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# Do Financial Systems Spur Economic Growth in the USA? An Empirical Investigation

**Summary:** 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 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. We, therefore, recommend that both pro-bank-based and pro-market-based financial sector development policies should be pursued in the USA – in order to bolster real sector growth and economic development.

**Key words:** USA, Bank-based financial development, Market-based financial development, Economic growth.

**JEL:** G10, G20, O16.

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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 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. There are studies that found a positive relationship between financial development and economic growth; others found the relationship to be negative; while others found no significant relationship. 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.

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. The rest of the paper is organised as follows: Section 1 gives an overview of the financial systems in the USA. Section 2 reviews the literature on bank-based and market-based financial development and economic growth. Section 3 covers the estimation techniques and empirical analysis; while Section 4 concludes the paper.

## 1. 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 (see also Sheilla Nyasha and Nicholas M. Odhiambo 2013a, b). 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" (Asli Demirgüç-Kunt and Ross 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 2015). 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 (Board of Governors of the Federal Reserve System 2015).

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 for International Settlement 2003). Furthermore, unlike most countries, where only a few banks dominate the market; in the USA, there are over 5400 commercial banks, and more than 870 savings institutions (Federal Deposit Insurance Corporation 2015).

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 Richard 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).

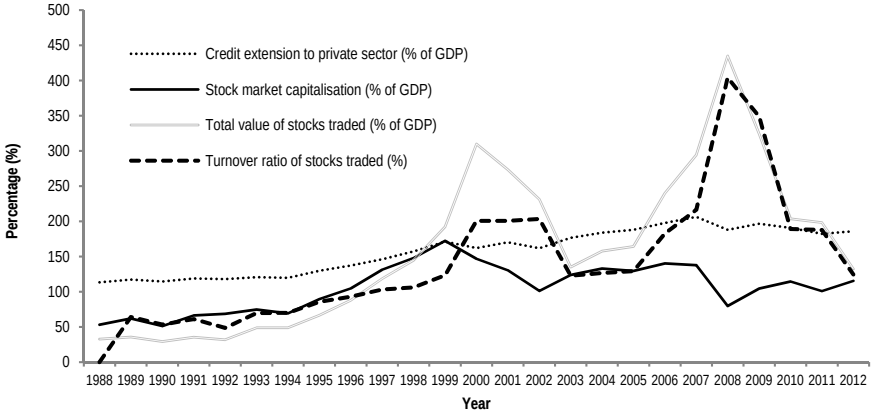
In order to keep pace with the global demand for modernisation, and to escape the high inflation rate trap of the 1970s crisis, the USA embarked on a financial sector deregulation exercise, in the form of a chain of financial sector reforms, targeting both the banking institutions and the financial markets. 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.

Although the USA financial sector responded largely positively to the financial reforms, financial deregulation and the reluctance to introduce regulation on new financial products significantly contributed to conditions for the 2007-2008 financial crisis (Herman Schwartz 2009). In the run-up to the crisis, deregulation created an environment in which mortgage lending expanded and speculation in other financial markets was heightened. Ultimately, the mortgage market failed, followed by the collapse of banks and a major insurance company, thereafter the market for short-term loans also collapsed. This failure initially led to a liquidity crisis, which manifested itself in the form of insolvencies and debt deflation, engulfing the whole USA economy; as it sank into a deep recession. However, it is of paramount importance to notice that although financial deregulation was one of the major causes of the 2007-2008 financial crisis, there were also other causes; since, according to Gerald A. Epstein and Martin H. Wolfson (2013), financial crises are not caused by finance alone; and they certainly have impacts that go way beyond finance. Tocurb the repeated occurrences of the stock market crashes and the financial crisis, the USA embarked on further financial reforms.

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 (Public Law 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 to 425,000 in 2015 (U.S. Department of State - Bureau of International Information

Programmes 2012; An Lian et al. 2018). 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)[1]. 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.




**Source:** World Bank (2015).

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

## 2. Literature Review

From the theoretical front, generally, financial systems can be divided into bank-based and market-based types, according to the relative role of financial intermediaries and financial markets in an economy. Whether the comparative development of financial markets and banks can influence economic growth is, however, a question that has long been hotly debated; and to date, the debate is far from being concluded.

