

# *Are Banks and Stock Markets Complements Or Substitutes? Empirical Evidence from Three Countries*

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This paper has tested whether bank-based financial development and market-based financial development are complements of, or substitutes for, one another in enhancing economic growth in the USA, Brazil and Kenya during the period from 1980 to 2012. These three countries represent a modest cross-section of the general financial structure prevalent in many developed and developing countries. Unlike some of the previous studies, the study employs the newly developed ARDL-Bounds-testing approach to carry out the test. The study also employs the method of means-removed average to construct both bank-based and market-based financial development indices. The results of this study show that while in the USA and Brazil, bank-based and market-based financial systems complement each other in enhancing economic growth; in Kenya, the two financial systems seem to be substitutes rather than complements.

*Key Words:* bank-based financial development, market-based financial development, economic growth, Unites States of America, Brazil, Kenya

*JEL Classification:* G10, G20, O16

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## **Introduction**

While it has been widely acknowledged that financial development is important in propelling economic growth, it is still debatable whether bank-based and market-based financial development are complements or substitutes for one another in stimulating economic growth. The relationship between financial-sector development and economic growth has received considerable attention for many decades: in both the developing and the developed economies. However, the vast majority of the previous studies have focused mainly on the relationship between financial intermediaries

and economic growth (see, among others, Ahmed and Ansari 1998; Allen and Ndikumana 2000; Christopoulos and Tsionas 2004; Zang and Kim 2007; Güryay, Şafakli, and Tüzel 2007; Kargbo and Adamu 2009; Hassan, Sanchez, and Yu 2011; Adu, Marbuah, and Mensah 2013).

Empirical studies on market-based financial development and economic growth are scanty; so are studies on bank-based and market-based financial development and economic growth. Thus, very few studies have put to the test the three financial structure views – the bank-based view, which postulates that a bank-based financial system is better than a market-based system in promoting economic growth; the market-based view, which places a high level of importance on market-based financial development in propelling economic growth; and the financial services view, which minimises the importance of the bank-based versus the market-based debate, and stresses the importance of the complementarity of the two financial systems in providing sound financial services.

It is against this backdrop that this study attempts to examine the dynamic relationship between bank- and market-based financial development in propelling economic growth in the United States of America (USA), Brazil and Kenya, using the newly developed ARDL-Bounds-testing procedure. The three selected countries represent a modest cross-section of the general financial structure prevalent in many developed and developing countries. Specifically, the study attempts to establish whether bank-based financial development and market-based financial development complement each other, or substitute each other in driving economic growth. The interaction of bank- and market-based financial development is captured by the interaction term – comprising the bank-based financial development and market-based financial development proxies – in a standard growth model. The study hypothesises that bank- and market-based financial development complement one another in driving economic growth.

In order to incorporate the various proxies of bank-based and market-based financial development in the empirical analysis, the current study employs the method of the means-removed average, in order to construct a bank-based financial development index, from  $M_2$ ,  $M_3$  and credit provided to the private sector; and a market-based financial development index, from stock market capitalisation, the total value of stocks traded and the turnover ratio (see also Demirguc-Kunt and Levine 1996).

Bank-based and market-based financial development, investment, savings and trade openness are additional variables employed in the stan-

dard growth model, in order to control for other potential determinants of economic growth in the regressions (see also Beck and Levine 2004).

The rest of this paper is organised as follows: the second section gives an overview of the financial sector reforms and development in the study countries. The third section highlights the theoretical and empirical literature review on bank-based and market-based financial development and economic growth. The fourth section deals with the empirical model specification, the estimation technique, and the empirical analysis of the regression results. The fifth section concludes the study.

### **Financial Sector Reforms and Development in the USA, Brazil and Kenya**

By any standard, modern or otherwise, the USA has a highly developed financial sector, which ranks very highly in terms of the development and sophistication of its bank and non-bank financial institutions – and also of its financial markets, as well as the size, depth and access available to its financial services. The USA was ranked number 1 in 2010 and number 2 in 2011, in terms of financial development, based on the Financial-Development Index rankings (World Economic Forum 2011).

The USA had several stock exchanges, which gradually acquired one another and/or merged over the years to form three big stock exchanges – the biggest one being the NYSE Euronext, followed by the NASDAQ OMX, which is two-thirds the size of the NYSE Euronext by market capitalisation, followed by the Chicago Stock Exchange (CHX) (<http://www.chx.com>; <http://usequities.nyx.com>; <http://www.nasdaq.com>). Although these three are the most visible stock exchanges in the USA, there are numerous other exchanges that specialise in financial instruments, other than stocks. The USA's financial system is generally referred to as a market-based financial system.

The Brazilian financial system, on the other hand, is the largest and most sophisticated in Latin America (World Bank 2007). The sector consists of both the banking segment and the capital market segment. Although both segments are still developing by international standards, the capital market segment plays an important role in driving economic growth, alongside the banks. The Brazilian financial system is, therefore, commonly referred to as a 'market-based' financial system (Demirguc-Kunt and Levine 2001).

The history of the stock market in Brazil dates back to as early as 1817, when the first Brazilian stock exchange (now the inactive Sal-

vador Exchange) was inaugurated. Several stock exchanges gradually emerged over the years. However, these gradually acquired one another, and/or merged over the years, to form one big stock exchange, the BM&FBOVESPA, which is Latin America's leader in the securities and derivatives segments (see <http://www.bmfbovespa.com.br>).

