The Effect of Financial Development on Economic Growth: The Case of South Africa

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Abstract

This study examines the effect of financial development on economic growth in South Africa. South Africa is an interesting case study, as it provides a relatively rich environment in terms of data. While the finance and business sector has grown significantly in the last ten years becoming a major contributor to gross domestic product, the South African economy has been struggling to register positive output in the preceding years. The study utilizes an Autoregressive Distributed Lag approach to cointegration and a Solow model to consider the role of banks, financial institutions, and financial markets independently. The results reveal that financial institutions have a considerable role in fostering economic development in the long run in South Africa. Conversely, financial market indicators do not have long run effects on growth in South Africa and in the short run, financial markets negatively influence growth. High foreign participation in the financial markets including ease of capital flows and currency volatility could be reasons for this result.

Keywords: Financial Development, Economic Growth, South Africa, ARDL

1. Introduction

Financial development is a major focus for countries intending to develop while sustaining long periods of economic growth[1]. Understanding the main channels through which financial development influences growth is important for formulating policies that encourage growth and developing systems that mitigate the risk of financial sector failure. This promotes stability in a country's economic system thereby reinforcing its growth prospects.

Financial development refers to the financial sectors ability to attain information, facilitate transactions, enforce contracts, and encourage a conducive environment in which markets, financial intermediaries, financial contracts, improve continuously, and are undertaken at low cost (Rajan and Zingales, 2003; Levine, 1994).

By supplying funds to the economy, the financial sector acts as a conduit that enables entrepreneurs to introduce innovations into an economy; thereby increasing its overall productivity and efficiency. Implicit in this argument is the presumption that often, small, and medium-sized enterprises (SME's) are technologically inept, thus relying on large amounts of labour to operate, in turn creating more employment than larger firms[2].

Whereas there has been unanimity among economists about the positive effects of financial development, empirical evidence provides mixed results, and in some cases, unexpected results see Kumar *et al.,* (2015). Some economists take the view of a minor or non-existent role of finance in the growth process. Robinson (1952) argued that finance plays a minimal role in stimulating economic growth and that it is mainly a byproduct of the growth process. Lucas (1989) is of a similar view. More recently, Shan (2005) argues that the Asian economic crisis of 1997 induces skepticism about the positive effect of finance on economic growth due to the inability of the financial sector to efficiently allocate funds to profitable ventures. Finally, the global financial crisis of 2008 reinforces this argument. Economic analysis of the event indicates the main reason behind the meltdown resided in unethical practices in the subprime mortgage category brought about by deregulation in the financial sector.

[1] Used interchangeably as growth, or gross domestic product and gross domestic product per capita.
[2] This argument would be valid for agrarian and small industrial economies.

On the contrary, Miller (1998;2012) emphasizes the role of financial markets as being too obvious to warrant a debate. Schumpeter (1912) argued that financial systems are important for economic development by allowing the efficient allocation of resources towards entrepreneurial activities that in turn promote growth. In addition, stock markets encourage specialization and reduce the cost of information, making investing more efficient and more likely to occur (Greenwood and Smith 1997). Finally, Greenwood and Jovanovic (1990) argue that greater access to financial services by individuals effectively spreads out risk leading to increased investment activity in human and physical capital and thus increasing economic output.

Finally, financial development goes beyond institutions and infrastructure. It can include robust policies for regulation and supervision, and the global financial crisis in 2008 emphasizes the need for strong financial regulation to mitigate these credit and financial risks. Consequently, finance matters for development both when it functions and when it does not (World Bank, 2012).

Against this background, I attempt to establish a positive relationship between financial development and economic growth for South Africa using an autoregressive distributed lag model (ARDL) and time series data over the period 1975 to 2019. The focus on South Africa is primarily motivated by the mixed empirical results and the lack of theoretical models used to measure this nexus. In addition, while most early studies on finance and growth predominantly focused on developed countries, few studies provided evidence for developing countries, particularly African countries. Consequently, this paper intends to add to the discourse on financial development and growth in Africa.

Some of the questions the paper investigates include whether bank-based indicators and stock market indicators influence economic growth. Some authors find that banking services are more important than stock market services (Arestis, Demetriades and Luintel, 2001) whereas other authors argue that the stock market is just as important and vital for economic growth (Mattana and Panetti, 2014).

The rest of the paper is structured as follows; the second section provides a theoretical and empirical review of the literature on financial development and economic growth. The third section provides an overview of South Africa, providing key statistics and unique features. The fourth section provides information on the data and methodology that will be used in the economic analysis of the paper. The fifth section will provide the results and a discussion of them. The sixth

section will discuss diagnostics. The seventh section will provide policy recommendations and shortcomings of the paper, followed by a conclusion.

2. Literature Review

Many economists accept the hypothesis that the financial sector is a crucial component for economic growth. The past deregulation of financial markets has led to liberalization and innovations in the financial industry (Allen and Gale, 1994). After the passing of the Glass-Steagall Act 1933, modern commercial banks begun undertaking activities that were primarily the preserve of investment banks and accelerated the rate at which financial instruments were engineered (Allen and Santomero, 1996). Consequently, deregulation ensured that banks played a major role in the economy. This is contrary to Arestis, Demetriades and Luintel (2001) assertion that firms demand for banking services would decline significantly when they decide to raise capital in stock markets.

There are several channels through which financial development affect economic growth. Firstly, financial development improves household consumption patterns by allowing them to adjust their spending habits according to the macroeconomic environment. Access to credit, particularly during recessions can boost aggregate demand. Secondly, financial development increases investment in the economy by identifying investment opportunities and allocating resources towards them efficiently. Thirdly, financial development improves trade between countries by easing the process through which traders exchange pecuniary advantage for goods. Finally, financial development improves public sector development by providing finance for development projects such as schools, roads, medical facilities, and other public goods essential for economic growth to occur (Djoumessi, 2009).

Early theoretical foundations of financial development on economic growth can be found in Keynes (1936) liquidity preference theory and Tobin's (1965) portfolio framework for household sector allocation. However, these theories conclude negative or at best a neutral effect of financial development on economic growth (Fry, 1989).

There are two main schools of thought around financial development the first is Robinson (1952) demand leading hypothesis and the second is the supply leading hypothesis of financial development proposed by Patrick (1966).

Robison (1952) contends that financial development follows growth and at best, there could be a bi-directional relationship between the two variables. In this theory, the financial sector responds and grows in relation to demand for services rather than as the main instigator of growth. In this view, an absence of financial services in an economy is due to a lack of demand for them at that stage of its economic development.

Contrastingly, Patrick (1966) proposes a theory where financial services and products are first provided in the economy leading to an increase in demand for these services by entrepreneurs that use these services to increase productivity. Hence the supply leading hypothesis role resides in transferring resources from traditional (stagnant) sectors, to modern ones and the stimulation of an entrepreneurial response into modern sectors implying an innovation by finance managers (Patrick, 1966).

In reality, these two theories are not mutually exclusive and can occur at different stages in the growth process of an economy. Patrick (1966) proposes that pre-industrial economies can encourage economic growth through supply leading finance using banks that stimulate innovation. As the economy grows, the importance of bank-based led growth becomes less important, and agents begin to demand more complex financial products and services leading to an increasing role for demand-led finance by stock markets and other non-deposit institutions. A relevant example includes Japan in the 19th century and before world war one (see Patrick 1967).

Since then, economists have put forward new supply leading theoretical frameworks in which financial development induces positive economic growth. One of these theories by two different economists focuses on financially repressed economies. Mckinnon (1973) and Shaw (1973) argue that in a financially repressed economy, economic growth is constrained not by a lack of investment opportunities, but by lack of savings.

Extensions of the Mckinnon-Shaw model involve models where the deposit rate, determined by government below the free-market equilibrium is the measure of financial repression (Fry, 1988; Kapur, 1976; Galbis, 1977 and Mathieson, 1980). Inflation exacerbates financial repression, which is induced by requirements on reserves, therefore, increasing the deposit rate, increases credit availability and lowers inflation (Fry, 1989).

Kapur (1976) and Mathieson (1980) further extend the Mckinnon-Shaw model to include a labour surplus in the model. The major shortfall of the model however is that financial development impacts the quality of investment more than quantity. However, it contributes to the theoretical literature on financial development.

