{n} \theta_{2i} \Delta BFD_{t-i} + \sum_{i=0}^{n} \theta_{3i} \Delta y_{t-i} + \theta_4 y_{t-1} + \theta_5 BFD_{t-1} + \theta_6 SAV_{t-1} + \mu_{3t} \quad (3)$$

Model 2 – Market-based financial development and economic growth:

$$\Delta y_t = \delta_0 + \sum_{i=1}^{n} \delta_{1i} \Delta y_{t-i} + \sum_{i=0}^{n} \delta_{2i} \Delta MFD_{t-i} + \sum_{i=0}^{n} \delta_{3i} \Delta SAV_{t-i} + \delta_4 y_{t-1} + \delta_5 MFD_{t-1} + \delta_6 SAV_{t-1} + \varepsilon_{1t} \quad (4)$$

$$\Delta MFD_t = \gamma_0 + \sum_{i=1}^{n} \gamma_{1i} \Delta MFD_{t-i} + \sum_{i=0}^{n} \gamma_{2i} \Delta y_{t-i} + \sum_{i=0}^{n} \gamma_{3i} \Delta SAV_{t-i} + \gamma_4 y_{t-1} + \gamma_5 MFD_{t-1} + \gamma_6 SAV_{t-1} + \varepsilon_{2t} \quad (5)$$

$$\Delta SAV_t = \Phi_0 + \sum_{i=1}^{n} \Phi_{1i} \Delta SAV_{t-i} + \sum_{i=0}^{n} \Phi_{2i} \Delta MFD_{t-i} + \sum_{i=0}^{n} \Phi_{3i} \Delta y_{t-i} + \Phi_4 y_{t-1} + \Phi_5 MFD_{t-1} + \Phi_6 SAV_{t-1} + \varepsilon_{3t} \quad (6)$$

Following Ang and McKibbin (2007), Narayan and Smyth (2008) and Odhiambo (2009b) trivariate causality models for this study, based on an error-correction mechanism, are expressed as follows:

Model 1 – Bank-based financial development and economic growth:

$$\Delta y_t = a_0 + \sum_{i=1}^{n} a_{1i}\,\Delta y_{t-i} + \sum_{i=1}^{n} a_{2i}\,\Delta BFD_{t-i} + \sum_{i=1}^{n} a_{3i}\,\Delta SAV_{t-i} + \alpha_4 ECM_{t-1} + \mu_{1t} \quad (7)$$

$$\Delta BFD_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i}\,\Delta y_{t-i} + \sum_{i=1}^{n} \beta_{2i}\,\Delta BFD_{t-i} + \sum_{i=1}^{n} \beta_{3i}\,\Delta SAV_{t-i} + \beta_4 ECM_{t-1} + \mu_{2t} \quad (8)$$

$$\Delta SAV_t = \theta_0 + \sum_{i=1}^{n} \theta_{1i}\,\Delta y_{t-i} + \sum_{i=1}^{n} \theta_{2i}\,\Delta BFD_{t-i} + \sum_{i=1}^{n} \theta_{3i}\,\Delta SAV_{t-i} + \theta_4 ECM_{t-1} + \mu_{3t} \quad (9)$$

Model 2 – Market-based financial development and economic growth:

$$\Delta y_t = \delta_0 + \sum_{i=1}^{n} \delta_{1i}\,\Delta y_{t-i} + \sum_{i=1}^{n} \delta_{2i}\,\Delta MFD_{t-i} + \sum_{i=1}^{n} \delta_{3i}\,\Delta SAV_{t-i} + \delta_4 ECM_{t-1} + \varepsilon_{1t} \quad (10)$$

$$\Delta MFD_t = \gamma_0 + \sum_{i=1}^{n} \gamma_{1i}\,\Delta y_{t-i} + \sum_{i=1}^{n} \gamma_{2i}\,\Delta MFD_{t-i} + \sum_{i=1}^{n} \gamma_{3i}\,\Delta SAV_{t-i} + \gamma_4 ECM_{t-1} + \varepsilon_{2t} \quad (11)$$

$$\Delta SAV_t = \Phi_0 + \sum_{i=1}^{n} \Phi_{1i}\,\Delta y_{t-i} + \sum_{i=1}^{n} \Phi_{2i}\,\Delta MFD_{t-i} + \sum_{i=1}^{n} \Phi_{3i}\,\Delta SAV_{t-i} + \Phi_4 ECM_{t-1} + \varepsilon_{3t} \quad (12)$$

where:

y = growth rate of real gross domestic product (a proxy for economic growth)