Unlike the USA and Brazil, which are dominated by a market-based financial system, Kenya's financial sector is dominated by a bank-based financial system. Although Kenya has the largest financial sector in East Africa – from both the bank-based and the market-based fronts – it is still young and developing by the standards of advanced economies. The country has one stock market, known as the Nairobi Securities Exchange – formerly the Nairobi Stock Exchange (see <http://www.centralbank.go.ke>; <http://www.nse.co.ke>).

As early as the 1930s, the USA embarked on the financial sector reform journey to keep pace with the national demands for development, and the global demands for modernisation, with Brazil and Kenya joining in during the 1980s. However, the 21st Century saw the intensification of these reforms, both in the respective banking sectors and the stock markets. In the banking sectors, these reforms have focused on improving the legal, regulatory, judiciary and supervisory environments; reducing financial repression; restoring bank soundness; and rehabilitating the financial infrastructure; and they have also included programmes designed to encourage new entrants (Central Bank of Brazil 2009; FSD Kenya 2010; see also <http://www.fdic.gov>).

On the stock market side, the reforms have addressed the legal, regulatory, judiciary as well as supervisory aspects of the business, as well as the general modernisation of the trading environment.

The rigorous reforms over time have given rise to a developed and well-regulated financial system in the USA, with Brazilian standards trailing behind those of the USA, and the Kenyan standards trailing behind the Brazilian developmental standards. The development of the banking sector in the countries of study is evidenced by the growth in private sector credit, the increasing number of Automated Teller Machines (ATMs), low levels of non-performing loans, and strong legal rights (see <http://data.worldbank.org/topic/financial-sector>).

In terms of the credit extended to the private sector by the banking sector, the USA started and finished off in the best position of the three economies, reaching a peak of almost 250% in 2007; while Kenya had the worst performance – with the lowest credit extended to the private sec-

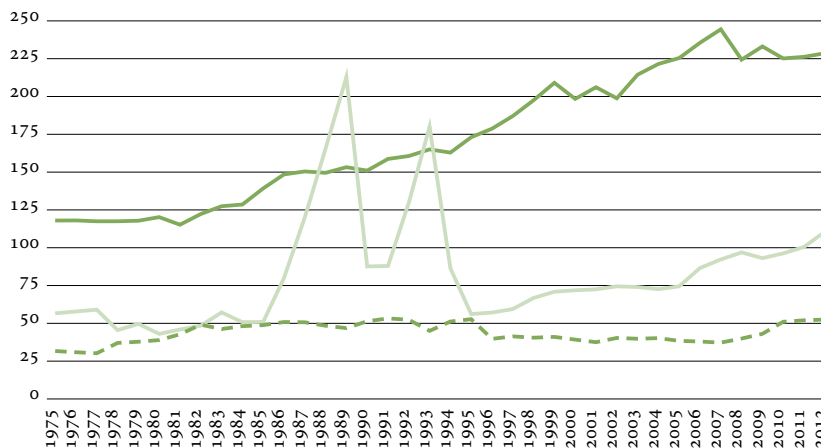


FIGURE 1 Trends in the Banking Sector Growth in the USA (dark), Brazil (light) and Kenya (dashed) (1975–2013; based on World Bank Development Indicators, <http://data.worldbank.org/topic/financial-sector>)

tor throughout the period – and never exceeding the 75% mark. Figure 1 illustrates the trends in banking sector growth, as shown by credit extension to the private sector in the USA, Brazil and Kenya during the period 1975–2013.

On the stock market front, the reforms gave rise to an increased number of listed companies, a remarkable increase in stock market capitalisation, total value traded and turnover ratio up to the early 2000s (see <http://data.worldbank.org/topic/financial-sector>). Overall, Kenya has relatively the smallest and most inactive stock market of the three study countries, in all respects, i.e. in terms of the number of listed companies, stock market capitalisation, the total value of stocks traded and the turnover ratio. The USA, on the other hand, has the biggest and the most liquid stock market in general. Figures 2–4 track and compare stock market size and activity for the USA, Brazil and Kenya during the period 1988 to 2012. Despite this growth, these countries’ financial systems still face some challenges. Although these challenges differ in dimension and magnitude, financial inclusion, reduced bank profitability, the Eurozone contagion, and stock market liquidity, seem to top the list.

### **Bank-Based Financial Development, Market-Based Financial Development and Economic Growth**

Generally, a financial system consists of two components; the bank-based component and the market-based component. According to Demirguc-

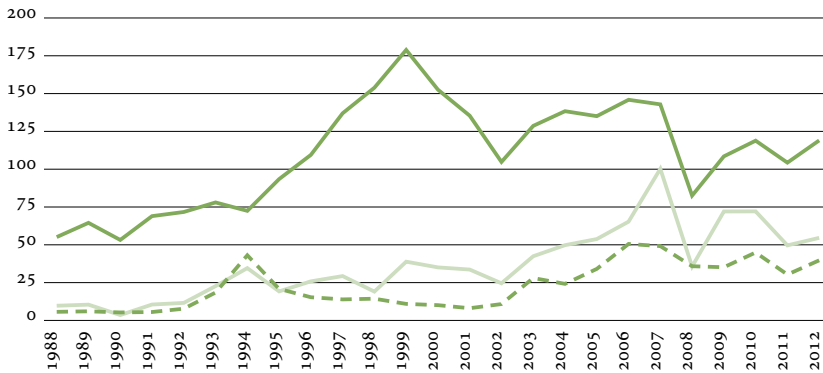


FIGURE 2 Trends in Stock Market Capitalisation in the USA (dark), Brazil (light) and Kenya (dashed) (1988–2012; based on World Bank Development Indicators, <http://data.worldbank.org/topic/financial-sector>)