Key conclusions from the Mckinnon- Shaw framework and their extensions are the policy prescriptions for such repressed economies which include abolishing institutional interest rate ceilings and eradicating reserve requirement tax by encouraging a competitive financial environment of free entry or reducing inflation rates. The removal of interest rate ceilings results in an optimal outcome of raising average investment efficiency and maximizing investments. If competitive conditions cannot be induced, minimum deposit rates can be instituted to stimulate competition (Fry, 1989).

Empirically, economists mainly focus on two sources of financial development which can then be further subdivided into various measures. These are development in the banking sector and development in the financial markets or stock markets. As Patrick (1966) earlier alluded, banking systems are important in the initial stages of economic growth, as economies grow, economic agents will then demand more complex services in turn making financial markets more important than banks.

Banks, credit unions and savings and loans companies and other deposit-taking financial institutions play a key role in fostering economic growth. This involves bringing together savers and borrowers in a manner that is mutually beneficial while managing risk. More importantly, deposit-taking institutions perform the important tasks of maturity transformation, risk diversification and risk management (Diamond, 1984).

The banking system then is important in mobilizing savings, facilitating risk management, acquiring information about potential investment opportunities, monitoring borrowers, and exerting corporate control and facilitating the exchange of goods and services between countries (Allen and Santomero, 1994).

Implicit in the argument for banks is that banks are in a better position to address the principal-agent problem. Thus, preference by firms to use the stock market to raise funds as opposed to obtaining a loan from a bank could have negative consequences for efficient resource allocation

in a developing nation (Arestis, Demetriades and Luintel, 2001). From a theoretical perspective, this is a reasonable argument, however, there could be other reasons why firms would choose to issue new equity or choose venture capital over traditional banking services. Availability of liquidity in financial markets and the need to raise funds without paying back are key considerations.

Financial markets promote specialization and foster an environment in which the acquisition and dissemination of information occur with great ease (Diamond, 1984). Moreover, stock markets enhance corporate governance through mitigation of the principal-agent problem by aligning shareholders (owners) interest with that of managers (Jensen and Murphy, 1990). This assertion has become common practice particularly in the United States of America where top executive's remuneration packages include stock option performance bonuses.

Additionally, Smith and Star (1996) propose that stock markets reduce the inherent risk of financial assets by reducing transaction costs due to the ubiquitous nature of information in the market. Resultantly, higher turnover of stocks traded allows for greater flexibility by market participants when adjusting their portfolios between stocks, cash or other financial assets that minimize their risk exposure. This simultaneously, allows companies to gain access to large pools of monetary capital without incurring debt.

These developments in the banking and market sectors, occurring throughout the economy, at low cost and with ease, result in enhanced levels of investment and productivity, which, in turn, increase economic growth (Kunt and Levine, 1996).

Studies on financial growth nexus can be further subcategorized into studies that focus on cross country comparisons, methodology, geography, level of economic growth and time. Key financial development indicators employed throughout literature vary according to theory, researcher's preference, and data availability. However, most indicators fall under three main themes: financial deepening, efficiency and access to financial services (Beck, Demirgüç-Kunt, and Levine, 1999).

From these three broad categories, we can derive relative and absolute measures of financial indicators which include central bank assets to total financial assets, deposit money banks assets to total financial assets and other financial institutions assets to total financial assets. There are

numerous measures and criteria used by different scholars and the above mentioned are only a small partition, for a comprehensive list (see Beck, Demirgüç-Kunt, and Levine, 1999).

Panel studies are a popular method of analyzing the finance-growth relationship. They are useful when examining the effects of economic phenomenon across groups of countries with similar characteristics.

Levine and Zervos (1998) use a panel study to investigate the effect of stock markets and banking institutions on economic growth. The authors examine whether stock market liquidity, size, volatility, and integration with international capital markets have a robust effect on productivity, savings, and economic growth. The paper uses data on 47 countries over the period 1976 to 1993 and employs the Solow growth model, the capital asset pricing model, and the international capital asset pricing model to test this relationship. They find that the market size and volatility are not robust predictors of economic growth. The paper further establishes that stock markets and banks provide differentiated services and that both matter for growth.

The result that stock market size does not influence economic growth is important due to the emphasis that most authors place on it as a traditional measure of financial development. The indicator tends to be volatile and a poor measure for financial development. This is because the stock market size is affected by share prices which in turn can be based on growth expectations of a company rather than real output. Real-world examples include the share price of Tesla incorporated having the largest market capitalization among car manufacturers due to expectations of increased future output from the market.

Results on the finance growth nexus can differ by region, indicators, or estimation strategy. Dawson (2008) examines the finance growth nexus for developing countries using annual panel data for 44 developing countries over the period 1974–2001. The author establishes mixed results of financial development on growth. The paper attributes this difference to the methods of estimation. The theoretical approach using an augmented Solow growth model produces a positive relationship between financial development and growth. The second approach was adopted from Ram's (1999) ad hoc specification, termed the proxy approach, and did not produce any significant results. A major strength of the paper is that it firmly establishes Patrick (1966) theory of a supply leading hypothesis in which economic growth is initially caused by financial development. The papers shortfall lies in its restriction of financial development to only depth indicators.

Other studies on finance and development in emerging economies include Estrada, Park, and Ramayandi (2010) who investigate the relationship for developing Asian countries using cross country regression methods (panel methods) to study this relationship. The time of the study spans from 1990 to 2008 and they find a positive and significant relationship between financial indicators and economic growth. Interestingly, like the previous study, the paper restricts itself to the use of depth indicators to proxy financial development.

The last set of panel studies Arestis, Demetriades and Luintel (2001) use quarterly time series data on output and indicators of the banking system, stock market capitalization and stock market volatility for five countries, Germany, the United States (U.S.A), Japan, the United Kingdom (UK) and France over the period 1968 to 1998. The method used to empirically investigate this relationship is a Vector Autoregression (VAR) framework, which was extended to error correct in the long run (VECM). The results indicate a strong positive relationship between the banking indicator and real GDP including a positive stock market capitalization effect for Germany, Japan, and France. They further establish that in Germany, banking is more important than the stock market, however, the banking system variable is endogenous. In the USA and UK, they find that financial development does not influence real GDP, they attribute this to the international nature of the financial markets in the USA.

The major weakness of panel data methods is that they may lead to incorrect inferences across groups of countries. This is because panel studies mask country-specific characteristics. To remedy this predicament, we review the literature on specific countries to examine the finance-growth nexus.

Mattana and Panetti (2014) investigate the effects of bank liquidity and stock market participation on economic growth using an Ordinary Least Squares (OLS) model and a two-stage least square Generalized Method of Moments estimator. The authors characterize an equilibrium growth model in which banks and stock markets compete to provide insurance services and investment opportunities to economic agents. The authors establish that after a particular threshold is met, the stock market allocation is preferred to the banking equilibrium leading to a decrease in the relative liquidity of the overall financial system. They attribute this to the inability of the market to provide ex-post cross-subsidization of impatient depositors offered by the banks. The main contribution of this paper lies in its ability to connect market participation to the evolutionary nature of banks and

financial markets on economic growth. The results of the paper however should be taken with caution on account of the Instrumental variables used. Even though the paper establishes they are valid, these results would need to be replicated by an independent researcher perhaps with a similar data set to confirm the results.

Levine (2001) adds to the discourse on finance and growth by arguing that policies that promote international financial integration positively affects economic growth in sixteen (16) emerging market economies. The paper highlights the importance of efficiency in capital allocation as the main channel that financial markets positively impact economic growth. This ensures that capital allocation is efficient leading to an increase in productivity which then positively impacts economic growth. Levine (2001) employs time series data for different countries and uses the OLS estimation method. The author concludes that countries with higher liquidity in their stock markets realize faster rates of growth in terms of GDP per capita in ensuing decades even after other economic, legal, and political factors affecting long-run growth have been controlled for.

