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Sheilla Nyasha[1] and Nicholas M. Odhiambo

Abstract

In this paper, we use the autoregressive distributed lag (ARDL) bounds testing approach to examine the dynamic impact of both bank-based financial development and market-based financial development on economic growth in the United States of America (USA) during the period 1980 to 2012. In order to adequately capture the depth and width of the USA's financial system, we used both bank-based and market-based financial development indices as proxies for bank-based and market-based financial systems. These indices were constructed from a number of bank- and market-based financial development indicators, using the method of means-removed average. Our empirical results reveal that both bank-based and market-based financial development have a positive impact on economic growth in the USA. These results apply irrespective of whether the regression analysis is conducted in the long run or in the short run.

1. Introduction

The debate on the relationship between financial development and economic growth has received considerable attention in recent years from numerous empirical studies in both developed and developing economies. The thrust of this debate has been whether financial sector development has a positive or a negative impact on economic growth. Although

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conventional wisdom has for a long time been in favour of the former, the empirical findings proving otherwise have been growing steadily in both number and substance.

Three groups of empirical work on the finance-growth nexus have emerged over the years. The first group consists of studies that support Schumpeter's (1911) notion that financial development has a positive impact on economic growth; and that it reflects the close relationship between financial development and economic growth. Studies that fall within this group include: Kargbo and Adamu (2009); Hassan *et al*. (2011); Levine and Zervos (1996), and Akinlo and Akinlo (2009). The second group is made up of studies that acknowledge the existence of a relationship between financial development and economic growth; but went further to state that this relationship is negative. Thus, according to this group of studies, financial development has a negative impact on economic growth. De Gregorio and Guidotti (1995), Adu *et al*. (2013), Ujunwa and Salami (2010), and Bernard and Austin (2011) are among the studies that fall within this group. Then, there is the third group that views financial development and economic growth as not related; and concludes that financial development has no impact on economic growth. Studies that anchor this group include those by Ram (1999) and Andersen and Tarp (2003).

Thus, whether financial development has an impact on economic growth – positive or negative – or not as postulated by the three groups of studies remains an issue for empirical investigation. Unfortunately, the majority of the previous studies on this topic have concentrated mainly on Asia and Latin America, affording the United States of America (USA) little coverage, even though it is one of the world's biggest economies.

Although the relationship between financial development and economic growth has received considerable attention for many years, most of the earlier studies have focussed primarily on

bank-based financial development proxies, giving market-based financial development little attention (see also Christopoulos and Tsionas 2004; Adu *et al*., 2013). Even where the latter studies have been done, the empirical findings have been largely inconclusive (Levine and Zervos, 1996; Ujunwa and Salami, 2010; Bernard and Austin, 2011). The evidence also suggests that the outcome is country- and time-variant. The outcome was also found to vary depending on the financial development proxy utilised; the model specified; and the estimation method used.

It is against this background that the current study attempts to empirically investigate the long- and short-run relative impact of bank and market-based financial development on economic growth in the USA. This study differs fundamentally from the majority of previous studies on the subject in several ways. First, it splits financial development into bank-based and market-based components and examines the relative impact of each component on economic growth. Second, unlike the majority of previous studies that used one or a few indicators of bank-based financial development, which might not sufficiently capture the breadth and depth of a financial sector, this study constructs bank- and market-based financial development indices from a number of bank- and market-based financial development indicators to ensure a holistic picture of the relationship between financial development and economic growth in the study country is captured.

Third, this study employs the newly developed autoregressive distributed lag (ARDL) bounds testing approach that is appropriate even when the sample size is too small – unlike the commonly used residual-based cointegration test associated with Engle and Granger (1987), or the maximum likelihood test based on Johansen (1988) and Johansen and Juselius (1990) (see Odhiambo, 2008). Finally, this study employs time-series data and econometric techniques, unlike most of the previous studies that over-relied on cross-sectional data, which may not have

satisfactorily addressed country-specific issues (Casselli *et al*., 1996; Ghirmay, 2004; Odhiambo, 2009). The findings of this study will not only contribute to the settlement of the still on-going finance-growth nexus debate, but could also provide policy guidance on finance-growth matters in the USA.

The rest of the paper is organised as follows: Section 2 gives an overview of the financial systems in the USA. Section 3 reviews literature on bank- and market-based financial development and economic growth. Section 4 covers the methodology of the study; while Section 5 presents and discusses the empirical results. Section 6 concludes.

2. An Overview of the Financial Systems in the USA

By any standard, modern or otherwise, the USA has one of the most highly developed financial systems in the world, which ranks very high in terms of the development and sophistication of its financial intermediaries and markets − as well as the size, depth and access available to its financial services. As a result, 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). Like any other financial system, the USA's financial system consists of two segments − the bank-based segment as well as the market-based segment − which are both highly developed. However, the securities markets share centre stage with banks in propelling economic growth, hence the USA's financial system is referred to as a "market-based financial system" (Demirguc-Kunt and Levine, 2001).

The financial system in the USA is unique in many respects. Unlike most financial systems whose apex position is occupied by a single central bank, the USA's financial system's apex is occupied by the Federal Reserve System, often known as the Federal Reserve or just "the Fed". The Federal Reserve System consists of the regional reserve banks and the Fed that controls

and coordinates operations of the regional reserve banks (Federal Reserve Bank of New York, 2012). Among its responsibilities, the Fed is responsible for supervising and regulating banks and other important financial institutions to ensure the safety and soundness of the nation's banking and financial system and to protect the credit rights of consumers. It is also responsible for monetary policy related matters and the maintenance and stability of the financial system (Federal Reserve Bank, 2012).