Kunt and Levine (2001), if an economy is driven by financial intermediaries – like banks and bank-like financial institutions more than it is driven by financial markets – like stock markets and bond markets, that economy’s financial system is generally referred to as ‘a bank-based financial system.’ However, if securities markets share centre stage with banks in driving economic growth *via* savings mobilisation and allocation, exerting corporate control, and easing risk management, that economy’s financial system is generally referred to as ‘a market-based financial system’ (Demirguc-Kunt and Levine 2001).

There exists a considerable debate in the literature on the relative merits of a bank-based versus a market-based financial system in fostering economic growth. In line with the bank-based view, most economists still believe that a bank-based financial system is better than a market-based system. In particular, it is argued that economic growth could be encouraged more in the bank-based system, since it can induce longer-term investment in the real sector; whereas investment in the market-based system is too sensitive to the stock market prices with short-term investment (Hoshi, Kashyap, and Scharfstein 1990).

On the other hand, the market-based view places a high importance on market-based financial development in propelling economic growth; and it highlights the positive role markets play in enhancing risk management, information dissemination, corporate control, and capital allocation (Levine and Zervos 1998). This view also stresses the problems associated with banks, arguing that powerful banks can stymie innova-

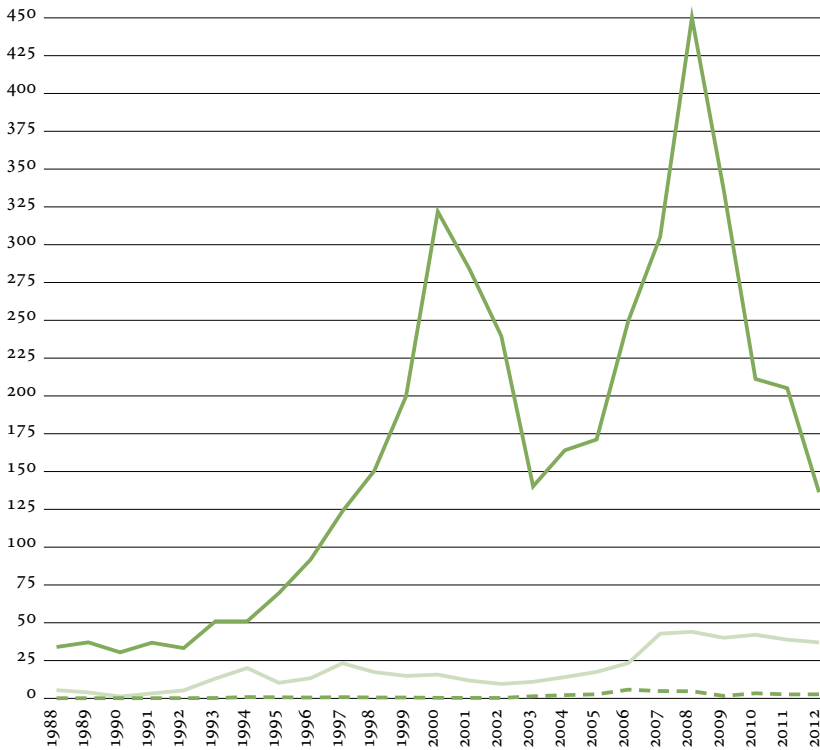


FIGURE 3 Trends in Total Value of Stocks Traded in the USA (dark), Brazil (light) and Kenya (dashed) (1988–2012; based on World Bank Development Indicators, <http://data.worldbank.org/topic/financial-sector>)

tion by extracting informational rents and protecting established firms with close bank-firm ties from competition (Rajan 1992).

In addition to these two competing views, there is a third view called the financial-services view. This view, as articulated by Merton and Bodie (1995) and Levine (1997), minimises the importance of the bank-based versus the market-based debate. Rather, it stresses that financial arrangements – contracts, markets, and intermediaries – arise to ameliorate market imperfections and to provide financial services (Levine 2002). Thus, according to this view, the main issue is neither banks nor markets, but creating an environment in which intermediaries and markets complement each other in providing sound financial services.