Furthermore, Levine (2001) establishes that foreign banks may directly introduce enhanced skill sets, management techniques technology, training procedures and products into the domestic market. Foreign banks enhance efficiency by stimulating competition and the development of auxiliary industries such as those that collect information about individuals and firms. A major criticism of the paper is that some of the banking measures used to measure the finance growth relationship have simultaneity issues leading to a bias in the results. Its strength lies in introducing more multidimensional measures of financial development.

Studies that focus on African countries are scarce mainly due to a lack of data resulting from underdeveloped financial markets. Consequently, most research on finance tends to focus mainly on Egypt, Nigerian and South Africa. Some of these studies find robust results while others find mixed results.

Chibvongodze, Kwenda and Sibanda (2014) investigate the finance growth relationship for South Africa. The paper uses time series data over the period 1996 to 2011 and employs both a Vector error correction model (VECM) and an Autoregressive distributed lag (ARDL) model to investigate the impact of financial development on economic growth. The authors establish that for South Africa, the banking sector is more important for economic growth than the stock market. Specifically, they find a bi-directional relationship running from the banking indicator to economic

growth. Additionally, they find a unidirectional relationship between economic growth and the stock market indicator.

Similarly, Nyasha and Odhiambo (2014) study the effects of financial development and economic growth in South Africa over the period 1980 to 2012 using time series data and an ARDL bounds test approach. The key finding of the paper reveals that the banking sector is important for economic growth while the stock market is not. This result is established both in the short run and long run. Its result on the stock market is its main strength as it highlights the effectiveness or in this case inconsequentiality of the stock market for economic growth in a developing nation such as South Africa. The paper further innovates by constructing financial development indicators using means removed averages for the stock market indicator, which could be a reason for the insignificant result on the variable.

Similarly, Phiri (2015) utilizes a momentum threshold autoregressive (M-TAR) approach to study the finance- growth nexus in South Africa using time series data over the period 1992-2013. The author extends the literature by testing for an asymmetric cointegration relationship between banking indicators, stock market indicators and economic growth by assuming they have an asymmetric relationship. The study establishes an asymmetric relationship between economic growth and banking indicator and a standard cointegrating relationship between the stock market and economic activity. The study further finds that banking sector indicators Granger causes economic growth, but that stock market activity does not. It finds that economic growth tends to cause an increase in stock market activity.

Kumar *et al.,* (2015) extends the debate on financial development and economic growth in South Africa to include energy and trade openness variables. The paper employs an ARDL model over the period 1971 to 2011. Its main findings reveal that financial development occurs independently from economic growth in South Africa. This result contradicts all the other empirical papers conducted on South Africa and confirms the argument that results of financial development are unique to certain conditions and specifications.

Salahuddin and Gow (2016) similarly extend the finance growth nexus to include internet usage and economic growth over the period 1991 to 2013. The paper makes use of time series data and an ARDL model to estimate the relationship. Findings reveal that both financial development and internet usage positively affect economic growth in the long run, but this effect is non-existent in

the short run. This study introduces the internet indicator dynamic which is a good proxy for the free flow of information and in doing so adds to the literature on the finance growth nexus for South Africa using a non-traditional indicator. A major drawback of the paper was the short- data set used to investigate this relationship, and this may have affected their results.

After reviewing the studies on the finance growth nexus for South Africa the evidence appears to agree with Patrick's (1966) hypothesis of supply leading finance and the notion that for developing countries, banks matter more than financial markets. The results further show a lot of dispersion in terms of the effect of financial development based on the type of specification and indicators the researchers incorporated into their estimations. Additionally, the literature on South Africa does not account for theoretical foundations when measuring the effect of financial development on growth.

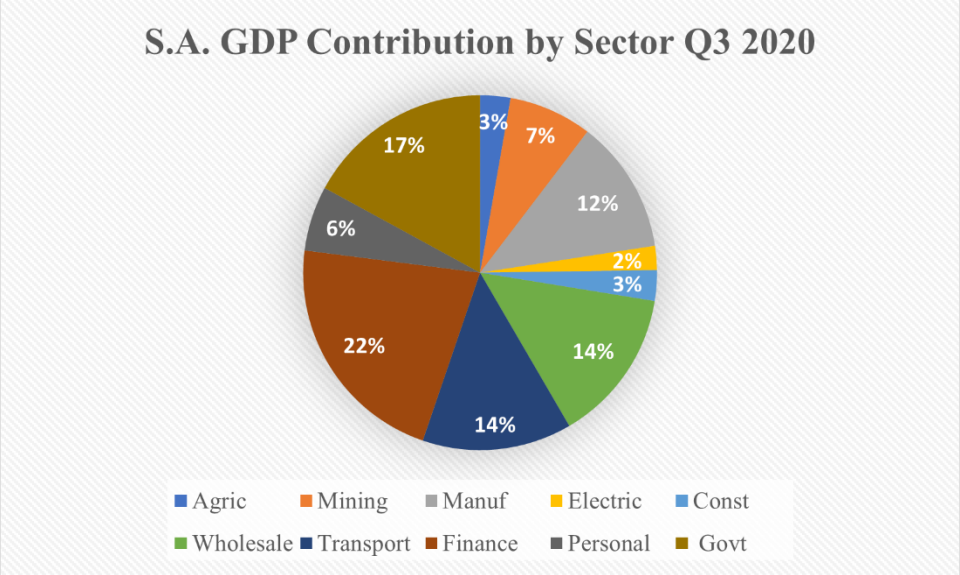
This paper then looks to add to the discourse on finance and growth by estimating an ARDL model using a variety of financial development indicators informed by theory and supplemented by more multidimensional and index measures of financial development. The author identifies a gap in the empirical literature where the use of adhoc methods in estimating the relationship between financial development and growth are common for South Africa. In this regard, the paper intends to use theoretical underpinnings based on an augmented Solow Growth model and this will be the main contribution of the paper. The paper uses World Bank data over the period 1975 to 2019 and a second financial index data set from the IMF over the period 1980 to 2018. A secondary contribution of the paper is to update the literature for South Africa using updated time series datasets.

3. South African financial System Profile and key statistics

The South African economy is the second largest economy in Africa after Nigeria and is supported by advanced legal and financial systems comprised of a strong banking sector and large and active stock exchange.

The financial services sector has grown rapidly, in the last five years, it was the biggest contributor to GDP. The graph below shows the contributions of various sectors of the South African economy to GDP in the third quarter of 2020.

Figure 1. S.A GDP by Sector Contribution 2020



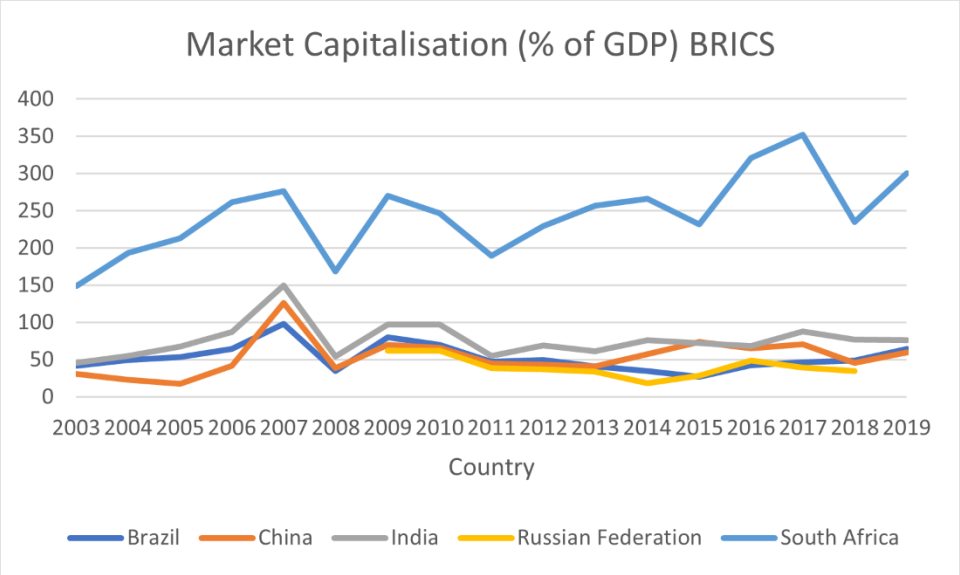
Source: South African Reserve Bank (2021)

Figure1. Indicates that the financial and business sector were the largest contributors to GDP in the third quarter of 2020 contributing 22% to GDP followed by government expenditure at 17%. The agricultural sector and the wholesale and retail trade sector both contribute 14% respectively. Clearly, the financial sector plays an important role for growth.