The uniqueness of the USA financial system can also be explained in terms of the complexity and unevenness of its financial institutions' regulatory structure as well as legal framework governing payment activity. While most countries have only one bank regulator, the USA's banking system is regulated at both federal and state levels (Bank of International Settlement, 2003). Furthermore, unlike most countries where only a few banks dominate the market, in the USA there are over 6000 commercial banks, 1500 savings and loan associations, 400 mutual savings banks, and 10,000 credit unions (Federal Deposit Insurance Corporation, 2012).

From the market-based segment front, it can be observed that there are a number of stock exchanges in the USA. The biggest one is the NYSE Euronext; followed by the NASDAQ OMX; then followed by the Chicago Stock Exchange (CHX) (World Stock Exchanges, 2015). According to Sylla (1998), the precocity of USA banking development was duplicated in the development of the stock market. Sylla (1998) further points out that even a securities' market crash in early 1792 could not for long arrest the rapid deepening of these markets. This leap in asset liquidity allowed both domestic and foreign investors to overcome their reluctance to hold USA securities. Thus, for the USA, capital market globalisation arrived early in the nation's history, long before the more celebrated capital market globalisations of the late 19th and late 20th Centuries (Sylla, 1998).
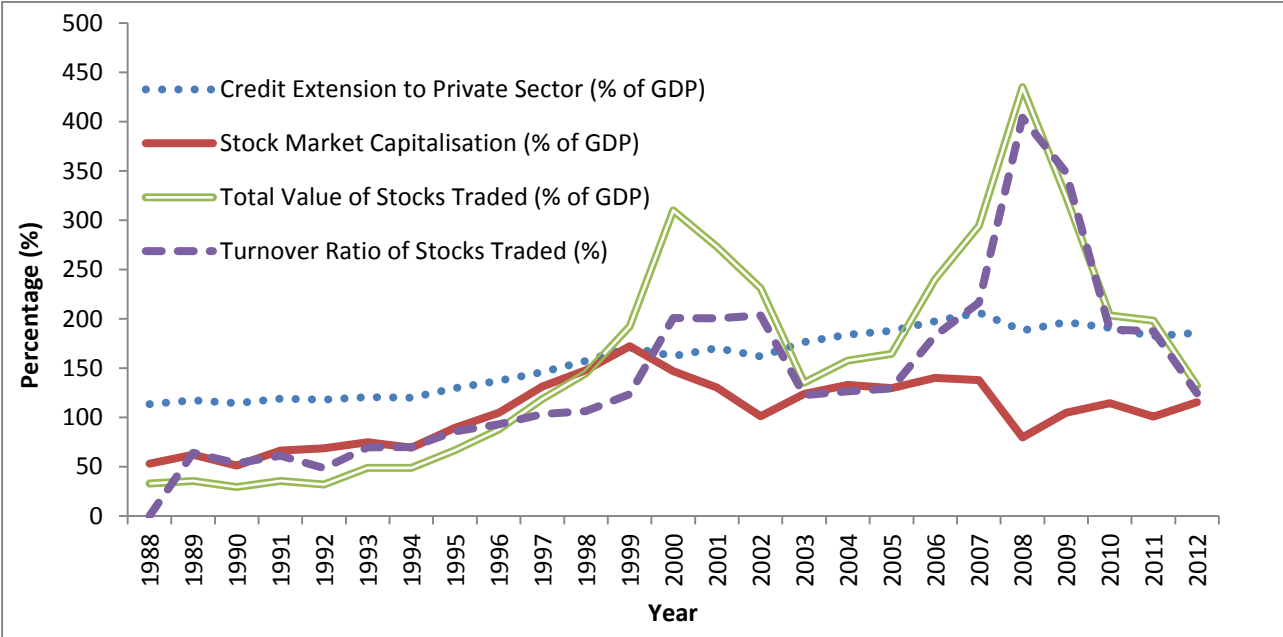
In order to curb the repeat occurrences of the stock market crushes and the financial crises; as well as to keep pace with the global demand for modernisation, the USA embarked on a chain of financial sector reforms, targeting both the banking institutions and the financial markets. These reforms included, but were not limited to: modernisation of the financial system – both in terms of clearing and settlement of transactions by banks and stock market trading systems; reducing financial repression; improving the legal, regulatory, judiciary and supervisory environments; rehabilitating the financial infrastructure; and restoring bank soundness.

To date, the landmark reform in the history of the USA's financial system is the Dodd–Frank Wall Street Reform and Consumer Protection Act (Pub.L. 111-203, H.R. 4173) (DFWSRCP Act) of 2010 that was passed in response to the recession of the late 2000s (United States Government Printing Office, 2012). It brought the most significant changes to financial regulation in the USA since the post-Great Depression regulatory reform. This legislative piece made changes in the American financial regulatory environment that affect all federal financial regulatory agencies and almost every part of the nation's financial services industry, including the stock market.

Over time, these reforms have given rise to a developed and well-regulated financial system in the USA. In the banking sector, this growth is evidenced by an increases in the number of Automated Teller Machines (ATMs) from 352,000 ATMs in 2002 to 396,000 in 2005, to 425,010 in 2008; and slightly down to 403,000 in 2009 (United States Department of State, 2012). Credit extension to the private sector has also grown from an average of 120% of GDP between 1975 and 1981 to 150% in the late 1980s. Historically, between 1975 and 2012, private sector lending reached an all-time low, of 115.2% in 1981; and an all-time high of over 200% in 2007 (World Bank, 2015). Likewise, the reform processes also gave rise to an increase in stock market capitalisation, total value of stocks traded and turnover ratio, despite a fall in

the number of listed companies from 7524 in 2000 to 4171 in 2011; and further down to 4102 in 2012 (World Bank, 2015). Figure 1 tracks the performance and growth of the USA's banking sector (as shown by credit extension to the private sector) and the stock market (based on stock market capitalisation, total value of stocks traded and turnover ratio of stocks traded) during the period 1988-2012.