Contrary to the commonly held belief that bank-based financial development is better in propelling economic growth, the empirical literature, although largely supportive of the two financial systems being com-

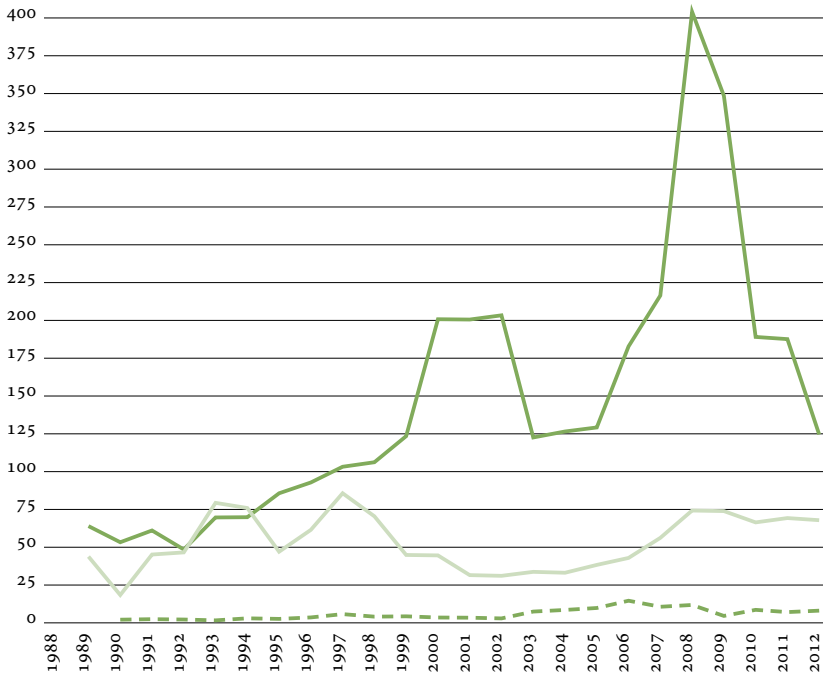


FIGURE 4 Trends in Turnover Ratio of Stocks Traded in the USA (dark), Brazil (light) and Kenya (dashed) (1988–2012; based on World Bank Development Indicators, <http://data.worldbank.org/topic/financial-sector>)

plements, has also shown that the market-based view is valid in some countries. Thus, to date, the question of whether bank-based and market-based financial systems are complements or substitutes is still debatable.

Levine (1999) selectively reviewed evidence on banks, markets and financial structures. Although he found that establishing a legal environment that rigorously protects the right of investors is fundamentally more important than any considerations involving comparisons between bank-based and market-based systems, he also concluded that both banks and markets provide complementary services to the economy – with positive implications for economic performance.

Beck and Levine (2002) empirically assessed the impact of financial structure on economic growth, industrial growth, new establishment formation, and capital allocation across industries for 42 countries and 36 industries. They found evidence for neither the market-based nor the bank-based hypothesis; and they concluded that having a bank-based or market-based system *per se* does not seem to matter much – but rather,



it is the legal system's efficiency and overall financial development that boost industrial growth, new establishment formation, and efficient capital allocation.

Levine (2002) empirically assessed competing theoretical views on whether bank-based or market-based financial systems are better at promoting long-run economic growth – using a wide assortment of 48 developed and developing countries. The results indicated that although overall financial development is robustly linked to economic growth, there is no support for either the bank-based or the market-based view. The two systems are rather complementary.

Levine (2004) reviewed, appraised, and critiqued theoretical and empirical research on the connections between the operation of the financial system and economic growth. While subject to ample qualifications and countervailing views were noted throughout the study, the predominance of evidence led Levine to suggest that both financial intermediaries and markets impact growth in their own ways, thereby complementing each other.

Yonezawa and Azeez (2010) empirically examined whether bank-based or market-based financial systems are better at promoting economic performance – using a panel dataset on 40 countries for the period 1990–2003. They found that market-based financial system induces capital accumulation more efficiently; whereas a bank-based financial system and a financially developed economy are more effective in promoting productivity. Furthermore, the bank-based system was found to promote capital accumulation in the past. Thus, the two financial systems were found to complement each other.

Ujunwa and Salami (2010) examined the channels through which banks and markets promote economic growth in Nigeria. Using bank size, bank activity, bank efficiency, market size, market activity and market efficiency as measures of bank-based and market-based financial development, the authors found evidence in support of banks and markets being complements of each other. In conclusion, the study relegated the financial structure arguments to the shadows, and recommended a favourable macro-economic environment that would allow for the development of the financial system.

Masoud and Hardaker (2012) analysed the relationship between financial development and economic growth for 42 emerging markets, over 12 years, using an endogenous growth model. The results suggested that stock market development and banking sector development have a signif-

ificant effect on economic growth. The authors further found that the stock market and the banking sector in the emerging economies are complementary to – rather than substitutes for each other – in promoting the economy.

Odhiambo (2014) examined the relationship between banks, stock markets and economic growth in South Africa, in an attempt to answer one critical question: Are stock markets and banks complementary to one another in the process of enhancing economic growth? Using stock market capitalisation, stock market traded value and stock market turnover as market-based financial development proxies – against the ratio of bank credit to the private sector, a proxy for bank-based financial development – the study found that complementarity between stock market development and bank-based financial development is sensitive to the variable used as a proxy for stock market development. Complementarity was found to exist when the stock market capitalisation was used as a proxy for stock market development. However, in general, the complementarity between stock market development and bank-based financial development in South Africa was found to be weak.

In the finance-growth literature, although scarce, there is also empirical evidence suggesting the outright importance of one financial system, and the insignificance of the other financial system – in fostering economic growth in an economy. Dey (2007) examined the determinants of stock market and bank liquidity in an economy in which stock market turnover and available bank credit denoted access to long- and short-term capital, respectively. It was found that these two variables are interdependent, and the errors are correlated. The results suggested that available bank credit and stock market turnover are inversely related to each other, confirming their substitutability relationship.