In addition, South Africa has the oldest stock exchange market on the African continent the Johannesburg stock exchange (JSE) which was established in 1887 following the first South African gold rush (Johannesburg Stock Exchange [JSE], 2020).

Market capitalization is one of the key indicators of financial development and it indicates the size of the stock market. The table below shows a comparison of the market capitalization among the BRICS (Brazil, Russia, India, China, and South Africa) economies.

Figure 2. Market Capitalization (% of GDP) BRICS



Source: World Bank (2020)

Compared to other similar emerging economies South Africa's market capitalization as a percentage of its economy is at least twice as large as other similar emerging economies. The graph further indicates that most emerging economies suffered major decreases during the global financial crisis in 2008. The graph further suggests more volatility in South Africa's stock market compared to other similar emerging markets.

South Africa's financial system remains bank dominated, and this is characteristically consistent for an emerging economy. The banking sector is highly concentrated and is dominated by four main banks (ABSA, First Rand, Standard bank and Nedbank) a mid-size investment bank (Investec) and two smaller banks (Capitec and African bank) that mostly issue unsecured loans to low-income households. Over the years non-banking financial institutions (NBFI) have experienced rapid growth and account for two thirds of financial assets in the economy. Unit trusts are the fastest growing segment in the financial sector accounting for 42% of GDP (IMF, 2014).

The figure below shows data for credit provided by banks and other financial institutions in South Africa.

Figure 3. Domestic credit provided by the financial sector (% of GDP) (1975-2019)

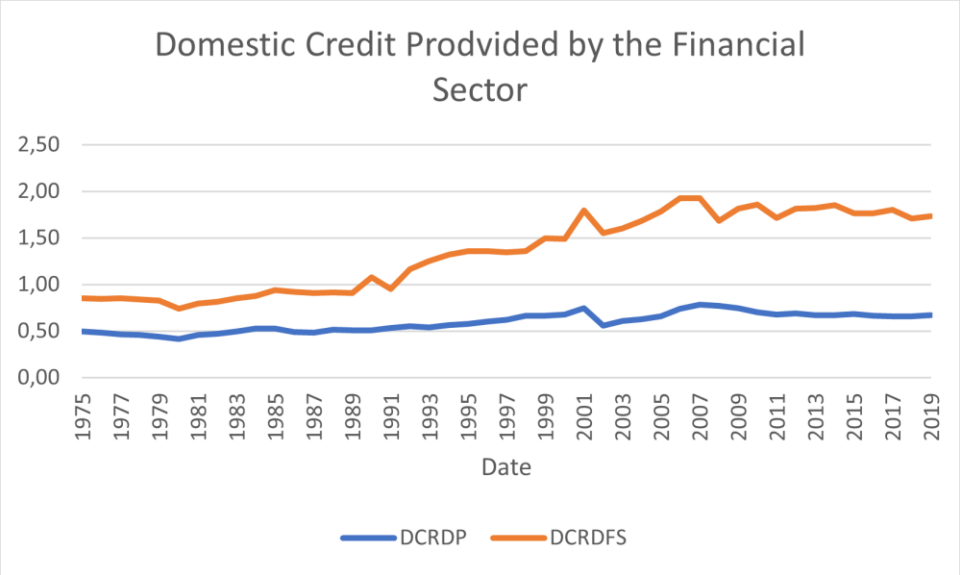


Figure 3. Domestic credit provided by the financial sector (% of GDP) (1975-2019)

Source: World Bank (2020)

Key

DCRDP- Domestic credit to private sector by banks (% of GDP)

DCRDFS- Domestic credit provided by financial sector (% of GDP)

Figure 3. above indicates that the amount of credit provided by the financial sector has steadily increased over the period 1975 to 2019 whereas the amount provided strictly by banks has remained relatively constant over the same period. This implies that banks may not be the major source from which businesses and individuals source their funding or it could indicate low savings. On average, lending by the financial sector in general was at least 1.3 times the size of GDP reflecting a high appetite for debt and financial services other than those offered by traditional banks in South Africa. Data for the year 1991 was not available in the world bank database hence an imputation was made.

4. Data, Model Specification and Methodology

4.1 Data

The paper employs time series data over the period 1975 to 2019, indicators were selected based on the availability of data over a longer period and suitability for analysis. The paper employs individual indicators with data sources from the World bank. This data is complemented by IMF financial development index data from 1980 to 2018.

Table. 1 Variable Definitions

Variable	Code	Description
GDP per capita (constant 2010 US$)	GDP	Gross domestic product per capita in constant 2010 U.S. dollars.
Domestic credit to private sector by banks (% of GDP)	DCRDP	Implies financial resources by banks to the private sector and includes loans and purchases of nonequity securities.
Domestic credit provided by financial sector (% of GDP)	DCRDFS	Refers to all credit to various sectors on a gross basis, excluding credit to the central government. Financial sector encompasses monetary authorities deposit money banks, and all other financial corporations where data are available.
Market capitalization of listed domestic companies (% of GDP)	MRKT	Market capitalization is the share price multiplied by the number of shares outstanding for listed domestic companies.
Stocks traded, total value (% of GDP)	STRD	Refers to the sum total of the number of domestic and foreign shares traded, multiplied by their corresponding prices.
Stocks traded, turnover ratio of domestic shares (%)	TURN	Turnover ratio refers to the value of domestic shares traded divided by their market capitalization. The annualized value is found by multiplying the monthly average by 12.
Gross fixed capital formation (% of GDP) - South Africa	GFCF/INV	Gross fixed capital formation includes land improvements; purchases of machinery, plant and equipment; includes roads, railways, schools, offices, hospitals, private residential dwellings, commercial and industrial building construction.
Total Population	POP	Refers to all residents residing in a country irrespective of legal status of citizenship.
Financial Institutions	FI	Index containing data about financial institutions
Financial Markets	FM	Index containing data about financial markets
Financial Institution Depth	FID	Index on liquidity and size of financial institutions
Financial Inst. Efficiency	FIE	Index on ability to provide financial services at low cost

Source: World Bank and IMF (2020)

Table 2. Descriptive Statistics

The table below shows some brief statistics about the variables used in the paper.

Variable	*DCRDP*	*DCRDFS*	*MRKT*	*STRD*	*TURN*	*POP*	*GFCF*	*GDPPC*
Mean	0,592512	1,346428	1,677995	0,351119	0,167121	41968869	4,91E+10	6555,139
Std.Dev	0,100303	0,412231	0,761075	0,347168	0,125193	9958087	2,14E+10	665,2154
Min	0,415028	0,741108	0,538219	0,020299	0,033319	25195187	2,69E+10	5517,53
Max	0,782941	1,926601	3,521564	1,357951	0,4198	58558270	8,67E+10	7582,697
Count	45	45	45	45	45	45	45	45

Source: World Bank (2020)

The table indicates that over the period 1975 to 2019 the average amount of credit provided to the private sector by banks was close to 60% per cent of GDP. Market capitalization was at least 1.6 times bigger than GDP, the average population size was 40 million people and the average income over the period was six thousand five hundred United States dollars.