BFD = an index of bank-based financial development, which is a means-removed average of M2, M3 and credit provided to private sector by financial intermediaries (a proxy for bank-based financial development)

MFD = an index of stock market development, which is a means-removed average of stock-market capitalisation, stock-market traded value and stock-market turnover (a proxy for stock market development)

SAV = share of savings in GDP

ECM = Error correction term

$\boldsymbol{\alpha_0, \beta_0, \theta_0, \delta_0, \gamma_0,}$ and $\boldsymbol{\Phi_0}$ = respective constants;

$\boldsymbol{\alpha_1 - \alpha_6, \beta_1 - \beta_6, \theta_1 - \theta_6, \delta_1 - \delta_6\ \gamma_1 - \gamma_6,}$ and $\boldsymbol{\Phi_1 - \Phi_6,}$ = respective coefficients;

Δ = difference operator;

n = lag length;

and $\boldsymbol{\mu_{it}}$ and $\boldsymbol{\varepsilon_{it}}$ = white-noise error terms.

To calculate a conglomerate index of bank-based financial development (BFD), the means-removed values of the three indicators of bank-based financial development are averaged, in a two-step procedure. First, the means-removed values – M2/GDP, M3/GDP and credit provided to private sector by financial intermediaries as ratio of GDP – are computed. The means-removed value of variable X is defined as Xm = [X- mean(X)] / [ABS(mean(X))], where ABS(w) refers to the absolute value of w. For mean (X), the average value of X over the 1980-2012 period was used. Second, a simple average of the means-removed M2/GDP, M3/GDP and credit provided to private sector by financial intermediaries to GDP ratio is taken to obtain an overall index of bank-based financial development (BFD). The same computations are applied to obtain MFD.

4.2 Sources of data

This study uses annual time-series data, covering the period 1980 to 2012. The primary data source for this study is the World Bank DataBank (2014). From this source, the following series from 1980 to 2012 for all the study countries were obtained: annual growth rate of real gross domestic product; ratio of M2 to GDP; ratio of M3 to GDP; credit provided to the private sector by financial intermediaries expressed as a percentage of GDP; and domestic savings as a percentage of GDP. From the same source, stock market capitalisation, total value of stocks traded and turnover ratio for all the study countries were obtained for the period 1987 to 2012. For all the study countries, data for the three later series for the period 1980 to 1986 were obtained from Emerging Stock Markets Factbook 1991 (International Finance Corporation, 1991) and from the study countries' stock exchange publications.

4.3 Unit root tests

Although the ARDL procedure does not require pre-testing the variables for unit root, the stationarity test provides guidance as to whether ARDL is suitable or not, since it is only appropriate for the analysis of variables that are integrated of order either zero [I(0)] or one [I(1)]. On this principle, before any analysis is done, the variables are first tested for stationarity, using the Phillips-Perron (PP) and the Perron (1997) (PPURoot) unit-root tests. The PPURoot is utilised to accommodate the possibility of structural breaks within the dataset. The results of the stationarity tests for all the variables for the developing countries are presented in Table no. 1 while those for the developed countries are presented in Table no. 2.

The results reported in Tables no. 1 and no. 2 show that the stationarity status of the variables varies depending on the type of stationarity performed. However, overall, all the variables were confirmed to be stationary after differencing them once; therefore, ARDL approach to the analysis of data is applicable. The next stage involves the performance of a co-integration test to examine whether the variables in each model are co-integrated.

Table no. 1 – Stationarity tests of all variables (developing countries)

Phillips-Perron (PP)

South Africa					Brazil				Kenya			
Variable	Stationarity of all Variables in Levels		Stationarity of all variables in First Difference		Stationarity of all Variables in Levels		Stationarity of all variables in First Difference		Stationarity of all Variables in Levels		Stationarity of all variables in First Difference	
	Without Trend	With Trend	Without Trend	With Trend	Without Trend	With Trend	Without Trend	With Trend	Without Trend	With Trend	Without Trend	With Trend
y	-4.155***	-4.531***	–	–	-5.697***	-5.851***	–	–	-3.310**	-3.331*	–	–
BFD	-1.756	-2.168	-5.909***	-5.902***	-2.907*	-2.670	-7.179***	-7.094***	-2.769*	-2.819	-7.795***	-7.747***
MFD	-1.267	-2.481	-6.620***	-6.661***	-1.115	-3.178	-7.367***	-7.237***	-1.466	-2.845	-6.280***	-6.162***
SAV	-2.474	-2.315	-6.216***	-7.113***	-3.030**	-2.982	-8.611***	-8.439***	-3.098**	-3.323*	–	–