Figure 1: Trends in Banking Sector and Stock Market Growth in the USA (1988-2012)

Source: World Bank Indicators (2015)

3. Literature Review

The relationship between bank-based financial development and economic growth has recently received emphasis from numerous empirical studies globally. However, of late, the lime light has been gradually shifting to a specific focus on market-based financial development and economic growth. In either case, the existing empirical work has documented largely mixed and inconclusive findings.

The empirical literature on the impact of bank-based financial development and economic growth, on the one hand; and that of market-based financial development and economic

growth, on the other hand, can be classified conveniently into three groups. The first group argues that bank- and market-based financial development is positively related to, and has a positive impact on, economic growth. The second group contends that financial development – both bank- and market-based – and economic growth are negatively related. It is this group that concludes that both bank- and market-based financial development have a negative impact on economic growth. The third group, however, claims that bank- and market-based financial development are not related to, and have no impact on, economic growth.

The empirical work consistent with the first group of studies – that argue that bank-based financial development and market-based financial development impact positively on economic growth include studies such as: Kargbo and Adamu (2009); Hassan *et al*. (2011); Adu *et al*. (2013); Levine and Zervos (1996); Adjasi and Biekpe (2006); and Akinlo and Akinlo (2009).

Kargbo and Adamu (2009) examined the relationship between financial development and economic growth in Sierra Leone for the period 1970-2008. Using the ARDL approach, the results showed that financial development exerts a statistically significant positive effect on economic growth. In the same vein, Hassan *et al*. (2011) examined the role of financial development on economic growth in low- and middle-income countries, using both panel regressions and variance decompositions. The results showed a positive relationship between financial development and economic growth. Two years later, Adu *et al*. (2013) investigated the long-run growth effects of financial development in Ghana and found that the effect of financial development on economic growth is sensitive to the choice of proxy used. When credit to the private sector as a ratio to GDP and total domestic credit are used as proxies of financial development; a positive association between financial development and economic growth was established.

From the market-based financial development front, Levine and Zervos (1996) examined whether there is a strong empirical association between stock market development and long-run economic growth in 41 countries, using turnover ratio, total value of stocks traded and stock market capitalisation as proxies of stock market development. The results suggested that stock market development is positively and robustly associated with long-run economic growth. Adjasi and Biekpe (2006) studied the impact of stock market development on economic growth in 14 African countries in a dynamic panel data modelling setting. The results largely showed a positive relationship between stock market development and economic growth. Similarly, Akinlo and Akinlo (2009) examined the long-run relationship between stock market development and economic growth in seven sub-Saharan African countries using the ARDL bounds test. The results show that stock market development has a significant positive long-run impact on economic growth.

Contrary to the above, there are a number of studies that fall in the second category; and that contend that bank-based financial development and market-based financial development have a negative impact on economic growth. These studies include those by De Gregorio and Guidotti (1995); Adu *et al*. (2013); Ujunwa and Salami (2010); and Bernard and Austin (2011).

Using the ratio of bank credit to private sector as a measure of bank-based financial development, De Gregorio and Guidotti (1995) examined the empirical relationship between economic growth and financial development in a large cross-country sample. Although on overall they found that bank-based financial development is positively related to economic growth; its impact was found to be negative in a panel data for Latin America. Likewise, Adu *et al*. (2013), in their study on the long-run growth effects of financial development in Ghana, found the relationship between financial development and economic growth to be negative when broad money stock to GDP ratio was used as a measure of financial development.

From the market-based financial development angle, there is also empirical evidence of the negative impact of market-based financial development on economic growth. Such empirical evidence includes that put forward by Ujunwa and Salami (2010) and Bernard and Austin (2011). When the former examined the impact of stock market development on long-run economic growth in Nigeria, they found evidence of negative association between stock market development and economic growth when stock market liquidity was used as a proxy of stock market development. In the same vein, Bernard and Austin (2011) found a negative association between stock market development and economic growth in Nigeria, using stock market capitalisation and total value traded as proxies of stock market development.

Despite the overwhelming arguments in favour of the positive or the negative impact of financial development on economic growth, there is still the third group of studies that found that financial development does not have any impact on economic growth. Studies, whose results are consistent with this group include Ram (1999) and Andersen and Tarp (2003). Ram (1999) found that financial development does not promote economic growth. Based on his 95-country study, the predominant pattern was that of a negligible or weakly negative association between financial development and economic growth. Andersen and Tarp (2003) also found a weak association between financial development and economic growth in their 74-country study. Table 1 summarises the empirical studies on the impact of financial development on economic growth. Panel 1 indicates studies on bank-based financial development and economic growth while Panel 2 shows studies on market-based financial development and economic growth.

Table 1: Studies Showing the Nature of Impact of Bank- and Market-Based Financial Development on Economic Growth

Author(s)	Region/Country	Methodology	Nature of Impact
Panel 1: Bank-Based Financial Development and Economic Growth			
De Gregorio and Guidotti, 1995	A large number of countries	- Cross-sectional data analysis	Positive impact (in a large cross-country sample)
Odedokun, 1996	LDCs - 71 developing countries	- Ordinary Least Squares (OLS) techniques - Generalized Least Squares (GLS) technique	Positive impact (in 85% of the 71 countries)
Ahmed and Ansari, 1998	India, Pakistan and Sri Lanka	- Pooled data based on time-series and cross- sectional observations	Positive impact
Allen and Ndikumana, 2000	8 Southern Africa – Botswana, Lesotho, Mauritius, Malawi, Swaziland, South Africa, Zambia and Zimbabwe	- Cross-sectional data analysis	Positive impact
Güryay *et al*., 2007	Northern Cyprus	- Time-series - Ordinary Least Squares techniques	Positive impact (though negligible)
Kargbo and Adamu, 2009	Sierra Leone	- Time-series - ARDL approach	Positive impact
Hassan *et al*., 2011	Low- and middle-income countries	- Panel regressions - Variance decompositions	Positive impact
Adu *et al*., 2013	Ghana	- Time-series - ARDL approach	Positive impact (when credit to the private sector as ratio to GDP and total domestic credit are used as proxies of financial development)
De Gregorio and Guidotti, 1995	A large number of countries	- Cross-sectional data	Negative impact (in Latin America)
Odedokun, 1996	LDCs - 71 developing countries	- OLS techniques - Generalized Least Squares (GLS) technique	Negative impact (in 15% of the 71 countries)
Adu *et al*., 2013	Ghana	- Time-series - ARDL approach	Negative impact (when broad money