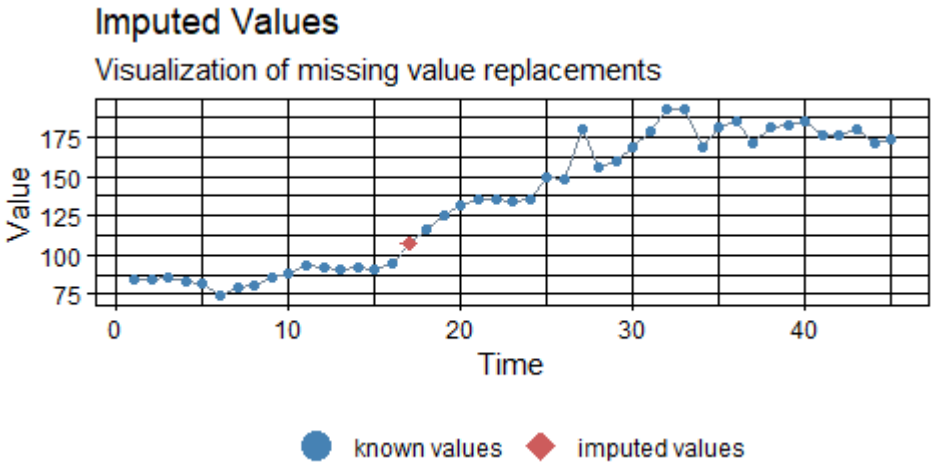
4.2 Data transformation

The data manipulation and model estimations were carried out using Microsoft Excel, R studio and the Microfit software package. Key transformations of the variables included changing all the financial indicators from percentage form into decimals by dividing by a hundred (100) in the excel spreadsheet. The financial indicator variables were then logged. The GDP per capita variable and the gross fixed capital formation both in constant terms were both logged. GDP per capita is the dependent variable in our model, it proxies productivity growth while gross fixed capital formation is a proxy for investment and one of the control variables in our model. Finally, the population variable, a proxy for labour, was transformed into a growth rate by logging it.

Other minor transformations include two variables in the World Bank dataset that were imputed for, these are domestic credit to private sector by banks (% of GDP) and domestic credit provided by financial sector (% of GDP). The variables both contained missing observations for the year 1991. The method used to impute for the missing data was a Kalman Smoothing algorithm. The algorithm provides more accurate results for missing time series data particularly when the data exhibits trends or seasonality (see Morizt and Bartz-Beilstein, 2017).

The algorithm is suitable for imputing data to be used in Autoregressive moving average models (ARIMA) and state space models. This was not problematic as only one observation was missing in the series. The table below shows a plot of the data on after the imputation Domestic credit provided by financial sector (% of GDP) after using the Kalman Smoothing algorithm.

Figure 4: Imputed values on Domestic credit by the financial sector (% of GDP)



Source: World Bank (2020)

4.3 Model Specification

The theoretical underpinnings of the model to be estimated is a Solow growth model. According to Romer (2012) the Solow growth model is the starting point for all macroeconomic analysis on economic growth. Even models that fundamentally differ from the Solow theory are still compared to it, consequently, an augmented version of the model will be adapted for the analysis of the impact of financial development on economic growth.

The Solow growth model comprises of four main components, output(Y), labour (L), capital(K) and technology (A), sometimes referred to as knowledge. In addition, technology and labour enters the model multiplicatively leaving us with technologically augmented labour (AL) (Romer, 2012) the model is described in the equation below:

$$Y_t = f(A_t, L_t K_t)$$

Time does not enter the model explicitly and hence is denoted as a subscript.

The model is augmented to include measures of financial development which can also be seen to be part of technological progress. The specification is given below.

$$Y_t = f(A_t, L_t, K_t, Z_t)$$

Where Productivity growth (Y) is proxied by GDP per capita, augmented labour (AL) and capital (K) are proxied by population growth and gross fixed capital formation (investment) respectively and (Z) is a vector of financial development indicators, t is a time subscript. Therefore, the model assumes changes in Productivity growth in response to a change in production and financial development. The augmented model assumes a linear relationship between output and the rest of the variables, subsequently, all the variables are logged as they enter the regression. The model used in this paper differs from papers on South Africa that estimate the growth and finance nexus by estimating a growth model with theoretical foundations rather than adhoc regression equations see Nyasha and Odhiambo (2014).

4.4 Estimation Strategy and Methodology

The method used to estimate the relationship between growth and financial development is the Autoregressive distributed lag model (ARDL). ARDL models are an extension of univariate autoregressive models, hence are multivariate time series models that fall into the class of distributed lag models. They are mainly used to describe dynamic relationships between variables where the relationship between them occurs over time rather than at one point in time (Box and Jenkins, 1976). Additionally, in certain circumstances, these models can be used to accurately improve forecasting results.

Engel and Granger (1987) established that for non-stationary variables, a cointegrating relationship could be attained in an error correction mechanism. The popularity then of the ARDL models particularly for economic time series analysis rests in their ability to reparametrize nonstationary variables in an error correction representation (Hassler and Walter, 2006). This equips the econometrician with an extremely potent tool to help model nonstationary data in both the short

run and the long run. Furthermore, they have been used by economists to estimate structural equations in which the residuals are autocorrelated (see Sargan, 1964).

According to Pesaran and Shin (1995) and Pesaran, Shin, and Smith (2001) ARDL models have the distinct advantage of producing consistent estimates of long-run coefficients that are asymptotically normal regardless of whether the underlying regressors are I(0) or I(1). The models are further augmented by a bounds testing procedure that allows the analyst to make inferences about the relationship between variables without the knowledge of the whether the variables are integrated of the order zero I (0) or one I (1).

One criticism of distributed lag models is that they are prone to multicollinearity. This mostly occurs in finite distributed lag models with stationary regressors. In such a situation, the analyst may need to restrict the β coefficients to satisfy prior assumptions of smoothness or economic theory (James, 1994).

Another criticism of finite distributed lag model is the lag length selection criteria, which in most cases is not obvious. This can be extremely problematic when long lag lengths are imposed on models with short time series. This leads to a decrease in the degrees of freedom. However, some statistical packages can recommend an appropriate lag length based on information criteria such as *Akaike information criterion (AIC)* and the *Schwartz/Bayesian in-formation criterion (SBIC)* or through multiple simulations. Other methods include checking for autocorrelation in the residuals to find the best fitting model James (1994).

The equations to be estimated are given below:

1. $\Delta LGDP_t = \alpha_0 + \delta \cdot t + \sum_{i=1}^{n} \alpha_{1i} LGDP_{t-i} + \sum_{i=1}^{n} \alpha_{2i} LFIN_{t-i} + \sum_{i=1}^{n} \alpha_{3i} LINV_{t-i} + \sum_{i=1}^{n} \alpha_{4i} LPOP_{t-i} + \sigma_1 LFIN_{t-1} + \sigma_2 LINV_{t-1} + \sigma_3 LPOP_{t-1} + \varepsilon_t$
2. $\Delta LGDP_t = \alpha_0 + \delta \cdot t + \sum_{i=1}^{n} \alpha_{1i} LGDP_{t-i} + \sum_{i=1}^{n} \alpha_{2i} LFINindex_{t-i} + \sum_{i=1}^{n} \alpha_{3i} LINV_{t-i} + \sum_{i=1}^{n} \alpha_{4i} LPOP_{t-i} + \sigma_1 LFINindex_{t-1} + \sigma_2 LINV_{t-1} + \sigma_3 LPOP_{t-1} + \varepsilon_t$

Where; α_0 and $\delta \cdot t$ are constants and time trends and the rest of the variables are as defined earlier logged and lag form representations. LFIN and LFIN index are vectors for financial development indicators.

4.4.1 Unit Root Tests

The variables in the model were tested for unit root after being transformed using an Augmented Dickey Fuller Test (ADF). The comprehensive results of the tests are reported in the appendix. The number of lags used for the test was based on the Schwartz/Bayesian in-formation criterion (SBIC), the justification for using this criterion is that it minimizes the sum of residual squares in our test equations similar to AIC but has stricter penalties.

Table 3. Unit Root Results

The table below gives a summary of results from the ADF tests.

Variable	Code	Level of Integration
GDP (constant 2010 US$)	LGDPC	I (1) with constant and no trend
Domestic credit to private sector by banks (% of GDP)	LDCRDP	I (1) with constant and trend
Domestic credit provided by financial sector (% of GDP)	LDCRDFS	I (1) with constant and trend
Market capitalization of listed domestic companies (% of GDP)	LMRKT	I (0) with constant and trend
Stocks traded, total value (% of GDP)	LSTRD	I (1) with constant and trend
Stocks traded, turnover ratio of domestic shares (%)	LTURN	I (1) with constant and trend
Gross fixed capital formation, private sector (% of GDP)	LGFCF	I (1) with constant and trend
Population Growth	LPG	I (0) with constant and trend
Financial Institutions	FI	I (1) with constant and trend
Financial Markets	FM	I (1) with constant and trend
Financial Institution Depth	FID	I (1) with constant and trend
Financial Inst. Efficiency	FIE	I (1) with constant and trend

The results show that all the variables except market capitalization and population growth are non-stationary in levels. In addition, all the variables contain a constant and time trend. Results for the financial index data are presented in the appendix see table A2.