Perron, 1997 (PPURoot)

South Africa					Brazil				Kenya			
Variable	Stationarity of all Variables in Levels		Stationarity of all variables in First Difference		Stationarity of all Variables in Levels		Stationarity of all variables in First Difference		Stationarity of all Variables in Levels		Stationarity of all variables in First Difference	
	Without Trend	With Trend	Without Trend	With Trend	Without Trend	With Trend	Without Trend	With Trend	Without Trend	With Trend	Without Trend	With Trend
y	-3.024	-4.932	-6.653***	-6.931***	-4.822	-4.540	-6.952***	-6.775***	-4.311	-4.500	-6.183***	-6.593***
BFD	-2.472	-3.414	-8.573***	-8.532***	-3.671	-3.353	-6.541***	-6.461***	-4.842	-5.136	-8.585***	-8.481***
MFD	-2.725	-4.933	-7.767***	-7.896***	-3.494	-3.436	-7.604***	-7.849***	-4.049	-4.411	-7.213***	-6.893***
SAV	-4.453	-4.091	-7.522***	-9.567***	-4.913	-4.736	-6.725***	-6.963***	-4.353	-4.893	-8.838***	-8.770***

*Note: *, ** and *** denotes stationarity at 10%, 5% and 1% significance levels respectively.*

Table no. 2 – Stationarity tests of all variables (developed countries)

Phillips-Perron (PP)

USA					UK				Australia			
Variable	Stationarity of all Variables in Levels		Stationarity of all variables in First Difference		Stationarity of all Variables in Levels		Stationarity of all variables in First Difference		Stationarity of all Variables in Levels		Stationarity of all variables in First Difference	
	Without Trend	With Trend	Without Trend	With Trend	Without Trend	With Trend	Without Trend	With Trend	Without Trend	With Trend	Without Trend	With Trend
y	-4.022***	-4.281***	–	–	-3.226**	-3.122	-5.797***	-7.056***	-5.173***	-5.034***	–	–
BFD	-0.588	-2.359	-7.627***	-7.502***	-0.932	-2.742	-6.597***	-6.484***	0.571	-2.672	-6.952***	-7.958***
MFD	-1.593	-2.255	-4.044***	-4.032**	-1.891	-2.564	-6.329***	-6.371***	-1.285	-2.685	-6.479***	-6.460***
SAV	-1.440	-2.055	-5.197***	-5.097***	-1.333	-2.311	-4.695***	-4.634***	-1.786	-0.946	-4.448***	-6.297***

Perron, 1997 (PPURoot)

USA					UK				Australia			
Variable	Stationarity of all Variables in Levels		Stationarity of all variables in First Difference		Stationarity of all Variables in Levels		Stationarity of all variables in First Difference		Stationarity of all Variables in Levels		Stationarity of all variables in First Difference	
	Without Trend	With Trend	Without Trend	With Trend	Without Trend	With Trend	Without Trend	With Trend	Without Trend	With Trend	Without Trend	With Trend
y	-4.665	-4.870	-7.412***	-8.934***	-3.993	-3.936	-5.700**	-6.006**	-4.186	-4.247	-8.019***	-8.223***
BFD	-3.683	-3.804	-9.127***	-8.969***	-3.731	-4.328	-6.214***	-6.335***	-5.983	-5.035	-6.998***	-7.307***
MFD	-2.404	-3.780	-5.345**	-5.936**	-4.594	-4.616	-6.505***	-6.742***	-3.994	-4.171	-6.700***	-7.024***
SAV	-3.684	-3.664	-6.752***	-6.742***	-3.335	-2.813	-5.526**	-5.616**	-4.102	-4.032	-6.036***	-5.958**

*Note: *, ** and *** denotes stationarity at 10%, 5% and 1% significance levels respectively.*

4.4 Cointegration analysis

It is of paramount importance to perform a bounds F-test for co-integration to ascertain the possible existence of any long-run relationship between the variables of interest before testing for causality. The ARDL-based cointegration test is performed in a two-step approach. Firstly, the order of lags of the first differenced variables in equations (1) to (6) is determined. This is followed by the application of a bounds F-test to equations (1) to (6), in order to establish the existence of a long-run relationship, if any, between the variables under study. The null hypothesis of no co-integration is tested against the alternative hypothesis of co-integration. The calculated F-statistic is compared with the critical values computed by Pesaran *et al.* (2001). If the calculated F-statistic lies above the upper bound level, the variables in question are co-integrated. However, if it lies below the lower-bound level, the variables are not co-integrated. If the calculated F-statistic falls within the upper and the lower-bounds, the results are interpreted as inconclusive. Tables no. 3 and no. 4 report the results of the bounds F-test for co-integration for developing and the developed countries respectively.