### **Estimation Techniques and Empirical Analysis**

#### **CO-INTEGRATION: ARDL BOUNDS-TESTING PROCEDURE**

This study utilises the newly proposed autoregressive-distributed lag (ARDL) bounds testing approach, which was initially introduced by Pesaran and Shin (1999), and later extended by Pesaran, Shin, and Smith (2001), to test the complementarity or substitutability of bank-based and market-based financial development in enhancing economic growth. This test has numerous advantages over previous co-integration tests, such as the residual-based technique by Engle and Granger (1987), and

the Full-Maximum Likelihood (FML) test, based on the work of Johansen (1988; 1991), and on the study by Johansen and Juselius (1990).

Firstly, unlike these other tests, the ARDL approach can be applied to test the existence of a relationship between variables – regardless of whether the underlying regressors are integrated of order one [I(1)], order zero [I(0)], or fractionally integrated. Thus, the ARDL-bounds testing approach does not impose the restrictive assumption that all the variables under study must be integrated of the same order. Secondly, while other co-integration techniques are sensitive to the size of the sample, the ARDL test is suitable even when the sample size is small. Thus, the ARDL test has superior small sample properties, when compared with the Johansen and Juselius (1990) co-integration test (Pesaran and Shin 1999).

Thirdly, the ARDL technique generally provides unbiased estimates of the long-run model and valid *t*-statistics – even when some of the regressors are endogenous. Fourthly, while conventional co-integration methods estimate the long-run relationship within the context of a system of equations, the ARDL method employs only a single reduced-form equation (Pesaran and Shin 1999). Consequently, this approach is considered appropriate for analysing the underlying relationship; and it has been increasingly used in empirical research in recent years.

The empirical model used in this study, to test whether bank-based financial development and market-based financial development are complements or not in promoting economic growth is expressed in the ARDL form as follows:

$$\begin{aligned}
 \Delta \text{GDP}_t = & \lambda_0 + \sum_{i=1}^n \lambda_{1i} \Delta \text{GDP}_{t-i} + \sum_{i=0}^n \lambda_{2i} \Delta \text{BFD}_{t-i} \\
 & + \sum_{i=0}^n \lambda_{3i} \Delta \text{MFD}_{t-i} + \sum_{i=0}^n \lambda_{4i} [\Delta (\text{BFD}^* \text{MFD})]_{t-i} \\
 & + \sum_{i=0}^n \lambda_{5i} \Delta \text{INV}_{t-i} + \sum_{i=0}^n \lambda_{6i} \Delta \text{SAV}_{t-i} + \sum_{i=0}^n \lambda_{7i} \Delta \text{TOP}_{t-i} \\
 & + \sigma_1 \text{GDP}_{t-1} + \sigma_2 \text{BFD}_{t-1} + \sigma_3 \text{MFD}_{t-1} + \sigma_4 (\text{BFD}^* \text{MFD})_{t-1} \\
 & + \sigma_5 \text{INV}_{t-1} + \sigma_6 \text{SAV}_{t-1} + \sigma_7 \text{TOP}_{t-1} + \sigma_t, \tag{1}
 \end{aligned}$$

where GDP is the growth rate of real gross domestic product – a proxy for economic growth - this proxy has been used extensively in literature (see, among others, Wood 1993; Odedokun 1996; Shan and Jianhong 2006; Majid 2008); BFD is an index of bank-based financial development, which

is a means-removed average of  $M_2$ ,  $M_3$  and credit provided to the private sector by financial intermediaries – a proxy for bank-based financial development (see also Demirguc-Kunt and Levine 1996);  $MFD$  is an index of market-based financial development, which is a means-removed average of stock market capitalisation, stock market traded value and stock-market turnover – a proxy for market-based financial development (see also Demirguc-Kunt and Levine 1996).  $BFD^*MFD$  is the interaction term between bank-based and market-based financial development;  $INV$  is the share of the investment in gross domestic product;  $SAV$  is the share of the savings in gross domestic product;  $TOP$  is trade openness;  $\lambda_0$  is a constant;  $\lambda_1 - \lambda_7$  and  $\sigma_1 - \sigma_7$  are regression coefficients;  $\Delta$  is the difference operator;  $n$  is the lag length and  $\varepsilon_t$  is the white noise-error term.

The error correction model is specified as follows:

$$\begin{aligned} \Delta GDP_t = & \lambda_0 + \sum_{i=1}^n \lambda_{1i} \Delta GDP_{t-i} + \sum_{i=0}^n \lambda_{2i} \Delta BFD_{t-i} \\ & + \sum_{i=0}^n \lambda_{3i} \Delta MFD_{t-i} + \sum_{i=0}^n \lambda_{4i} [\Delta (BFD^*MFD)]_{t-i} \\ & + \sum_{i=0}^n \lambda_{5i} \Delta INV_{t-i} + \sum_{i=0}^n \lambda_{6i} \Delta SAV_{t-i} + \sum_{i=0}^n \lambda_{7i} \Delta TOP_{t-i} \\ & + \xi ECM_{t-1} + \varepsilon_t. \end{aligned} \quad (2)$$

### DATA SOURCES

This study utilised annual time-series data, covering the period from 1980 to 2012. The annual data used in the study were obtained from the World Bank Economic Indicators (see <http://data.worldbank.org/topic/financial-sector>), except for the market-based financial development proxies (stock market capitalisation, stock market traded value, and stock market turnover) for the period 1980 to 1988, which were obtained from the Emerging Stock Markets Factbook (International Finance Corporation 1991) and the countries' stock exchanges. All of the model estimations were computed using Microfit 5.0 software.