Author(s)	Region/Country	Methodology	Nature of Impact
			stock to GDP ratio is used as proxies of financial development)
Ram, 1999	95 countries	- Individual/country group time-series	No impact
Andersen and Tarp, 2003	74 countries	- Cross-section	No impact

Panel 2: Market-Based Financial Development and Economic Growth

Author(s)	Region/Country	Methodology	Nature of Impact
Levine and Zervos, 1996	41 countries	- Cross-country regressions	Positive impact
Caporale *et al.,* 2003	Four developing countries (Chile, Korea, Malaysia and the Philippines)	- Quarterly time-series - non-causality trivariate test	Positive impact
Bekaert *et al.* 2005	A large number of countries	- Panel data analysis	Positive impact
Adjasi and Biekpe, 2006	14 African countries	- Dynamic panel data modelling	Positive impact
Nurudeen, 2009	Nigeria	- Time-series - Error-correction approach	Positive impact
Akinlo and Akinlo, 2009	Seven countries in sub-Saharan Africa	- ARDL bounds test	Positive impact
Ujunwa and Salami, 2010	Nigeria	- Time-series - Ordinary Least Squares techniques	Positive impact (when stock market development is proxied by stock market size and turnover ratios)
Bernard and Austin, 2011	Nigeria	- Time-series - Ordinary Least Squares techniques	Positive impact (when stock market development is proxied by turnover ratio)
Ujunwa and Salami, 2010	Nigeria	- Time-series - Ordinary Least Squares techniques	Negative impact (when stock market development is proxied by total value of shares traded)

Author(s)	Region/Country	Methodology	Nature of Impact
Bernard and Austin, 2011	Nigeria	- Time-series - Ordinary Least Squares techniques	Negative impact (when stock market development is proxied by market capitalization and value traded ratios)

4. Estimation Techniques and Empirical Analysis

4.1 ARDL Bounds Testing Approach

This study adopts the recently developed autoregressive distributed lag (ARDL) bounds testing approach to examine both the long-run and the short-run relationship between bank- and market-based financial development and economic growth. The choice of this test is based on a number of advantages it has over other conventional cointegration tests – such as the residual-based approach by Engle and Granger (1987); and the full maximum likelihood test proposed by Johansen (1988) and Johansen and Juselius (1990). First, the ARDL-bounds testing approach does not impose the restrictive assumption that all the variables under study must be integrated of the same order. Thus, the ARDL approach can be applied to test the existence of a relationship between variables irrespective of whether the regressors are integrated of the same order or not; as long as they are integrated of order not more than one. Second, the ARDL technique normally provides unbiased estimates of the long-run model and valid t-statistics even when some of the regressors are endogenous (Odhiambo, 2008). Third, the ARDL method employs only a single reduced-form equation, unlike the conventional cointegration methods that estimate the long-run relationships within a context of a system of equations (see also Duasa, 2007). Fourth, the ARDL test has superior small sample properties, when compared to the other conventional methods of testing cointegration (Pesaran and Shin, 1999). While other cointegration techniques are sensitive to the size of the sample, the ARDL test is appropriate even when the sample size is small. Because of these reasons, the ARDL approach is, therefore,

considered to be very suitable for analysing the underlying relationship. The method has also been increasingly used in empirical research of late.

4.2 Specification of the Empirical Model

The ARDL-based empirical model used in this study to test the impact of bank-based and market-based financial development on economic growth is expressed as follows:

$$\Delta y_t = \gamma_0 + \sum_{i=1}^{n} \gamma_{1i}\Delta y_{t-i} + \sum_{i=0}^{n} \gamma_{2i}\Delta FDB_{t-i} + \sum_{i=0}^{n} \gamma_{3i}\Delta FDM_{t-i} + \sum_{i=0}^{n} \gamma_{4i}\Delta INV_{t-i}$$

$$+ \sum_{i=0}^{n} \gamma_{5i}\Delta SAV_{t-i} + \sum_{i=0}^{n} \gamma_{6i}\Delta TOP_{t-i} + \theta_1 y_{t-1} + \theta_2 FDB_{t-1} + \theta_3 FDM_{t-1}$$

$$+ \theta_4 INV_{t-1} + \theta_5 SAV_{t-1} + \theta_6 TOP_{t-1} + \mu_{1t} \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots (1)$$

Where:

y = Growth rate of real gross domestic product – a proxy for economic growth;

FDB = An index of bank-based financial development; which is a means-removed average of M2, M3 and credit provided to the private sector by financial intermediaries – a proxy for bank-based financial development (see also Demirguc-Kunt and Levine, 1996);

FDM = 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);

INV = Gross fixed capital formation as a percentage of GDP;

SAV = Gross savings as a percentage of GDP;

TOP = Trade openness, which is the sum of the share of total imports in GDP and the share of total exports in GDP;

γ_0 = constant;

γ_1- γ_6; θ_1- θ_6 = respective regression coefficients;

Δ　　　= difference operator;

n　　　= lag length; and

μ_t　　　= white noise-error term

To calculate a conglomerate index of market-based financial development (FDM), the means-removed values of the three indicators of market-based financial development are averaged, in a two-step procedure. First, the means-removed values − of stock market capitalisation ratio, calculated as the value of listed shares divided by GDP (CAP); the total value of stocks traded as a ratio of GDP, calculated as total shares traded on the stock market exchange divided by GDP (TV); and turnover ratio (TOR) which is equal to the value of total shares traded divided by market capitalisation − 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 CAP, TV and TOR is taken to obtain an overall index of market-based financial development (FDM). The same computations are applied to obtain FDB.