If financial intermediaries (banks and bank-like financial institutions) play a leading role in driving an economy, that economy's financial system is generally referred to as "a bank-based financial system" (Demirgüç-Kunt and Levine 2001). The development of financial intermediaries, or the banking system, is what is broadly termed "bank-based financial development"; and the notion that it is the bank-based financial system that drives economic growth is generally termed the "bank-based theory".

[1] **World Bank.** 2015. World Bank Development Indicators. http://databank.worldbank.org/topic/financial-sector (accessed June 03, 2015).

Bank-based financial sector development includes both bank-based financial widening and deepening. According to Syed Ahmed and M. I. Ansari (1998), financial widening refers to the expansion of the financial services and the growth of financial institutions; while financial deepening refers to either an increase in the *per capita* amount of financial services and institutions, or an increase in the ratio of financial assets to income.

If financial markets (like stock and bond markets) share centre stage with banks in driving economic growth *via* savings mobilisation, resource allocation, exerting corporate control, and easing risk management, then that economy is referred to as having "a market-based financial system" (Demirgüç-Kunt and Levine 2001). Thus, the development of financial markets is what is broadly termed "market-based financial development"; and the notion that it is the market-based financial system that drives economic growth is generally termed the "market-based theory".

In a market-based financial system, the preponderance of financial power is held by the stock market; and the economic mood is dependent on how well, or how poorly, the stock market is doing (Robin Trehan 2013). Banks in a market-based financial system are less dependent on interest from loans; and they gain much of their revenue through fee-based services, such as checking accounts. Further, in a market-based financial economy, the wealth is spread more unevenly. It is constantly shifting; and each individual within the society has the opportunity to gain or lose on any given day (Trehan 2013).

Sanusi Lamido Sanusi (2011) argues that financial systems play a central role in the development of every economy by mobilising the resources for productive investments, and also by providing a conduit for the implementation of monetary policy. The role of banks and stock-markets in economic development is widely acknowledged in the literature. In particular, Joseph A. Schumpeter (1911) places the role of financial sector at the centre of economic development, by asserting that it plays a pivotal role in economic development. He argues that it does this by affecting the allocation of savings, thereby improving productivity, technical change and the rate of economic growth (Schumpeter 1911). It has also been widely recognised that the financial sector, through commercial banks, plays a pivotal role in the creation of credit by advancing loans and purchasing securities, thereby enabling investment in economic activities that would otherwise not have been undertaken due to resource limitation (Schumpeter 1911).

The endogenous growth literature supports the argument that financial development has a positive effect on economic growth Valerie Bencivenga and Bruce Smith 1991). According to the endogenous growth literature, well-functioning financial systems are able to mobilise savings, allocate resources efficiently, enhance the flow of liquidity, reduce information asymmetry and transaction costs, and provide an alternative to raising funds through individual savings (Bencivenga and Smith 1991). In the light of these functions, it may be confidently stated that financial systems have a positive impact on growth.

Levine (1997, 2004) differentiates between five basic channels, through which financial development can spur economic growth. These are: the facilitation of risk management; information production and the allocation of capital; the monitoring of

managers and control over corporate governance; savings mobilisation and easing of the exchange of goods and services. Thus, according to Levine (1997, 2004), a financial system plays an important role in the development of an economy by influencing savings and investment decisions, and hence growth (Levine 1997). The more developed the financial system is, the better would be financial resource allocation and the monitoring of productive borrowers. A number of studies have illustrated the existence of a positive correlation between financial development and the development of the economy as a whole (Levine 1997).

Financial systems promote economic growth through the facilitation of risk-management. Given the availability of specific information and transaction costs, financial markets and institutions may arise to ease the trading, hedging, and the pooling of risk, with positive implications for resource allocation and growth. Financial intermediaries may enhance liquidity and reduce liquidity risk. According to Bencivenga and Smith (1991), and as echoed by Levine (2004), banks can increase investment in high-return, illiquid assets and accelerate growth by eliminating liquidity risk. Furthermore, given the presence of specific costs associated with information and transaction, the presence and operation of financial systems may arise to facilitate the trading, hedging, and pooling of risk in a way that re-allocates resources – thereby enhancing growth.