Table no. 3 – Bounds F-test for cointegration (developing countries)

Model 1 – Bank-based financial development (BFD), savings (SAV) and economic growth (y)				**Model 2** – Market-based financial development (MFD), savings (SAV) and economic growth (y)			
Dependent Variable	**Function**	**F-statistic**	**Cointegration Status**	**Dependent Variable**	**Function**	**F-statistic**	**Cointegration Status**
South Africa							
y	F(y|BFD, SAV)	5.084**	Cointegrated	y	F(y|MFD, SAV)	8.854***	Cointegrated
BFD	F(BFD| y, SAV)	1.663	Not cointegrated	MFD	F(MFD|y, SAV)	3.097	Not cointegrated
SAV	F(SAV |y, BFD)	6.534***	Cointegrated	SAV	F(SAV|y, MFD)	6.927***	Cointegrated
Brazil							
y	F(y|BFD, SAV)	4.743*	Cointegrated	y	F(y|MFD, SAV)	8.009***	Cointegrated
BFD	F(BFD| y, SAV)	4.559*	Cointegrated	MFD	F(MFD|y, SAV)	1.101	Not cointegrated
SAV	F(SAV |y, BFD)	3.035	Not cointegrated	SAV	F(SAV|y, MFD)	2.148	Not cointegrated
Kenya							
y	F(y|BFD, SAV)	2.852	Not cointegrated	y	F(y|MFD, SAV)	3.146	Not cointegrated
BFD	F(BFD| y, SAV)	1.948	Not cointegrated	MFD	F(MFD|y, SAV)	1.157	Not cointegrated
SAV	F(SAV |y, BFD)	5.663**	Cointegrated	SAV	F(SAV|y, MFD)	4.280*	Cointegrated

Asymptotic Critical Values						
Pesaran *et al.* (2001, pp. 300, Table CI(iii))	1%		5%		10%	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
	5.15	6.36	3.79	4.85	3.17	4.14

*Note: *, ** and *** denote statistical significance at 10%, 5% and 1% level respectively*

Table no. 4 – Bounds F-test for cointegration (developed countries)

Model 1 – Bank-based financial development (BFD), savings (SAV) and economic growth (y)				**Model 2** – Market-based financial development (MFD), savings (SAV) and economic growth (y)			
Dependent Variable	**Function**	**F-statistic**	**Cointegration Status**	**Dependent Variable**	**Function**	**F-statistic**	**Cointegration Status**
USA							
y	F(y|BFD, SAV)	6.785***	Cointegrated	y	F(y|MFD, SAV)	2.251	Not cointegrated
BFD	F(BFD| y, SAV)	0.705	Not cointegrated	MFD	F(MFD|y, SAV)	1.895	Not cointegrated
SAV	F(SAV |y, BFD)	4.532*	Cointegrated	SAV	F(SAV|y, MFD)	6.520***	Cointegrated
UK							
y	F(y|BFD, SAV)	4.202*	Cointegrated	y	F(y|MFD, SAV)	5.228**	Cointegrated
BFD	F(BFD| y, SAV)	2.511	Not cointegrated	MFD	F(MFD|y, SAV)	1.676	Not cointegrated
SAV	F(SAV |y, BFD)	6.975***	Cointegrated	SAV	F(SAV|y, MFD)	4.276*	Cointegrated
Australia							
y	F(y|BFD, SAV)	4.694*	Cointegrated	y	F(y|MFD, SAV)	5.604**	Cointegrated
BFD	F(BFD| y, SAV)	0.374	Not cointegrated	MFD	F(MFD|y, SAV)	2.453	Not cointegrated
SAV	F(SAV |y, BFD)	4.273*	Cointegrated	SAV	F(SAV|y, MFD)	4.220*	Cointegrated

Asymptotic Critical Values

Pesaran *et al.* (2001, pp. 300, Table CI(iii))	1%		5%		10%	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
	5.15	6.36	3.79	4.85	3.17	4.14

*Note: *, ** and *** denote statistical significance at 10%, 5% and 1% level respectively*