Following the ARDL model specified in equations (1) the ARDL-based error-correction model is specified as follows:

$$\Delta y_t = \gamma_0 + \sum_{i=1}^{n} \gamma_{1i} \Delta y_{t-i} + \sum_{i=0}^{n} \gamma_{2i} \Delta FDB_{t-i} + \sum_{i=0}^{n} \gamma_{3i} \Delta FDM_{t-i} + \sum_{i=0}^{n} \gamma_{4i} \Delta INV_{t-i}$$
$$+ \sum_{i=0}^{n} \gamma_{5i} \Delta SAV_{t-i} + \sum_{i=0}^{n} \gamma_{6i} \Delta TOP_{t-i} + \xi_1 ECM_{t-1} + \mu_t \ \dots \dots \dots \dots (2)$$

5.2 Sources of Data

The annual time series data, covering the period from 1980 to 2012, utilised in this study were obtained from the World Bank Economic Indicators and International Financial Statistics Year Books (IFS, various issues).

5. Empirical Results

5.1 Unit Root Tests

Before any analysis is made, the variables are first tested for stationarity, using Dickey-Fuller Generalised Least Square (DF-GLS), Phillips-Perron (PP) and Perron (1997) (PPURoot) unit root tests. The PPURoot test was employed to cater for possible structural breaks within the dataset. The detailed results of stationarity tests for all the variables are presented in Table 2.

Table 2: Stationarity Tests for all Variables

Dickey-Fuller Generalised Least Square (DF-GLS)

Variable	Stationarity of all Variables in Levels		Stationarity of all variables in First Difference	
	Without Trend	With Trend	Without Trend	With Trend
y	-3.401***	-3.937***	–	–
FDB	0.024	-2.641	-2.772***	-7.684***
FDM	-1.244	-2.927*	-4.219***	–
INV	-2.415**	-2.980*	–	–
SAV	-1.018	-2.563	-4.453***	-5.020***
TOP	0.153	-2.854	-6.009***	-6.667***

Phillips-Perron (PP)

Variable	Stationarity of all Variables in Levels		Stationarity of all variables in First Difference	
	Without Trend	With Trend	Without Trend	With Trend
y	-4.022***	-4.281***	–	–
FDB	-0.588	-2.359	-7.627***	-7.502***
FDM	-1.593	-2.255	-4.044***	-4.032**
INV	-0.900	-1.201	-3.475**	-3.303**
SAV	-1.440	-2.055	-5.197***	-5.097***
TOP	1.225	-3.045	-6.557***	-7.580***

Perron, 1997 (PPURoot)

Variable	Stationarity of all Variables in Levels		Stationarity of all variables in First Difference	
	Without Trend	With Trend	Without Trend	With Trend
y	-4.665	-4.870	-7.412***	-8.934***
FDB	-3.683	-3.804	-9.127***	-8.969***
FDM	-2.404	-3.780	-5.345**	-5.936**
INV	-4.468	-4.150	-5.271**	-5.682**
SAV	-3.684	-3.664	-6.752***	-6.742***
TOP	-4.075	-4.436	-6.493***	-6.476***

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

Overall, the results reported in Table 2 show that no variable is conclusively stationary in levels. The stationarity of the variables is mixed, depending on the stationarity testing method used and whether a trend has been included or not. However, after differencing the variables once, all the variables were confirmed stationary.

Although the ARDL does not require pre-testing of variables, the stationarity test provides guidance as to whether ARDL is appropriate or not, as it is only applicable for the analysis of variables that are integrated of order zero or one. In this case, the variables are found to be integrated of either order 0 [I(0)] or 1 [I(1)], therefore, ARDL bounds testing technique can be performed.

5.2 Bounds F-Test for Cointegration

This section examines the long-run relationship between the variables in the specified model using the ARDL bounds-testing approach. The first phase is to get the order of lags on the first differenced variables in equations (1) using either the Schwartz Bayesian Criterion or the Akaike Information Criterion. This is followed by the second phase, which is the application of a bounds F-test to equation (1) to establish the existence of a long-run relationship, if any, between the variables under study. The results of the bounds F-test are reported in Table 3.

Table 3: Bounds F-Test for Cointegration

Dependent Variable	Function		F-statistic		Cointegration Status	
y	F(y|FDB, FDM, INV, SAV,TOP)		5.486***		Cointegrated	
Asymptotic Critical Values						
Pesaran *et al.* (2001), p.300, Table CI(iii) Case III	1%		5%		10%	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
	3.41	4.68	2.62	3.79	2.26	3.35

Note: *** denotes statistical significance at 1% level

The results of the ARDL bounds test for cointegration reported in Table 3 show that the calculated F-statistic of 5.486 is higher than the critical values reported by Pesaran *et al.* (2001)

in Table CI(iii) Case III. Based on these results, it can therefore be concluded that the variables in the specified model are cointegrated.