Financial systems also play a role in information production and capital allocation in the economic growth process. Unlike individual savers and borrowers, financial systems collect, process, and produce information regarding plausible investments (Levine 1997, 2004). In so doing, the costs of acquiring, processing and producing information are reduced; and resource allocation is improved. Besides playing the information-production and capital-allocation role, financial systems can monitor firms and exert corporate governance (Levine 1997, 2004). Efficient financial systems lead to the optimal allocation of capital, thereby promoting economic growth.

According to Levine (2004), the extent to which the providers of capital can efficiently monitor and influence how the capital is used, has implications for both savings and allocation decisions at a national level (Levine 2004). Additionally, financial arrangements that lower transaction costs can promote specialisation, technological innovation, and growth (Adam Smith 1776). This eases exchange, and facilitates business with positive ramifications for economic growth.

There are several traditional theoretical models that show the interaction between economic growth and financial development. These models include Harrod-Domar, the neoclassical growth models, the endogenous growth models and the Schumpeterian growth models. At the heart of the Harrod-Domar growth model is the concept of the steady accumulation of physical capital through savings and investment translating into higher production levels (Lawrence Bouton and Mariusz Sumlinski 1998).

The neoclassical theory attributes underdevelopment to poor resource allocation caused by incorrect pricing policies and excessive state intervention. However financial intermediaries can help improve resource allocation and consequently impact positively on economic growth (Robert Solow 1956).

Amongst the first researchers to propose the endogenous growth models as ways of finding channels through which the financial system affects long-run

economic growth were Bencivenga and Smith (1991) and Levine (1991). They put emphasis on the important role financial markets play in spreading agents' risk – both investment and liquidity risk. Another strand of endogenous growth theory is the Schumpeterian approach to economic growth. In this strand, economic growth is mainly driven by innovations within the entrepreneurial environment.

From the empirical front, 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: Levine and Sarah Zervos (1996), Charles Adjasi and Nicholas Biekpe (2006), Anthony Enisan Akinlo and Olufisayo Akinlo (2009), Santigie Mohamed Kargbo and Patricia Adamu (2009), Kabir Hassan, Benito Sanchez, and Jung-Suk Yu (2011) and George Adu, Justice Marbuah, and Tei Mensah (2013).

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, Sanchez, and Yu (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, Marbuah, and Mensah (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 Jose de Gregorio and Pablo Guidotti (1995), Augustine Ujunwa and Otaru Pius Salami (2010), Alajekwu Udoka Bernard and Achugbu Austin (2011) and Adu, Marbuah, and Mensah (2013).

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, Marbuah, and Mensah (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 Rati Ram (1999) and Thomas Barnebeck Andersen and Finn 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.

Besides these three common views in the finance-growth literature, there are also studies, which postulate that the association between finance and growth could be

non-linear (see Luca Deidda and Bassam Fattouh 2002; Felix Rioja and Neven Valev 2004; Jean-Louis Arcand, Enrico Berkes, and Ugo Panizza 2012, among others). According to these studies, the finance and growth relationship is positive, but only up to a certain point, after which it turns negative.

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) |
| Matthew Odedokun (1996) | LDCs - 71 developing countries | Ordinary least squares (OLS) techniques<br>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 |
| Danielle Allen and Léonce Ndikumana (2000) | 8 Southern Africa - Botswana, Lesotho, Mauritius, Malawi, Swaziland, South Africa, Zambia and Zimbabwe | Cross-sectional data analysis | Positive impact |
| Erdal Güryay, Okan Veli Şafakli, and Behiye Tüzel (2007) | Northern Cyprus | Time-series<br>Ordinary least squares techniques | Positive impact (though negligible) |
| Kargbo and Adamu (2009) | Sierra Leone | Time-series<br>ARDL approach | Positive impact |
| Hassan, Sanchez, and Yu (2011) | Low- and middle-income countries | Panel regressions<br>Variance decompositions | Positive impact |
| Adu, Marbuah, and Mensah (2013) | Ghana | Time-series<br>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<br>Generalized least squares (GLS) technique | Negative impact (in 15% of the 71 countries) |
| Adu, Marbuah, and Mensah (2013) | Ghana | Time-series<br>ARDL approach | Negative impact (when broad money stock to GDP ratio is used as proxies of financial development) |
| Ram (1999) | 95 countries | Individual/country group<br>Time-series | No impact |
| Andersen and Tarp (2003) | 74 countries | Cross-section | No impact |