### STATIONARITY TESTS

Before any analysis was conducted, the variables were first tested for stationarity, using the Dickey-Fuller generalised least-square (DF-GLS) and the Phillips-Perron (PP) tests. To cater for possible structural breaks

within the dataset, the Perron (1997) test for unit root (PPUR-Root) was also utilised as the third unit-root testing method.

The DF-GLS lag length was selected automatically by SIC; the PP truncation lag was selected automatically on the Newey-West bandwidth; and the PPU-Root break years were also automatically selected; and these dates ranged from 1987 to 2006, depending on the variable. The results of DF-GLS, PP and the PPU-Root stationarity tests for all the variables are presented in table 1.

The results reported in table 1 show that after differencing the variables once, all the variables were confirmed to be stationary. Even though the ARDL test does not require the pre-testing of variables, the unit-root test provides guidance as to whether ARDL is applicable or not, as it is only applicable for the analysis of variables that are integrated of order zero  $I(0)$ , or order one  $I(1)$ . In this instance, the variables are conclusively stationary, after being differenced once; hence, the ARDL bounds-testing procedure can be satisfactorily performed.

#### CO-INTEGRATION AND ARDL-BASED ECM MODEL

In this section, the long-run relationship between the variables is examined, using the ARDL bounds-testing procedure. The first step is to get the order of lags on the first differenced variables in equations (1) by using the Akaike Information Criterion and the Schwartz-Bayesian Criterion. This is followed by the application of a bounds  $F$ -test to equation (1) to establish a long-run relationship between the variables in the study. The results of the bounds  $F$ -test are reported in table 2.

The results of the  $F$ -test suggest that there exists a long-run relationship between GDP and BFD, MFD,  $BFD * MFD$ , INV, SAV and TOP. Following the estimation of the ARDL model and the use of AIC or SIC for optimal lag-length selection, the SIC-based  $ARDL(2,3,2,3,3,3,1)$ ,  $ARDL(2,0,1,1,2,1,0)$  and  $ARDL(2,1,0,0,2,0,2)$  models were selected for the USA, Brazil and Kenya, respectively, because they were more parsimonious than the AIC-based alternatives. The long-run results of the selected models are reported in table 3 panel A; and the short-run results are reported in table 3 panel B.

The results reported in table 3 show that the complementarity/substitutability between bank-based and market-based financial development is both country- and time-variant. In the USA and Brazil, bank-based and market-based financial development have been found to be complements; while in Kenya, they were found to be substitutes. While the com-

TABLE 1 Stationarity Tests of all Variables

Variable	United States			Brazil			Kenya					
	1a	1b	2a	2b	1a	1b	2a	1a	1b	2a	2b	
<i>Dickey-Fuller Generalised Least Square (DF-GLS)</i>												
GDP	-3.401***	-3.937***	-	-	-4.197***	-5.013***	-	-	-3.060***	-3.283**	-	-
BFD	0.024	-2.641	-2.772***	-7.684***	-1.897	-2.169	-6.690***	-6.742***	-2.190**	-2.764	-6.714***	-7.327***
MFD	-1.244	-2.927*	-4.219***	-4.368***	-0.926	-3.194**	-7.387***	-7.419***	-1.257	-2.916*	-6.259***	-6.284***
BFD* MFD	-3.265***	-3.320**	-	-	-3.265***	-3.320**	-	-	-3.265***	-3.320**	-	-
INV	-2.415**	-2.980*	-4.166***	-4.184***	-1.978**	-2.264	-5.105***	-4.164***	-2.634**	-2.668	-5.454***	-5.516***
SAV	-1.018	-2.563	-4.453***	-5.020***	-3.061***	-3.101*	-	-	-3.227***	-3.498**	-	-
TOP	0.153	-2.854	-6.009***	-6.667***	-1.176	-2.133	-5.004***	-5.115***	-1.846*	-2.379	-5.684***	-5.957***
<i>Phillips-Perron (PP)</i>												
GDP	-4.022***	-4.281***	-	-	-5.697***	-5.851***	-	-	-3.310**	-3.331*	-	-
BFD	-0.588	-2.359	-7.627***	-7.502***	-2.907*	-2.670	-7.179***	-7.094***	-2.769*	-2.819	-7.795***	-7.747***
MFD	-1.593	-2.255	-4.044***	-4.032**	-1.115	-3.178	-7.367***	-7.237***	-1.466	-2.845	-6.280***	-6.162***
BFD* MFD	-3.096**	-9.547***	-	-	-3.096**	-3.008**	-	-	-3.096**	-3.227*	-	-
INV	-0.900	-1.201	-3.475**	-3.303**	-2.495	-2.245	-5.152***	-5.514***	-2.547	-2.572	-7.571***	-8.456***
SAV	-1.440	-2.055	-5.197***	-5.097***	-3.030**	-2.982	-8.611***	-8.439***	-3.098**	-3.323*	-	-
TOP	1.225	-3.045	-6.557***	-7.580***	-1.209	-2.412	-4.968***	-4.948***	-2.054	-2.468	-5.760***	-6.423**
<i>Perron 1997 (PPU-Root)</i>												
GDP	-4.665	-4.870	-7.412***	-8.934***	-4.822	-4.540	-6.952***	-6.775***	-4.311	-4.500	-6.183***	-6.593***
BFD	-3.683	-3.804	-9.127***	-8.969***	-3.671	-3.353	-6.541***	-6.461***	-4.842	-5.136	-8.585***	-8.481***
MFD	-2.404	-3.780	-5.345**	-5.936**	-3.494	-3.436	-7.604***	-7.849***	-4.049	-4.411	-7.213***	-6.893***
BFD* MFD	-8.824***	-9.551***	-	-	-8.824***	-9.551***	-	-	-8.824***	-9.551***	-	-
INV	-4.468	-4.150	-5.271**	-5.682**	-3.455	-3.252	-6.695***	-7.800***	-4.324	-5.129	-6.015***	-6.392***
SAV	-3.684	-3.664	-6.752***	-6.742***	-4.913	-4.736	-6.725***	-6.963***	-4.353	-4.893	-8.838***	-8.770***
TOP	-4.075	-4.436	-6.493***	-6.476***	-4.040	-3.690	-6.400***	-6.657***	-3.654	-3.769	-7.143***	-7.063**