5. Empirical findings and Discussion

The unit root test established that none of our variables are integrated of order (2). This allows us to use the ARDL approach to cointegration. The section presents results from the banking and stock market indicators on growth. It then presents the results from the index of financial development indicators developed by the IMF. We first look at the separate effects of banks on stock markets on the market before proceeding to the index indicators.

5.1 Banks effects on economic growth

Similar to Demirguc-Kunt and Detragiache (1999) and Levine (2002) the paper uses the ratio of credit provided by banks to the private sector and the credit provided by the financial sector to GDP as a measure of banking sector development.

Before estimating the model, a bounds test for cointegration was carried out and the results are presented in the tables below.

Table 4. Bounds test LDCRDFS

F-statistic	**95% Lower Bound**	**95% Upper Bound**	**90% Lower Bound**	**90% Upper Bound**
3.5012	4.4282	5.5875	3.7096	4.7816
W-statistic	**95% Lower Bound**	**95% Upper Bound**	**90% Lower Bound**	**90% Upper Bound**
14.0049	17.7127	22.3500	14.8384	19.1263

Table 5. Bounds test LDCRDP

F-statistic	**95% Lower Bound**	**95% Upper Bound**	**90% Lower Bound**	**90% Upper Bound**
3.3072	4.4282	5.5875	3.7096	4.7816
W-statistic	**95% Lower Bound**	**95% Upper Bound**	**90% Lower Bound**	**90% Upper Bound**
13.2289	17.7127	22.3500	14.8384	19.1263

In both cases, the test statistic lies below the lower bound, therefore the null hypothesis of no level effect cannot be rejected and consequently we conclude that there are no cointegrating relationships between our banking indicators and per capita GDP. We proceed to estimate the long run model and error correction model to confirm these results.

Table 6. Long run estimates

Long-run regression results
Dependent variable: Log of real per capita GDP
ARDL based on Schwarz Bayesian Criterion

	Data: 1977-2019	Data: 1977-2019
Selected Model	(1,0,1,0)	(1,0,1,0)
LDCRDFS	.0096956	
	(.0073867) [.994]	
LDCRDP		-.58428
		(-1.1604) [.254]
LINV	.46693	.54115
	(.60128) [.551]	(2.7451) [.009]
LPG	-8.3184	-2.8015
	(-.30010) [.766]	(-.98616) [.331]
C	-11.7581	1.9983
	(-.16561) [.869]	(.26403) [.793]
T	-.029879	.5837E-3
	(-.22402) [.824]	(.061533) [.951]

t-ratio () p-value []

The results indicate that none of the banking sector indicators influences economic growth in the long run. This result differs from the hypothesis that financial development influences economic growth. Interestingly other measures of banking financial development such as Private credit by deposit money banks and other financial institutions to GDP (%) and Nonbank financial institutions' assets to GDP (%) yielded similar results for South Africa[3].

[3] Data on these variables was available from 1960 to 2017, the result did not change even with a slightly longer dataset.

Table 7. Short run estimates

Error Correction Representation of the ARDL
Dependent variable: *Differenced* ***Log of real per capita GDP***
ARDL based on Schwarz Bayesian Criterion

	Data: 1977-2019	Data: 1977-2019
Selected Model	(1,0,1,0)	(1,0,1,0)
dLDCRDFS	.2801E-3	
	(.0074599) [.994]	
dLDCRDP		-.060473
		-1.3370[.189]
dLINV	.17157	.19440
	(3.2177) [.003]	(3.5790) [.001]
dLPG	-.24035	-.28996
	(-2.6030) [.013]	(-3.4737) [.001]
dT	-.8633E-3	.6041E-4
	(-.75395) [.456]	(.058435) [.954]
ecm(-1)	-.028894	-.10350
	(-.30046) [.766]	(-1.0067) [.321]

t-ratio () p-value []

The term on the error correction variable is negative but insignificant thus confirming an absence of a long-term relationship between the banking sector indicators and growth. Furthermore, none of the indictors was significant in the short run.

5.2 Stock Markets and economic growth

The next set of results show the impact of the financial markets/stock market on economic growth. Like most researchers such as Arestis *et al.* (2001) and Beck and Levine (2004), we use the ratio of Stocks traded, total value (% of GDP) and turnover ratio of domestic shares (%). Market capitalization was also regressed but had no effect on economic growth as expected from previous findings.

The results from the bounds test are shown in the table below.

Table 8. Bounds test LSTRD

F-statistic	95% Lower Bound	95% Upper Bound	90% Lower Bound	90% Upper Bound
3.4404	4.4282	5.5875	3.7096	4.7816
W-statistic	**95% Lower Bound**	**95% Upper Bound**	**90% Lower Bound**	**90% Upper Bound**
13.7616	17.7127	22.3500	14.8384	19.1263

Table 9. Bounds test LTURN

F-statistic	95% Lower Bound	95% Upper Bound	90% Lower Bound	90% Upper Bound
3.2521	4.4282	5.5875	3.7096	4.7816
W-statistic	**95% Lower Bound**	**95% Upper Bound**	**90% Lower Bound**	**90% Upper Bound**
13.0085	17.7127	22.3500	14.8384	19.1263

Again, both test statistics from the different variables lie below the lower bound, therefore the null hypothesis of no level effect cannot be rejected and consequently we conclude that the there are no cointegrating relationships between our stock market indicators and per capita GDP. We proceed to estimate the long run model and error correction model to confirm these findings.

Table 10. Long run Estimates

Long-run regression results
Dependent variable: Log of real per capita GDP
ARDL based on Schwarz Bayesian Criterion

	Data: 1977-2019	Data: 1977-2019
Selected Mode	(1,0,1,0)	(1,0,1,0)
LSTRD	2.0043	
	(.042245) [.967]	
LTURN		.32958
		(.12383) [.902]
LINV	-.99258	.074030
	(-.027134) [.979]	(.019063) [.985]
LPG	-45.6533	-14.3534
	(-.043075) [.966]	(-.14787) [.883]
C	-101.8786	-26.7062
	(-.039391) [.969]	(-.10890) [.914]
T	-.37358	-.074597
	(-.041967) [.967]	(-.13169) [.896]

t-ratio () p-value []

Similar to the banking sector indicators, the stock market indicators do not influence economic growth in South Africa.

Table 11. Short run results

Error Correction Representation of the ARDL
Dependent variable: Differenced Log of real per capita GDP
ARDL based on Schwarz Bayesian Criterion

	Data: 1977-2019	Data: 1977-2019
Selected Model	(1,0,1,0)	(1,0,1,0)
dLSTRD	.0080088	
	(.82761) [.413]	
dLTURN		.0046083
		(.41520) [.680]
dLINV	.17119	.16898
	(3.2703) [.002]	(3.1827) [.003]
dLPG	-.18242	-.20069
	(-1.7598) [.087]	(-1.6298) [.112]
dT	-.0014927	-.0010430
	(-1.3596) [.182]	(-1.1485) [.258]
ecm(-1)	-.0039958	-.013982
	(-.043014) [.966]	(-.14616) [.885]

t-ratio () p-value []

The result in the short run is similar to the long run, there appears to be no relationship between financial development indicators and economic growth in South Africa. The error correction term in this model is negative but insignificant.

5.3 Financial development index estimates

Having established the non-existent individual effects of financial development indicators on economic growth, the author recognizes the inability of basic financial development proxies to account for the multidimensional and complex nature of financial development. This section attempts to correct for this by incorporating financial development index indicators that model the complexity of financial development.

The index indicators summarize developed financial institutions and financial markets in terms of depth (size and liquidity), access (ease with which individuals and companies can access financial services) and efficiency (the ability of institutions to provide financial services at low costs) while sustaining revenue production and achieving a decent level of activity capital markets (IMF, 2021). The dataset spans from 1980 to 2018, for more information on the construction of the index indicators (see Sahay *et al.*, 2015 and Svirydzenka, 2016).