**Panel 2: Market-based financial development and economic growth**

| | | | |
|---|---|---|---|
| Levine and Zervos (1996) | 41 countries | Cross-country regressions | Positive impact |
| Guglielmo Maria Caporale, Peter Howells, and Alaa Soliman (2003) | Four developing countries (Chile, Korea, Malaysia and the Philippines) | Quarterly time-series Non-causality trivariate test | Positive impact |
| Geert Bekaert, Campbell Harvey, and Christian Lundblad (2005) | A large number of countries | Panel data analysis | Positive impact |
| Adjasi and Biekpe (2006) | 14 African countries | Dynamic panel data modelling | Positive impact |
| Abu 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) |
| 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) |

**Source:** Authors' compilation.

# 3. Estimation Techniques and Empirical Analysis

## 3.1 ARDL Bounds Testing Approach

This study adopts the autoregressive distributed lag (ARDL) bounds testing approach, originally developed by M. Hashem Pesaran and Yongcheol Shin (1999), and later extended by Pesaran, Shin, and Ron Smith (2001), to examine both the long-run and the short-run relationship between bank-based 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 Robert Engle and Clive Granger (1987); and the full maximum likelihood test proposed by Søren Johansen (1988) and Johansen and Katarina 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, 2009). 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 Jarita 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.

## 3.2 Specification of the Empirical Model

In this study, the annual growth rate of real GDP is used as an indicator of economic growth (*y*). This proxy has been used extensively in the literature. Financial development, on the other hand, is proxied by bank-based and market-based financial indicators. Bank-based financial development is proxied by a bank-based financial development index (FDB) which is constructed from three bank-based financial development variables – namely M2 to nominal GDP (*M2*), M3 to nominal GDP (*M3*), and domestic credit to private sector divided by nominal GDP (*C*). Market-based financial development on the other hand, is proxied by a market-based financial development index (*FDB*) which is constructed from three market-based financial development variables – namely, stock market capitalisation (*CAP*), total value of stocks traded (*TV*) and turnover ratio (*TOR*). The coefficients of the indices are expected to be positive.

The M2 to GDP ratio shows the overall size of the financial intermediary in a country (see Levine 1997). A higher ratio of M2 to GDP shows a larger financial sector and consequently, a larger financial intermediation. The opposite is also true. The second variable of bank-based financial development used to capture the extent of intermediation in the countries of interest is the ratio M3 to GDP. This variable reflects the change in liquidity of the banking sector in relation to time (Khalifa Ghali 1999). Growth in M3 to GDP can be seen as progress in an economy's financial sector. The third bank-based financial development variable used in the creation of the bank-based financial development indicator is credit provided to the private sector by financial intermediaries expressed as a percentage of GDP (*C*). It is often claimed to be a more superior measure of financial development since it better reflects the extent of efficient resource allocation (James Ang and Warwick McKibbin 2007).

According to Ang and McKibbin (2007), these variables are highly correlated in most cases, yet there is no uniform argument as to which proxies are most appropriate for measuring financial development. This justifies the need for constructing an index as a single measure that represents the overall development in the bank-based financial sector by taking the relevant financial proxies into account.

The first indicator used to construct the market-based financial development index (*FDM*) in this study is market capitalisation ratio (*CAP*), which measures the stock market size. In terms of economic significance, the assumption behind market capitalisation is that market size is positively correlated with the ability to mobilise capital and diversify risk. The second indicator of market-based financial development utilised is the total value traded as a ratio of GDP (*TV*). The total value traded ratio measures the organised trading of equities as a share of national output. As a result, it

is expected to positively reflect liquidity in an economy. The third indicator of market-based financial development used in this study is the turnover ratio (*TOR*). Turnover measures trading relative to the stock market size.

In addition to the real GDP growth rate ($y$) and the financial development indicators (*FDB* and *FDM*), three other variables have been introduced in the model. These additional variables comprise the share of investment in GDP (*INV*), the share of savings in GDP (*SAV*), and also trade openness (*TOP*). These three variables have been included in the above model to fully specify the model. According to the growth theory, the three additional variables exert a positive impact on economic growth – hence, their coefficients are also expected to be positive (see also, Ronald McKinnon 1973; Edward Shaw 1973; Ang and McKibbin 2007; Suleiman Abu-Bader and Aamer Abu-Qarn 2008).