The results reported in Table no. 3 (Model 1) show that the cointegration relationship between bank-based financial development, savings and economic growth is sensitive to the choice of the dependent variable used. For South Africa, the variables are co-integrated only when economic growth (y) and savings ratio (SAV) are dependent variables. For Brazil, the variables are co-integrated only when economic growth (y) and bank-based financial development (BFD) are dependent variables. In Kenya, cointegration exists only when savings ratio (SAV) is the dependent variable. This is confirmed by the corresponding F-statistics in the respective functions which have been found to be statistically significant. As with the cointegration between bank-based financial development, savings and economic growth, the cointegration relationship between market-based financial development, savings and economic growth is also sensitive to the choice of the dependent variable used. As reported in Table no. 3 (Model 2), cointegration tends to exist in the savings function in Kenya, in the economic growth function in Brazil, and in the economic growth and savings functions in South Africa. These results have been confirmed by corresponding F-statistics in the respective functions, which are statistically significant.

The cointegration results for developed countries, as reported in Table no. 4, also show that the cointegration relationship of the variables of interest is sensitive to the choice of the dependent variable used. However, the results indicate that cointegration between bank-based financial development, savings and economic growth has been accepted. This is confirmed by the F-statistics in economic growth and savings ratio functions of the three countries. The cointegration between market-based financial development, savings and economic growth has also been accepted, as confirmed by the F-statistics in the savings function for the USA and both the economic growth and savings functions for the UK and Australia, which are statistically significant.

While the existence of cointegration between the variables suggests that there must be Granger-causality in at least one direction, it does not indicate the direction of causality between these variables (see Narayan and Smyth, 2004; Odhiambo, 2009b). According to Narayan and Smyth (2004) and Odhiambo (2009b), the short-run causal impact is determined by the F-statistics on the explanatory variables, whereas the long-run causal impact is measured through the error-correction term. Although the error-correction term has been incorporated in all the six equations of the Granger-causality model [equations (7) to (12)], it should, however, be noted that only equations where the null hypothesis of no co-integration is rejected, will be estimated with an error-correction term (Narayan and Smyth, 2004; Odhiambo, 2009b).

There are *a priori* four possibilities regarding the causal relationship between financial development (whether it is bank-based or market-based) and economic growth (Graff, 1999). The first being unidirectional causality from financial development to economic growth; the second being unidirectional causality from economic growth to financial development; the third being bidirectional causality between financial development and economic growth; and the fourth being no causality at all between the two.

4.5 Analysis of causality test based on error-correction model

Having found at least one cointegrating vector in both models for all the countries, the next step is to perform causality tests. This is done by incorporating the lagged error-correction term into the relevant regression equations. The causality in this instance is examined through the significance of the coefficient of the lagged error-correction term and significance of the F-statistics of the explanatory variables as determined by the Wald Test or Variable Deletion Test. The results of the causality test within the Error-Correction Mechanism are reported in Tables no. 5 and no. 6 for the developing and the developed countries, respectively.

The empirical results reported in Table no. 5 (Model 1) for bank-based financial development, savings and economic growth reveal that in South Africa and Kenya, there is no short-run or long-run Granger-causality between bank-based financial development and economic growth. This is confirmed by F-statistics of ΔBFD in the economic growth function and that of Δy in the bank-based financial development function, which are both statistically insignificant. However, in Brazil there is bidirectional Granger-causality between bank-based financial development and economic growth. This applies in both the short and the long run. The short-run bidirectional causal flow is supported by the F-statistics of ΔBFD and Δy in the corresponding functions, which are statistically significant. The long-run causal flow, on the other hand, is supported by the coefficients of the error-correction terms in the economic growth and the bank-based financial development functions, which are negative and statistically significant, as expected.

Table no. 5 – Results of Granger-causality tests (developing countries)

Model 1 – Bank-based financial development (BFD), savings (SAV) and economic growth (y)

Dependent Variable	F-statistics [probability] Δy_t	ΔBFD_t	ΔSAV_t	ECT_{t-1} [t-statistics]
South Africa				
Δy_t	-	2.056 [0.164]	5.423** [0.028]	-0.739*** [-3.609]
ΔBFD_t	1.698 [0.204]	-	2.528 [0.124]	-
ΔSAV_t	0.044 [0.835]	3.461* [0.075]	-	-0.167 * [-1.842]
Brazil				
Δy_t	-	5.653** [0.025]	2.014 [0.168]	-0.7485*** [-4.521]
ΔBFD_t	3.228* [0.084]	-	0.728 [0.401]	-0.560** [-2.392]
ΔSAV_t	0.661 [0.423]	5.598** [0.025]	-	-
Kenya				
Δy_t	-	0.0432 [0.837]	0.361 [0.553]	-
ΔBFD_t	0.188 [0.668]	-	3.284* [0.082]	-
ΔSAV_t	0.230 [0.636]	3.189* [0.086]	-	-0.694*** [-4.362]