5.3 Estimated ARDL Model

Having found that y, FDB, FDM, INV, SAV and TOP are cointegrated, the ARDL technique is employed in the estimation of the model. The first stage in this process is the determination of the optimal lag-length for the specified model using the Akaike information criterion (AIC) or the Bayesian information criterion (BIC). The optimal lag-length selected based on BIC is ARDL(1,0,0,1,0,1). The BIC-based model was chosen because it was more parsimonious than the AIC-based model. The long-run and short-run results of the selected model are reported in Table 4 Panel 1 and Panel 2, respectively.

Table 4: Empirical Results of the Estimated ARDL Model

Panel 1: Estimated long-run coefficients [Dependent variable: real GDP growth rate (y)]			
Regressor	Co-efficient (t-statistic)		
C	10.51** (2.44)		
FDB	0.08* (1.96)		
FDM	0.01** (2.36)		
INV	-0.37 (-1.51)		
SAV	0.31* (1.73)		
TOP	-0.65** (-3.95)		
Panel 2: Estimated short-run coefficients [Dependent variable: real GDP growth rate (Δy)]			
ΔFDB	0.10* (1.97)		
ΔFDM	0.02** (2.37)		
ΔINV	0.79*** (3.94)		
ΔSAV	0.37* (1.75)		
ΔTOP	-0.16 (-1.00)		
Ecm (-1)	-0.58*** (-4.85)		
R-Squared	0.888	R-Bar-Squared	0.847
SE of Regression	0.938	F-Stat F(6,24)	28.989[0.000]
Residual Sum of Squares	19.339	DW statistic	2.174
Akaike Info. Criterion	-45.673	Schwarz Bayesian Criterion	-52.126

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

The regression results reported in Table 4 show that the coefficient of bank-based financial development is positive and statistically significant, as expected. This implies that in the USA, bank-based financial development has a positive impact on economic growth. Thus, an increase in the level of bank-based financial development in the USA leads to an increase in economic growth. These results apply both in the long run and in the short run. The long-run positive impact is supported by the coefficient of bank-based financial development in Panel 1, that is positive and statistically significant, while the short-run economic impact of bank-based financial development on economic growth is shown by the coefficient of bank-based financial development in Panel 2, that is also positive and statistically significant.

The results displayed in the same table further show that the coefficient of market-based financial development (FDM) is positive and statistically significant, as also expected. This indicates that, market-based financial development has a positive impact on economic growth in the USA. These results apply irrespective of whether the model is estimated in the long run or in the short run. The long-run positive impact is evidenced by the coefficient of market-based financial development in Panel 1, that is positive and statistically significant, while the short-run economic impact of market-based financial development is supported by the coefficient of market-based financial development in Panel 2, that is also positive and statistically significant.

Other results show that the coefficient of investment is positive and statistically significant as expected, suggesting that investment impacts positively on economic growth, but only in the short run. In the long run, the coefficient of investment is statistically insignificant. The coefficient of savings ratio is positive and statistically significant as expected, both in the long run and in the short run. Thus in the USA, an increase in the savings ratio leads to an increase in economic growth. The other results, however, show that while the coefficient of trade

openness is statistically insignificant in the short run, it is negative and statistically significant in the long run. These findings, though contrary to the expectations of the current study, are consistent with the results obtained in some of the previous studies (see Odedokun, 1996; Güryay *et al.*, 2007). The coefficient of ECM (-1) is also found to be negative and statistically significant, as expected.

The regression for the underlying ARDL model fits well, as indicated by an R-squared of 88.8%. On a battery of tests performed for serial correlation, functional form, normality and heteroscedasticity, the results displayed in Table 5 show that the model passed all tests except normality. However, an inspection of the Cumulative Sum of Recursive Residuals (CUSUM) and the Cumulative Sum of Squares of Recursive Residuals (CUSUMSQ) graphs in Figures 2 and 3 shows that there is stability and that there is no systematic change identified in the coefficients at 5% significance level over the study period. Thus, the CUSUM and CUSUMSQ graphs show that the parameters in this model are stable over the sample period.