NOTES 1a - stationarity of all variables in levels, without trend, 1b - stationarity of all variables in levels, without trend, 2a - stationarity of all variables in first difference, without trend, 2b - stationarity of all variables in first difference, with trend; \*, \*\*, and \*\*\* denotes stationarity at 10%, 5% and 1% significance levels respectively.

TABLE 2 Bounds *F*-test for Co-integration

Country	Dep. variable	Function	<i>F</i> -statistic	Co-int. status	
USA	GDP	$F(\text{GDP} \text{BFD}, \text{MFD}, \text{BFD}*\text{MFD}, \text{INV}, \text{SAV}, \text{TOP})$	4.9629***	Cointegrated	
Brazil	GDP	$F(\text{GDP} \text{BFD}, \text{MFD}, \text{BFD}*\text{MFD}, \text{INV}, \text{SAV}, \text{TOP})$	6.4118***	Cointegrated	
Kenya	GDP	$F(\text{GDP} \text{BFD}, \text{MFD}, \text{BFD}*\text{MFD}, \text{INV}, \text{SAV}, \text{TOP})$	3.4766*	Cointegrated	
Asymptotic critical values		1%	5%	10%	
Pesaran, Shin, and Smith (2001, 300)		I(0) 3.15	I(1) 4.43	I(0) 2.45	I(1) 3.61
				I(0) 2.12	I(1) 3.23

NOTES \*\*\* and \* denotes statistical significance at 1% and 10% level, respectively.

TABLE 3 Estimation of Long-Run and Short-Run Coefficients

Regressors	Coefficient ( <i>t</i> -statistic)		
	USA ARDL(2,3,2,3,3,3,1)	Brazil ARDL(2,0,1,1,2,1,0)	Kenya ARDL(2,1,0,0,2,0,2)
<i>Panel A: Estimated Long-Run Coefficients (dependent variable: GDP)</i>			
C	28.0132 (6.1388)***	16.3305 (2.2787)**	-9.2477 (-1.9081)*
BFD	0.0138 (2.5987)**	-0.0093 (-2.1203)**	0.0647 (0.6772)
MFD	0.2218 (3.8721)***	0.0100 (0.3086)	0.6589 (2.2473)**
BFD*MFD	0.6590 (4.5784)***	0.2445 (1.9063)*	-0.0147 (-1.9415)*
INV	-0.6374 (-4.2212)***	-1.1425 (-2.3300)**	0.9574 (4.5662)***
SAV	0.4279 (4.9249)***	0.76016 (2.3486)**	-0.0197 (-0.3859)
TOP	-0.9940 (-5.3616)***	-0.2617 (-1.9287)*	-0.1545 (-2.5931)**

Continued on the next page

plementarity of the bank-based and market-based financial development applies both in the short-run and in the long-run for the USA, the nature of the relationship between the two (complements/substitutes) for Brazil and Kenya has been established only in the long run. This is confirmed by the coefficient of [BFD\*MFD], which is: statistically significant and positive for the USA, both in the long run and in the short run; statistically significant and positive for Brazil, only in the long run; but insignificant