Model 2 – Market-based financial development (MFD), savings (SAV) and economic growth (y)

Dependent Variable	F-statistics [probability] Δy_t	ΔMFD_t	ΔSAV_t	ECT_{t-1} [t-statistics]
Δy_t	-	2.316 [0.140]	3.346* [0.079]	-0.817*** [-3.737]
ΔMFD_t	3.004* [0.098]	-	0.963 [0.338]	-
ΔSAV_t	3.162* [0.072]	7.150*** [0.000]	-	-0.826*** [-4.288]
Δy_t	-	0.849 [0.365]	7.102** [0.001]	- 0.603*** [-5.300]
ΔMFD_t	8.240*** [0.000]	-	7.910*** [0.000]	-
ΔSAV_t	0.1445 [0.707]	4.750** [0.038]	-	-
Δy_t	-	4.578** [0.043]	6.700*** [0.010]	-
ΔMFD_t	3.623* [0.068]	-	8.708*** [0.000]	-
ΔSAV_t	3.860* [0.065]	2.856 [0.103]	-	-0.554*** [-3.314]

*Note: *, ** and *** denote statistical significance at 10%, 5% and 1% level respectively*

Table no. 6 – Results of Granger-causality tests for the developed countries

Model 1 – Bank-based financial development (BFD), savings (SAV) and economic growth (y)

Dependent Variable	F-statistics [probability] Δy_t	ΔBFD_t	ΔSAV_t	ECT_{t-1} [t-statistics]
USA				
Δy_t	-	0.379 [0.544]	6.053*** [0.005]	- 0.797*** [-3.873]
ΔBFD_t	0.114 [0.739]	-	6.090*** [0.004]	-
ΔSAV_t	4.446** [0.045]	7.460*** [0.000]	-	-0.982 *** [-4.309]
UK				
Δy_t	-	3.918* [0.058]	0.122 [0.730]	-0.283** [-2.103]
ΔBFD_t	1.897 [0.180]	-	2.868 [0.102]	-
ΔSAV_t	3.863* [0.060]	0.057 [0.814]	-	-0.632** [-2.518]
Australia				
Δy_t	-	7.291*** [0.001]	2.629 [0.117]	-0.6509*** [-4.310]
ΔBFD_t	3.145* [0.088]	-	1.052 [0.314]	-
ΔSAV_t	0.406 [0.529]	7.018*** [0.004]	-	-0.885*** [-3.951]

Model 2 – Market-based financial development (MFD), savings (SAV) and economic growth (y)

Dependent Variable	F-statistics [probability] Δy_t	ΔMFD_t	ΔSAV_t	ECT_{t-1} [t-statistics]
Δy_t	-	3.829* [0.061]	6.149*** [0.008]	-
ΔMFD_t	0.157 [0.696]	-	6.402*** [0.009]	-
ΔSAV_t	7.547*** [0.000]	1.645 [0.211]	-	-0.787*** [-5.081]
Δy_t	-	2.159 [0.154]	5.152** [0.027]	-0.979*** [-5.350]
ΔMFD_t	0.002 [0.963]	-	4.119** [0.042]	-
ΔSAV_t	2.030 [0.166]	7.199*** [0.000]	-	-0.7003** [-3.761]
Δy_t	-	0.327 [0.573]	6.162*** [0.003]	-0.597*** [-4.002]
ΔMFD_t	0.104 [0.749]	-	0.516 [0.479]	-
ΔSAV_t	0.836 [0.369]	7.943*** [0.000]	-	-0.452 *** [-4.698]

*Note: *, ** and *** denote statistical significance at 10%, 5% and 1% level respectively*

Other results reported in Model 1, for the developing countries, reveal that in South Africa: (i) there is distinct short-run and long-run unidirectional causality from savings to economic growth and (ii) there is distinct short-run and long-run unidirectional causality from bank-based financial development to savings. In Brazil (i) there is no causality between savings and economic growth and (ii) there is distinct short-run unidirectional causality from bank-based financial development to savings. In Kenya (i) there is no causality between savings and economic growth; (ii) there is long-run unidirectional causality from bank-based financial development to savings; and (iii) there is short-run bidirectional causality between bank-based financial development and savings.

The empirical results reported in Table no. 5 (Model 2) for market-based financial development, savings and economic growth, show that in South Africa and Brazil, there is a distinct short-run unidirectional causal flow from economic growth to market-based financial development. This finding is confirmed by the F-statistics of Δy in the market-based financial development functions of the two countries, which are found to be statistically significant. The empirical results further reveal that in Kenya, there is short-run bidirectional causality between market-based financial development and economic growth.