Table 5: Diagnostic Tests

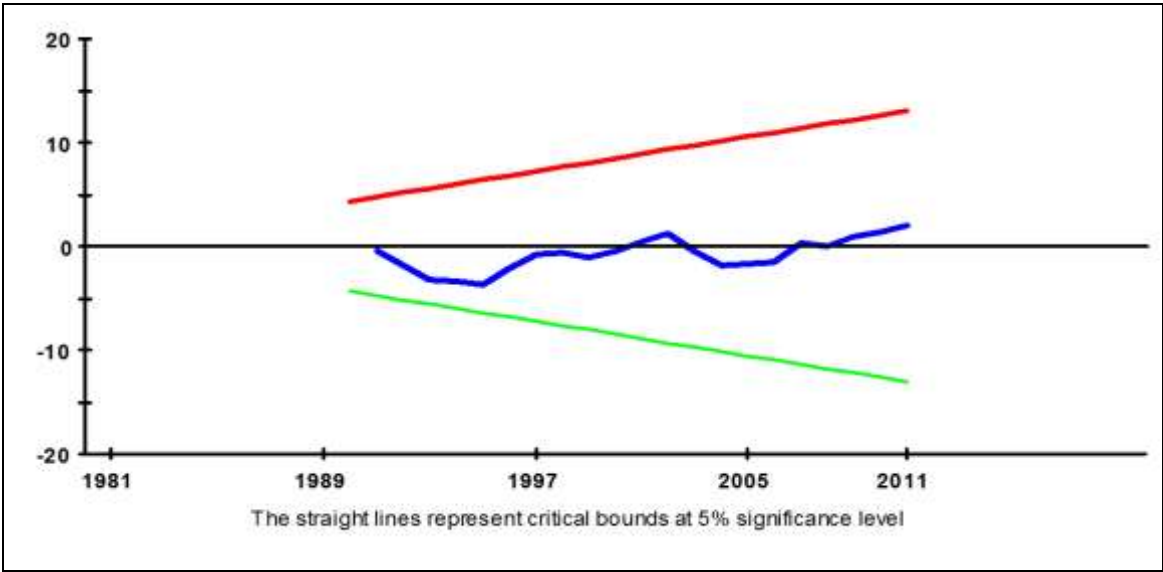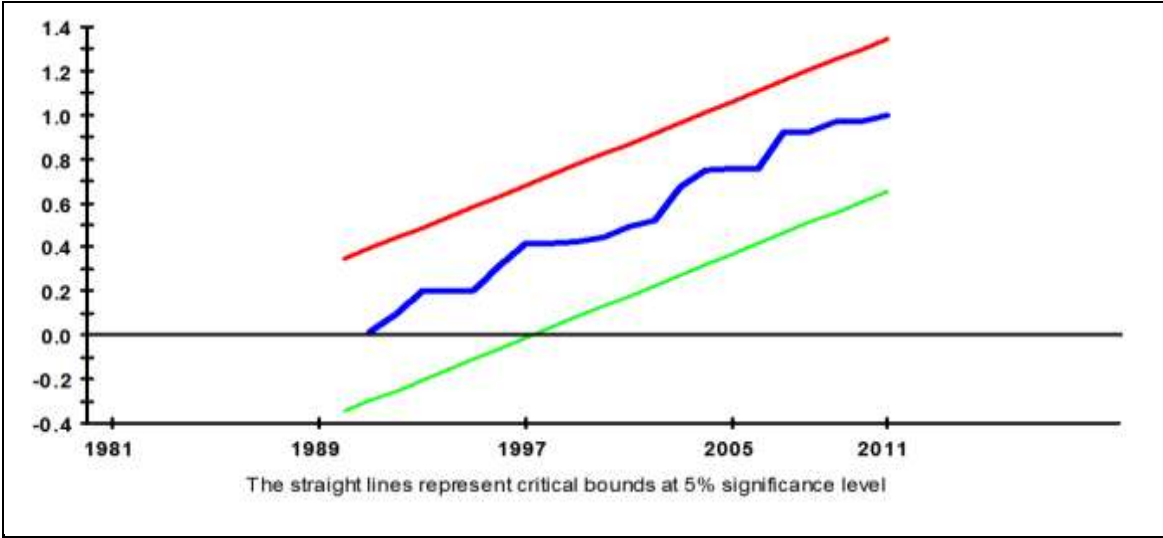| LM Test Statistic	Results [Probability]
Heteroscedasticity: CHSQ (1)	1.812[0.178]
Normality: CHSQ (2)	4.654[0.098]
Functional Form: CHSQ(1)	0.256[0.613]
Serial Correlation: CHSQ(1	0.663[0.416]

Figure 2: Plot of Cumulative Sum of Recursive Residuals

The straight lines represent critical bounds at 5% significance level

Figure 3: Plot of Cumulative Sum of Squares of Recursive Residuals

The straight lines represent critical bounds at 5% significance level

6. Conclusion

In this article, the relative impact of bank- and market-based financial development on economic growth in the USA has been explored during the period from 1980 to 2012. To date, the USA has a highly developed financial sector which ranks very high in terms of the development and sophistication of its bank- and market-based segments; as well as the size, depth and access available to its financial services. Although a number of studies have been done in an attempt to solve the finance-growth puzzle, many of these studies concentrated on

bank-based proxies of financial development and ignored market-based proxies. Studies that explicitly explored the dynamic impact of financial development, proxied by market-based proxies of financial development, on economic growth are scant. This also applies to the studies that have explored the link between economic growth and financial development, proxied by both bank-based and market-based proxies of financial development. Even where such studies have been done, the empirical findings have been largely inconclusive; and only a handful of these studies have been on the USA in particular. In addition, the current study uses the newly developed ARDL bounds testing technique to examine this relationship. This technique is known to have best small sample size properties and has been increasingly used in recent years. Moreover, the study utilises the method of means-removed average to construct both bank- and market-based financial development indices. The empirical results of this study show that in the USA there is a positive 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 – irrespective of whether the regression analysis is conducted in the long run, or in the short run. These results imply that in the USA, it is important to concentrate more on pro-financial development policies, which focus on both bank- and market-based financial development as the development of both the bank- and the market-based segments of the USA's financial sector have been found to impact positively on the country's real sector.

References

Adjasi, CKD. and Biekpe, NB. 2006. Stock market development and economic growth: The case of selected African countries. *African Development Review,* 18(1), 144-161.

Adu, G., Marbuah, G. and Mensah, JT. 2013. Financial development and economic growth in Ghana: Does the measure of financial development matter? *Review of Development Finance*, 3, 192-203.

Ahmed, SM. and Ansari, MI. 1998. Financial sector development and economic growth: The South-Asian experience. *Journal of Asian Economics*, 9(3), 503-517.

Akinlo, AE. and Akinlo, OO. 2009. Stock market development and economic growth: Evidence from seven sub-Sahara African countries. *Journal of Economics and Business*, 61(2), 162-171.

Allen, DS. and Ndikumana, L. 2000. Financial intermediation and economic growth in Southern Africa. *Journal of African Economies*, 9(2), 132-160.

Andersen, TB. and Tarp, F. 2003. Financial liberalization, financial development and economic growth. *Journal of International Development,* 15, 189-209.

Bank of International Settlement. 2003. Payment systems in the United States. Committee on Payment and Settlement Systems Red Book.

Bekaert, G. Harvey, C. and Lundblad, C. 2005. Does financial liberalization spur growth? *Journal of Financial Economics,* 77, 3-55.

Bernard, AU. and Austin, A. 2011. The role of stock market development on economic growth in Nigeria: A time-series analysis. *African Research Review*, 5 (6), 213-230.