TABLE 3 *Continued from the previous page*

Regressors	Coefficient ( <i>t</i> -statistic)		
	USA ARDL(2,3,2,3,3,3,1)	Brazil ARDL(2,0,1,1,2,1,0)	Kenya ARDL(2,1,0,0,2,0,2)
<i>Panel B: Error Correction Representation for the Selected ARDL Model (dependent variable: DGDP)</i>			
DGDP (-1)	0.4480 (4.1936)***	0.0215 (0.1002)	0.8653 (1.9862)*
DGDP (-2)	–	–	–
DBFD	0.1673 (3.3092)***	-0.0111 (-1.7473)*	-0.0567 (-0.4115)
DBFD (-1)	0.1540 (2.9779)**	–	–
DBFD (-2)	0.0468 (0.9949)	–	–
DMFD	0.1062 (3.9421)***	-0.0729 (-1.0713)	0.2109 (1.8968)*
DMFD (-1)	0.0206 (0.9373)	–	–
D (BFD*MFD)	0.0014 (4.7340)***	0.2100 (1.3702)	-0.0270 (-1.2242)
D (BFD*MFD) (-1)	0.4652 (2.4113)**	–	–
D (BFD*MFD) (-2)	0.3145 (3.6702)***	–	–
DINV	0.5435 (1.7301)	0.4533 (1.8700)*	0.5265 (2.8710)***
DINV (-1)	0.7290 (2.0632)*	0.0037 (0.0082)	-0.4542 (-0.9036)
DINV (-2)	0.8731 (2.0528)*	–	–
DSAV	0.9509 (5.6223)***	0.3978 (2.4935)**	-0.0362 (-0.3678)
DSAV (-1)	0.8597 (5.2374)***	–	–
DSAV (-2)	0.5838 (4.5496)***	–	–
DTOP	-0.5165 (-3.1023)**	-0.60522 (-3.0551)***	-0.2557 (-2.3119)**
DTOP (-1)	–	–	-0.0269 (-0.3425)
ECM (-1)	-0.9664 (-5.4015)***	-0.7914 (-2.7665)**	-0.8377 (-3.0826)***
R-squared	0.9973	0.8031	0.6512
F-statistic	110.1610	20.0314	14.1872
Prob (F-statistic)	0.000	0.000	0.000
DW statistic	2.0230	1.9639	2.0252

NOTES \*\*\*, \*\*, and \* denote statistical significance at the 1%, 5% and 10% levels, respectively.

in the short run; and statistically significant and negative for Kenya, only in the long run, but insignificant in the short run.

The other results show that the relationship between economic growth and the remaining regressors differ significantly from country to country – and over time as well. Both in the short and long run, bank-based financial development is found to have a positive impact on economic



growth in the USA, a negative impact on economic growth in Brazil, and no impact at all in Kenya. Market-based financial development, on the other hand, is found to have a positive impact on economic growth, both in the short and in the long run, in the USA and Kenya; but it has no impact in Brazil. While investment was found to be negatively related to economic growth in the long run in the USA and Brazil; it was found to be positively associated with economic growth in these two countries in the short run: and in Kenya, both in the short run and in the long run. In the USA and Brazil, savings are positively associated with economic growth, both in the short and long run; but they are not consistently related with economic growth in Kenya. Trade openness was found to be consistently detrimental to economic growth in all the three countries. The coefficient of  $ECM(-1)$  was also found to be negative and statistically significant, as was expected in all the study countries.

Based on both the short-run and long-run results, bank-based and market-based financial development were found to complement each other in enhancing economic growth in middle and high-income countries (the USA and Brazil); but they were found to substitute each other in the low-income country (Kenya). Thus, the policy implication of these results is that for the USA and the Brazilian economies, it does not matter much where policy makers are directing their efforts – towards the banking sector or the stock market – because ultimately, the two complement each other in enhancing economic growth.

However, in Kenya, where policy-makers channel their efforts matters a lot; since the banking sector and the stock market substitute each other in the economic growth process. Furthermore, since it is market-based, rather than bank-based financial development, that drives economic growth in Kenya, it is recommended that the policy-makers in this economy channel their efforts towards developing the market-based segment of the financial sector – in an effort to boost economic growth.

On the diagnostic tests, the results displayed in table 4 show that the model passes all the diagnostic tests performed against serial correlation, functional form, normality and heteroscedasticity in all the study countries.

## **Conclusion**

This paper has tested whether bank-based financial development and market-based financial development are complements or substitutes in enhancing economic growth in the USA, Brazil and Kenya during the period from 1980 to 2012. Although a number of studies have been con-

TABLE 4 ARDL-VECM Diagnostic Tests

LM Test Statistic	USA	Brazil	Kenya
Serial Correlation: CHSQ(1)	0.6631 [0.416]	0.3814 [0.984]	0.0699 [0.792]
Functional Form: CHSQ(1)	0.7626 [0.383]	0.0413 [0.839]	0.8262 [0.363]
Normality: CHSQ(2)	2.1739 [0.337]	0.8117 [0.666]	0.4067 [0.816]
Heteroscedasticity: CHSQ(1)	0.0129 [0.910]	1.5794 [0.209]	0.2025 [0.653]

ducted on financial development and economic growth, the majority of these previous studies were mainly based on the causal relationship between financial development and economic growth. Very few studies have examined in any detail the relative impact of both bank-based and market-based financial development on economic growth.

Of these few studies that split financial development into bank-based and market-based financial development, only a handful tested whether these two components of the financial sector complement or substitute each other in enhancing economic growth. This study, therefore, has attempted to reduce this existing gap. In addition, the majority of the previous studies relied mainly on the residual-based co-integration test and the maximum-likelihood test to test for co-integration. However, it is now known that these techniques may not be appropriate when the sample size is too small.

Thus, unlike the majority of the previous studies, the current study uses the newly developed ARDL-Bounds-testing approach to test the complementarity/substitutability of bank- and market-based financial development in the economic growth process in the three study countries. The study has also employed the method of means-removed average to construct both bank-based and market-based financial development indices from a number of proxies, in order to cater for the shortfalls of using only one proxy to measure the level of development of each financial sector component. The results of this study show that, in the USA and Brazil, bank-based and market-based financial systems complement each other in enhancing economic growth; in Kenya, however, the two financial systems are found to be substitutes.

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