Other results reported in Model 2 for the developing countries reveal that in South Africa there is: (i) short-run and long-run bidirectional causality between savings and economic growth; and (ii) short-run and long-run unidirectional causality from market-based financial development to savings. In Brazil there is: (i) distinct short-run and long-run unidirectional causality from savings to economic growth and (ii) short-run bidirectional causality between market-based financial development and savings. Finally, in Kenya there is: (i) short-run bidirectional causality between savings and economic growth; (ii) long-run unidirectional causality from economic growth to savings; and (iii) distinct short-run unidirectional causality from savings to market-based financial development.

From the developed countries front, the empirical results displayed in Table no. 6 (Model 1) reveal that for the USA, there is no Granger-causality between bank-based financial development and economic growth, irrespective of whether the causality is estimated in the short or long run. This is confirmed by the corresponding F-statistics in the economic growth and bank-based financial development functions, which are found to be statistically insignificant. For the UK, there is both short-run and long-run unidirectional causality from bank-based financial development to economic growth. This is confirmed by the F-statistic of ΔBFD in the economic growth function and the coefficient of the error-correction term in the same function, which are both statistically significant. The empirical results further reveal the existence of short-run bidirectional causality between bank-based financial development and economic growth in Australia. However, for Australia, the results further reveal the presence of long-run unidirectional causality from bank-based financial development to economic growth.

Other results reported in Model 1 reveal that in the USA there is: (i) short-run and long-run bidirectional causality between savings and economic growth; (ii) short-run bidirectional causality between bank-based financial development and saving; and (iii) long-run unidirectional causality from bank-based financial development to savings. In the UK, however, there is: (i) distinct short-run and long-run unidirectional causality from economic growth to saving and (ii) no causality between bank-based financial development and savings. Finally, in Australia there is: (i) no causality between savings and economic growth

and (ii) distinct short-run and long-run unidirectional causality from bank-based financial development to savings.

The empirical results reported in Table no. 6 (Model 2) for the developed countries show that there is no Granger-causality between market-based financial development and economic growth in the UK and Australia. However, there is distinct short-run unidirectional causality from market-based financial development to economic growth in the USA.

Other results reported in Model 2 reveal that in the USA there is: (i) short-run bidirectional causality between savings and economic growth; (ii) long-run unidirectional causality from economic growth to savings and (iii) distinct short-run unidirectional causality from savings to market-based financial development. In the UK there is: (i) distinct short-run and long-run unidirectional causality from savings to economic growth; (ii) short-run bidirectional causality between market-based financial development and savings; and (iii) long-run unidirectional causality from market-based financial development to savings. Finally, in Australia there is distinct: (i) short-run and long-run unidirectional causality from savings to economic growth; and (ii) short-run and long-run unidirectional causality from market-based financial development to savings.

Overall, the empirical results reported in Table no. 5 and no. 6, for all the (Models 1 and 2) imply that: (i) in South Africa, it is the real sector that drives stock market development; (ii) in Brazil, banking sector development and the real sector drive each other, but it is the real sector that propels stock market development; (iii) in Kenya, the stock market and the real sector drive each other; (iv) in the USA, it is the stock market that drives the real sector; (v) in the UK, it is the banking sector that drives the real sector; and (vi) in Australia, the banking sector and the real sector drive each other in the short run but it is the banking sector that propels the real sector in the long run. A summary of these results are presented in Table no. 7.

Table no. 7 – Summary of Models 1 and 2 Results (All Study Countries)

	Model 1 (BFD & y)		**Model 2 (MFD & y)**	
	Direction of Causality		Direction of Causality	
	Short Run	Long Run	Short Run	Long Run
Developing Countries				
South Africa	No causality	No causality	y → MFD	No causality
Brazil	BFD ↔ y	BFD ↔ y	y → MFD	No causality
Kenya	No causality	No causality	MFD ↔ y	No causality
Developed Countries				
USA	No causality	No causality	MFD → y	No causality
UK	BFD → y	BFD → y	No causality	No causality
Australia	BFD ↔ y	BFD → y	No causality	No causality

Notes: y=economic growth; BFD=bank-based financial development; MFD=market-based financial development; and → indicates direction of causality

As summarised in Table no. 7 (Model 1) bank-based financial development Granger-causes economic growth in one country, the UK; bank-based financial development and economic growth Granger-cause each other in one country, Brazil, while bank-based financial development and economic growth are not causally related in three countries, South Africa, Kenya and the USA. The results of Model 2 show that market-based financial

development Granger-causes economic growth in one country, the USA while economic growth Granger-causes market-based financial development in two countries, South Africa and Brazil. Model 2 results also indicate that market-based financial development and economic growth Granger-cause each other in one country, Kenya but they are not causally related in two countries, Australia and the UK.