The financial indicators were tested for unit root, the results indicated that they were integrated of order one I (1), see table A2. The author proceeds to estimate the regressions in a Solow growth model beginning with financial institution development.

5.3.1 Financial institutions index

The table below shows the bounds test results for cointegration.

Table 12. Bounds Test

Testing for existence of a level relationship among the variables in the **LFI ARDL model**

F-statistic	**95% Lower Bound**	**95% Upper Bound**	**90% Lower Bound**	**90% Upper Bound**
7.5247	4.5555	5.8175	3.8039	4.8896
W-statistic	**95% Lower Bound**	**95% Upper Bound**	**90% Lower Bound**	**90% Upper Bound**
30.0990	18.2221	23.2701	15.2157	19.5584

The results show that the test statistic is greater than the 95% upper bound, thus the null hypothesis of no level effect is rejected, and we conclude that there is one cointegrating relationship in the model. We then proceed to estimate the long run relationship.

Table 13. Long run estimates

Long-run regression results
Dependent variable: Log of real per capita GDP
ARDL based on Schwarz Bayesian Criterion

	Data: 1982-2018
Selected Model	(1,1,1,0)
LFI	1.5252
	(2.8814) [.007]
LINV	-.14393
	(-.57815) [.568]
LPG	-1.2516
	(-1.7651) [.088]
C	6.4056
	(3.4766) [.002]
T	-.018026
	(-1.9430) [.062]

t-ratio () p-value []

The long run results indicate that financial institutions development is important for economic growth in South Africa. There is a positive relationship between financial institutions and GDP per capita and holding all things constant a one per cent increase in financial institutions development leads to a 1.5 per cent increase in per capita GDP in the long run. Furthermore, compared to all the other variables, the trend has a downward trajectory of 0.018026 ceteris paribus.

Table 14. Short run estimates

Error Correction Representation of the ARDL
Dependent variable: Differenced Log of real per capita GDP
ARDL based on Schwarz Bayesian Criterion

	Data: 1982-2018
Selected Model	(1,1,1,0)
dLFI	.069922
	(.78947) [.436]
dLINV	.10392
	(2.3185) [.027]
dLPG	-.26791
	(-3.8586) [.001]
dT	-.0038587
	(-3.0357) [.005]
ecm(-1)	-.21406
	(-2.1610) [.039]

t-ratio () p-value []

The model reveals no short run relationship between financial institutions development and economic growth. Furthermore, the term on the error correction is negative and significant, confirming the existence of a long run relationship between financial indicators and growth. In addition, compared to all the other variables, there is a downward trend of 0.0038587 ceteris paribus.

We then proceed to estimate other measures of financial institution development that focus on depth and efficiency. The results are presented below:

Table 15. Bounds Test LFID

Testing for existence of a level relationship among the variables in the **LFID ARDL model**

F-statistic	**95% Lower Bound**	**95% Upper Bound**	**90% Lower Bound**	**90% Upper Bound**
8.1540	4.5555	5.8175	3.8039	4.8896
W-statistic	**95% Lower Bound**	**95% Upper Bound**	**90% Lower Bound**	**90% Upper Bound**
32.6161	18.2221	23.2701	15.2157	19.5584

Table 16. Bounds Test LFIE

Testing for existence of a level relationship among the variables in the **LFIE ARDL model**

F-statistic	**95% Lower Bound**	**95% Upper Bound**	**90% Lower Bound**	**90% Upper Bound**
9.0914	4.5555	5.8175	3.8039	4.8896
W-statistic	**95% Lower Bound**	**95% Upper Bound**	**90% Lower Bound**	**90% Upper Bound**
36.3655	18.2221	23.2701	15.2157	19.5584

In both cases, the results show that the test statistic is greater than the 95% upper bound, thus the null hypothesis of no level effect is rejected, and we conclude there is one cointegrating relationship in the models. We then proceed to estimate the long run relationships and the error correction models.

Table 17. Long run Results

Long-run regression results
Dependent variable: Log of real per capita GDP
ARDL based on Schwarz Bayesian Criterion

	Data: 1982-2018	Data: 1982-2018
Selected Model	(1,1,1,0)	(1,1,0,0)
LFID	3.6886	
	(2.4136) [.022]	
LFIE		.70506
		(2.6961) [.011]
LINV	-.39370	.10495
	(-1.0001) [.326]	(.61018) [.546]
LPG	-1.1413	-.59347
	(-1.4702) [.152]	(-1.0712) [.293]
C	6.9422	7.6622
	(3.5976) [.001]	(5.1680) [.000]
T	-.036546	.7857E-3
	(-1.9689) [.059]	(.22930) [.820]

t-ratio () p-value []

The results indicate that financial institutions depth development and financial institutions efficiency development influence growth in the long run for South Africa. Holding all other things constant, a one per cent increase in financial institutions depth leads 3.6886 per cent increase in GDP per capita in the long run. Similarly, a one per cent increase in financial efficiency leads to a 0.70506 per cent increase in economic growth in the long run ceteris paribus. The trend in the model had a downward trajectory compared to all the other variable of 0.036546 ceteris paribus. We then proceed to estimate the error correction models.

Table 18. Short run Results

Error Correction Representation of the ARDL
Dependent variable: *Differenced* ***Log of real per capita GDP***
ARDL based on Schwarz Bayesian Criterion

	Data: 1982-2018	Data: 1982-2018
Selected Model	(1,1,1,0)	(1,1,0,0)
dLFID	.23913	
	1.8268 [.077]	
dLFIE		.052036
		1.2012 [.239]
dLINV	.099168	.023627
	2.2646 [.031]	.53219 [.598]
dLPG	-.19939	-.13361
	-2.9202 [.006]	-1.4931 [.146]
dT	-.0063846	.1769E-3
	-3.5970 [.001]	.21537 [.831]
ecm(-1)	-.17470	-.22513
	-2.0566 [.048]	-2.6579 [.012]

t-ratio () p-value []

The short run results reveal that financial institution depth is important (it is significant at the 10% level) in the short run but financial institution efficiency is not. Ceteris paribus, a one per cent increase in financial development depth leads to a 0.23913 per cent increase in GDP per capita in the short run. The error correction terms in both models are negative and significant confirming the existence of a long run relationship between the financial development indicators and economic growth. The trend in the financial institutional model had a downward trajectory compared to all other variables of 0.0063846, ceteris paribus. The next section looks at the effects of financial market development on economic growth in South Africa.

5.3.2 Financial market index

The table below shows the results of the bounds test for cointegration.

Table 19. Bounds Test

Testing for existence of a level relationship among the variables in the **LFM ARDL model**

F-statistic	**95% Lower Bound**	**95% Upper Bound**	**90% Lower Bound**	**90% Upper Bound**
5.7016	4.5555	5.8175	3.8039	4.8896
W-statistic	**95% Lower Bound**	**95% Upper Bound**	**90% Lower Bound**	**90% Upper Bound**
22.8062	18.2221	23.2701	15.2157	19.5584

The test statistic lies between the lower and upper bound, as a result, the test for cointegrating relationships is inconclusive. We proceed to estimate the long run model.

Table 20. Long run estimates

Long-run regression results
Dependent variable: Log of real per capita GDP
ARDL based on Schwarz Bayesian Criterion

	Data: 1982-2018
Selected Model	(1,0,0,0)
LFM	-.60700
	(-1.1326) [.266]
LINV	.54324
	(2.4084) [.022]
LPG	-5.2229
	(-1.1502) [.259]
C	-5.1581
	(-.40506) [.688]
T	.0090335
	(1.3660) [.182]

t-ratio () p-value []

The results indicate no long run relationship between financial market index and economic growth. In addition, financial market efficiency, market access and market depth had no effect on economic growth in South Africa. We proceed to estimate the error correction model.