Caporale, GM., Howells, PGA. and Soliman, AM. 2003. Stock market development and economic growth: The causal linkage. *Journal of Economic Development*, 29(1), 33-50.

Casselli, F., Esquivel, G. and Lefort, F. 1996. Reopening the convergence debate: A new look at cross-country growth empirics. *Journal of Economic Growth* 1 (3).

Christopoulos, DK. And Tsionas, EG. 2004. Financial development and economic growth: evidence from panel root and cointegration tests. *Journal of Development Economics*, 73, 55-74.

De Gregorio, J. and Guidotti, PE. 1995. Financial development and economic growth. *World Development*, 23(3), 433–448.

Demirguc-Kunt, A. and Levine, R. 1996. Stock market development and financial intermediaries: Stylized facts. *World Bank Economic Review*, 10(2), 291-321.

Demirguc-Kunt, A. and Levine, R. 2001. Bank-based and market-based financial systems: Cross-country comparisons. In: Demirguc-Kunt, A. and Levine, R. (Eds.) *Financial Structure and Economic Growth: A Cross- Country Comparison of Banks, Markets, and Development*. MIT Press, Cambridge, MA, 81-140.

Duasa, J. 2007. Determinants of Malaysian trade balance: An ARDL bounds testing approach. *Journal of Economic Cooperation*, 28(3), 21-40.

Engle, RF. and Granger, CJ. 1987. Cointegration and Error-correction - Representation, Estimation and Testing. *Econometrica,* 55 (2), 251-278.

Federal Deposit Insurance Corporation. 2012. Various issues. [Online] Available from <http://www.fdic.gov/> [Accessed 05 November 2012].

Federal Reserve Bank. 2012. Various issues. [Online] Available from <http://www.federalreserve.gov> [Accessed 05 November 2012].

Federal Reserve Bank of New York. 2012. The founding of the Fed. [Online] Available from <http://www.newyorkfed.org/aboutthefed/history_article.html > [Accessed 05 November 2012].

Ghirmay, T. 2004. Financial development and economic growth in sub-Saharan African countries: Evidence from time series analysis. *African Development Review*, 16 (3), 15–432.

Güryay, E., Şafakli, OV. and Tüzel, B. 2007. Financial development and economic growth: Evidence from Northern Cyprus. *International Research Journal of Finance and Economics*, 8, 57-62.

Hassan, KM., Sanchez, B. and Yu, J. 2011. Financial development and economic growth: New evidence from panel data. *The Quarterly Review of Economics and Finance*, 51, 88-104.

Johansen, S. 1988. Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control,* 12, 231-254.

Johansen, S. and Juselius, K. 1990. Maximum likelihood estimation and inference on cointegration with applications to the demand for money. *Oxford Bulletin of Economics and Statistics*, 52,169-210.

Kargbo, SM.and Adamu, PA. 2009. Financial development and economic growth in Sierra Leone. *West African Journal of Monetary and Economic Integration*, 9(2), 30-61.

Levine, R. and Zervos, S. 1996. Stock market development and long run growth. *World Bank Economic Review*, 10(2), 323–340.

Nurudeen, A. 2009. Does stock market development raise economic growth? Evidence from Nigeria. *The Review of Finance and Banking*, 1(1), 15-26.

Odedokun, MO. 1996. Alternative econometric approaches for analysing the role of the financial sector in economic growth: Time-series evidence from LDCs. *Journal of Development Economics,* 50(1), 119-146.

Odhiambo, NM. 2008. Financial depth, savings and economic growth in Kenya: A dynamic causal linkage. *Economic Modelling*, 25, 704–713.

Odhiambo, NM. 2009. Finance-growth nexus and inflation dynamics in Kenya: An empirical investigation. *Savings and Development*, 33(1), 7-25.

Perron, P. 1997. Further evidence on breaking trend functions in macroeconomic variables. *Journal of Econometrics*, 80 (2), 355-385.

Pesaran, MH. and Shin, Y. 1999. An autoregressive distributed lag modelling approach to cointegration analysis, in *Econometrics and Economic Theory in the 20th Century*: The Ragnar Frisch Centennial Symposium, eds. Storm, S., Cambridge University Press, Chapter 11, pp.1-31.

Pesaran, MH., Shin, Y. and Smith, R. 2001. Bound Testing Approaches to the Analysis of Level Relationship. *Journal of Applied Econometrics*, 16, 174-189.

Ram, R. 1999. Financial development and economic growth: Additional evidence. *Journal of Development Studies*, 35(4), 164-174.

Schumpeter, JA. 1911. The *Theory of Economic Development*, *An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle.* Cambridge MA, Harvard University Press Stern, 1989

Sylla, R. 1998. USA securities markets and the banking system, 1790-1840, *Federal Reserve Bank of St. Louis Review*, 80, 83-98.

Ujunwa, A. and Salami, OP. 2010. Stock market development and economic growth: Evidence from Nigeria. *European Journal of Economics, Finance and Administrative Sciences*, 25, 44-53.

United States Department of State. 2012. *Outline of the USA. Economy*. Bureau of International Information Programmes: United States Department of State. USA.

United States Government Printing Office. 2012. Dodd-Frank wall Street Reform and Consumer Protection Act. Public Law 111–203 – July 21, 2010. [Online] Available from < http://www.gpo.gov> [Accessed 26 November 2012].

World Bank, 2015. World Bank Development Indicators. [Online] Available from <http://databank.worldbank.org/topic/financial-sector> [Accessed 3 June 2015].

World Economic Forum. 2011. *The Financial Development Report*. Insight Report. World Economic Forum, USA Inc.

World Stock Exchanges, 2015. US Stock echanges. [Online] Available from < http://www.world-stock-exchanges.net/> [Accessed 3 June 2015].