Although the results of this study are not uniform across the study countries, they are consistent with results of similar earlier work. From the bank-based financial development and economic growth causality angle, the results reveal evidence in support of finance-led growth in the short and long-run in the case of the UK but only in the long run in the case of Australia (see also Christopoulos and Tsionas, 2004; Majid, 2008; Odhiambo, 2009b). Evidence supporting bidirectional causality was found in both the short run and the long run in Brazil – and only in the short-run in Australia (see, among others, Sinha and Macri, 2001; Shan and Jianhong, 2006; Abu-Bader and Abu-Qarn, 2008). However, a neutrality view was supported in the cases of South Africa, Kenya and the USA. These results are consistent with those obtained by Shan *et al.* (2001) and Shan and Morris (2002), among others. From the market-based financial development and economic growth causality front, the results largely support the neutrality view in the long run in all the countries, as also in the short-run for Australia and the UK. The growth-led finance view is supported in the short run for South Africa and Brazil (see also Shan and Morris, 2002; Athanasios and Antonios, 2012), while the finance-led growth hypothesis is supported in the USA, in the short run. Evidence consistent with the bidirectional view is found only in Kenya, in the short run (Cheng, 2012; Marques *et al.*, 2013).

From the policy implication front, it is interesting to note that in the UK, where bank-based financial sector development leads economic growth, policy makers are recommended to consider banking sector enhancing policies in order to stimulate the real sector. However, Brazil and Australia are likely to benefit from both growth-enhancing and banking sector-enhancing policies since the real sector and the banking sector drive each other. In the USA, where market-based financial sector development drives growth of the real sector, pro-market-based financial sector development policies are recommended in order to further stimulate the real sector. In South Africa and Brazil, where it is the real sector that stimulates the development of the market-based financial sector, the study recommends policies that promote the development of the real sector of the economy to be put in place in order to further stimulate the financial markets. However, in Kenya policy makers are recommended to draft balanced policies that favour stock market development on the one hand and economic growth on the other.

The regression of the underlying causality model passes all the diagnostic tests against serial correlation, functional form, normality and heteroscedasticity.

5. CONCLUSION

In this study, the causal relationship between bank-based financial development and economic growth; and between market-based financial development and economic growth in three developing countries – South Africa, Brazil and Kenya – and three developed countries – United States of America, United Kingdom and Australia is examined for the period from 1980 to 2012. The study also focuses on examining whether the causality between financial development, bank-based and market-based, and economic growth differs depending on the country's level of development. To address the omission of variable bias,

the study uses savings as an intermittent variable – thereby creating a trivariate Granger-causality model. The study employs the method of means-removed average to construct both bank- and market-based financial development indices. The expectation was to have causality running from market-based financial development to economic growth in developed countries while it runs from bank-based financial development to economic growth in developing countries. However, the empirical findings show mixed results. Using the newly developed ARDL-Bounds testing approach to co-integration, and the ECM-based Granger-causality model, the results have been found to vary from country to country and over time. The results also tend to vary depending on the proxy used to measure the level of financial development. The results of Model 1 show that while bank-based financial development Granger-causes economic growth in the UK, in Brazil the two Granger-cause each other. However, contrary to the expectations of this study, no causality between bank-based financial development and economic growth has been found to prevail in the remaining three countries (South Africa, Kenya, USA). The results of Model 2, on the other hand, indicate that market-based financial development leads economic growth in the USA, while economic growth leads market-based financial development in South Africa and Brazil. However, bidirectional causality has been found to be predominant in Kenya. In Australia and the UK, no causality between market-based financial development and economic growth has been detected. Thus, the hypothesis that the relationship between bank-based financial development and economic growth in the study countries follows a distinct supply-leading response can be accepted only in two countries (the UK, both in the short and long run and Australia, only in the long run). On the other hand, the hypothesis that the relationship between market-based financial development and economic growth in the study countries follows a distinct supply-leading response can be accepted in the case of the USA only. In cases where there is causation between bank-based financial development and economic growth, the common causal flow was found to be supply leading and bidirectional. However, for market-based financial development and economic growth, the dominant causal flow is consistent with the demand following hypothesis.

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