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:

$$\begin{aligned}\Delta y_t = {} & \gamma_0 + \sum_{i=1}^{n} \gamma_{1i} \Delta y_{t-i} + \sum_{i=0}^{n} \gamma_{2i} \Delta FDB_{t-i} + \sum_{i=0}^{n} \gamma_{3i} \Delta FDM_{t-i} + \\ & \sum_{i=0}^{n} \gamma_{4i} \Delta INV_{t-i} + \sum_{i=0}^{n} \gamma_{5i} \Delta SAV_{t-i} + \sum_{i=0}^{n} \gamma_{6i} \Delta TOP_{t-i} + \theta_1 y_{t-1} + \\ & \theta_2 FDB_{t-1} + \theta_3 FDM_{t-1} + \theta_4 INV_{t-1} + \theta_5 SAV_{t-1} + \theta_6 TOP_{t-1} + \mu_{1t},\end{aligned} \tag{1}$$

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 Demirgüç-Kunt, Asli, 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 Demirgüç-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;

$\gamma_0$ = constant;

$\gamma_1$-$\gamma_6$; $\theta_1$-$\theta_6$ = respective regression coefficients;

$\Delta$ = difference operator;

$n$ = lag length; and

$\mu_t$ = 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:

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

## 3.3 Sources of Data

The annual time series data, covering the period from 1980 to 2012, utilised in this study were obtained from the International Monetary Fund (2015)[2] and the World Bank (2015).

## 3.4 Empirical Results

### 3.4.1 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 Pierre 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*** |

[2] **International Monetary Fund.** 2015. International Financial Statistics. https://data.imf.org/?sk=4C514D48-B6BA-49ED-8AB9-52B0C1A0179B (accessed June 03, 2015).

**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*** |

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

**Source:** Authors' calculations.

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.

### 3.4.2 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 Equation (1). This is followed by the second phase, which is the application of a bounds *F*-test to Equation (1), in order to establish whether a long-run relationship between the variables under study exists or not. The null hypothesis of no cointegration, $H_0$: $\theta_1=\theta_2=\theta_3=\theta_4=\theta_5=\theta_6=0$, is tested against the alternative hypothesis of cointegration, expressed as $H_1$: $\theta_1\neq\theta_2\neq\theta_3\neq\theta_4\neq\theta_5\neq\theta_6\neq0$.

The calculated *F*-statistic is compared with the critical values computed by Pesaran, Shin, and Smith (2001). If the calculated *F*-statistic is above the upper bound level, the null hypothesis of no cointegration is rejected at the corresponding significance level; and it is concluded that the variables in question are cointegrated. However, if the calculated *F*-statistic is below the lower-bound level, the null hypothesis of no cointegration is accepted; and it follows that the variables are not cointegrated. However, if the calculated *F*-statistic falls within the upper and the lower-bound levels, the results are inconclusive. The results of the bounds *F*-test for this study are reported in Table 3.

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, Shin, and Smith (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.

**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, Shin, and Smith (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 |

**Notes:** *** denotes statistical significance at 1% level.

**Source:** Authors' calculations.

### 3.4.3 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 | Coefficient (*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 - $\Delta y$)

| | |
|---|---|
| $\Delta FDB$ | 0.10* (1.97) |
| $\Delta FDM$ | 0.02** (2.37) |
| $\Delta INV$ | 0.79*** (3.94) |
| $\Delta SAV$ | 0.37* (1.75) |
| $\Delta TOP$ | -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 |

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

**Source:** Authors' calculations.

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, Şafakli, and Tüzel 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 and the Cumulative Sum of Squares of Recursive Residuals confirms stability and that there is no systematic change identified in the coefficients at 5% significance level over the study period. Thus, 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) |

**Source:** Authors' calculations.

## 4. 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. 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. Even where studies that include both bank- and market-based financial development have been done, the empirical findings have been largely inconclusive; and only a handful of these studies have been on the USA in particular. Using the newly developed ARDL bounds testing technique, 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. Thus, the results of the study lend support to both bank-based and market-based financial development theories. The study, therefore, recommends that both pro-bank-based and pro-market-based financial sector development policies should be pursued in the USA – in order to bolster real sector growth and economic development.

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