Table 21. Short run estimates

Error Correction Representation of the ARDL
Dependent variable: Differenced Log of real per capita GDP
ARDL based on Schwarz Bayesian Criterion

	Data: 1982-2018
Selected Model	(1,0,0,0)
dLFM	-.060510
	(-2.6256) [.013]
dLINV	.054154
	(1.2476) [.222]
dLPG	-.52066
	(-4.2803) [.000]
dT	.9005E-3
	(.99576) [.327]
ecm(-1)	-.099687
	(-1.3028) [.202]

t-ratio () p-value []

The error correction term on the model is insignificant, this confirms the absence of a long run relationship between financial markets and economic growth. The variable on financial markets is negative and significant, indicating a short-run effect of financial market development on growth in South Africa. A one per cent increase in financial market development leads to a 0.060510 percent decrease in economic growth ceteris paribus. The trend shows that ceteris paribus compared to all the other variables, there was an upward trajectory of 0.009005 of economic growth. The full results of the error correction models can be found in the appendix.

The result that the financial market indicator negatively affect economic growth can be explained by several factors. These include the fact that the South African financial markets are not immune to global economic and financial phenomenon. In addition, low savings in the South African economy may have led to an overreliance on foreign savings to fund domestic investment (Loewald *et al*., 2020).

The stock market in South Africa comprises of companies that are exposed to other economies and these companies contribute significantly to the market capitalization on the JSE. A pertinent

example is Naspers wherein most of its market value is influenced by the minority shares they hold in Tencent, a Chinese company.

Furthermore, a considerable number of companies on the stock exchange are involved in mineral resource extraction and production. The prices of mineral commodities are subject to considerable volatility and are mainly based on global demand and supply. Other factors include the volatility of the Rand and other structural economic factors. Finally, a developed financial market allows for ease in terms of movement of capital thereby creating volatility not only in the financial market but also in the exchange rate of a country which can lead to a spillover effect into other macroeconomic variables (Hassan, 2013).

The negative effect of the financial markets adds to the debate that, without adequate regulation, financial market development through, financial markets instability, could lead to negative effects into the real economy and negatively affect growth.

The results from the financial index data seems to indicate that financial institutions are more important for economic growth in the short run and long run than the financial market. Furthermore, the depth and efficiency of these institutions are important for growth in the long run in South Africa. Chibvongodze, Kwenda and Sibanda (2014) and Nyasha and Odhiambo (2014) find a similar result for South Africa with the exception of the negative result on financial markets.

6. Diagnostic Tests

The author realized that there could have been multiple structural breaks in the data due to local and global events. Key significant events such as the Soweto uprising in the 1980's, the end of apartheid in in the 1990's, the technology bubble at the end of the 1990's and the global financial crisis 2008 could have affected the series. As a result, the author decided to use a test for multiple structural breaks. The test used was the Bai-Peron test, which is suitable for checking for multiple breakpoints when dates are unknown (Bai and Perron , 1998).

The data reveals that possible structural breaks in the model could have occurred in the years 1984, 1991, 1999 and 2008 see table A4 in the appendix. These dates are approximately consistent with events previously mentioned. In this regard, models with financial index data were run to include

firstly all four dummies and then finally only the 1984 dummy to save on degrees of freedom and because it was the only significant dummy in the short run. The results show that once all dummies are included in the model none of them are significant in the long run or short run see tables A5. Further results show that once the structural break have been controlled for, the index variables did not have an effect on economic growth. Results for some select variables have been included in section A5 of the appendix.

7. Conclusion

The paper set out to establish a relationship between financial development and economic growth. The paper used the ARDL bounds approach to cointegration and a Solow growth framework to model this relationship. Despite the significant increase in the size and contribution of South Africa's finance and business sector, the South African economy has experienced low and, in some cases, negative economic growth.

The paper thus attempted to empirically estimate the effect of financial development on economic growth nexus in a middle-income country using three scenarios. The first case involved estimating the independent effect of basic banking financial indicators on economic growth. Secondly, the role of basic stock markets indicators were investigated separately. Lastly, the first 2 scenarios were repeated using more multidimensional measures of financial development developed by the IMF.

The first set of results indicates that the basic financial indicators which include both banking sector indicators and stock market indicators were not significant both in the short run and long run. Thus, it was concluded that they had no effect on economic growth in South Africa. This result was contrary to similar papers on South Africa and goes against findings in developed and developing economies, including most of the literature.

Nonetheless, the lack of significant results does not necessarily mean that banks and stock markets are unimportant for economic growth in South Africa. Demirguc- Kunt *et al* (2001) indicate that a lack of significant results does not mean institutions do not matter. Rather, it could be a case in which the indicators utilized do not sufficiently encapsulate the role of banks and stock markets.

The second set of results sought to rectify the deficiencies of the basic measures of financial development by employing multidimensional measures of financial institutions development. The results indicate that for South Africa, financial institutions, including banks and non-banking institutions are important for short run and long run economic growth. These findings are consistent with theory and empirical findings for South Africa and other developing countries.

Furthermore, financial institutional depth was important for growth in the short run and long run. However, financial efficiency was only important for growth in the long run. These results point to the importance of financial institutions in pooling and channeling resources to fund productive investments in the economy. The long run result was confirmed by the negative and significant result on the error correction term in the error correction model.

The last set of results employed a multidimensional measure for financial market development, and this resulted a negative relationship between the variable and economic growth in the short run. This result was not entirely surprising and could be explained by several factors that are unique to South Africa and other developing countries with similarly advanced financial markets.

The main limitation of the study was the lack of a longer time series on financial development index (IMF) data. This resulted in a limited analysis of financial development on economic growth to only 38 years and missed out on a significant amount of historical data that could have further informed the study. A further limitation includes the imputation of two variables in the World Bank set of data, which could have adversely affected the results. Future work on the topic may consider employing longer time series as well as different measures for financial development in South Africa.

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Appendix

A1. Calculations and formula

$$log\ population\ growth = \frac{pop - pop_{-1}}{pop_{-1}}$$

A2. Unit Root Tests

a) ADF tables Financial indicators

Variable	None	Intercept	Trend & Intercept	1st Difference	Conclusion
LGDPC	.17409	-.97310	-2.2957	-3.8686**	I (1)
LDCRDP	-1.9711	-2.2489	-2.1647	-4.7582**	I (1)
LDCRDFS	.33416	-1.9475	-.47361	-5.5685**	I (1)
LMRKT	1.1263	-1.9838	-4.2844**	-	I (0)
LSTRD	.89711	-.79418	-2.6910	-4.8195**	I (1)
LTURN	.54298	-.68261	-2.5182	-4.1680**	I (1)
LPG	1.0566	-3.1767	-4.1905**	-	I (0)

** Statistic greater than the 95% published asymptotic critical value corresponding to ADF (0)

b) ADF tables Financial index indicators

Variable	None	Intercept	Trend & Intercept	1st Difference	Conclusion
LFI	-2.7179	-.16668	-1.6356	-4.8379**	I (1)
LFM	-1.6687	-1.0825	-2.1124	-3.3506**	I (1)
LFID	-2.3432	.094524	-2.7001	-6.4409**	I (1)
LFIE	-1.5538	-1.7080	-2.0903	-5.0614**	I (1)

** Statistic greater than the 95% published asymptotic critical value corresponding to ADF (0)

A3. Error Correction full results.

a)

Error Correction Representation for the Selected ARDL Model

ARDL(1,1,1,0) selected based on Schwarz Bayesian Criterion

****

Dependent variable is dLGDPC

37 observations used for estimation from 1982 to 2018

****

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
dLFI	.069922	.088567	.78947[.436]
dLINV	.10392	.044822	2.3185[.027]
dLPG	-.26791	.069431	-3.8586[.001]
dT	-.0038587	.0012711	-3.0357[.005]
ecm(-1)	-.21406	.099056	-2.1610[.039]

****

List of additional temporary variables created:

dLGDPC = LGDPC-LGDPC(-1)

dLFI = LFI-LFI(-1)

dLINV = LINV-LINV(-1)

dLPG = LPG-LPG(-1)

dT = T-T(-1)

ecm = LGDPC -1.5252*LFI + .14393*LINV + 1.2516*LPG -6.4056*C + .01802

6*T

****

R-Squared .70983 R-Bar-Squared .63979

S.E. of Regression .014393 F-Stat. F(5,31) 14.1883[.000]

Mean of Dependent Variable .0020324 S.D. of Dependent Variable .023981

Residual Sum of Squares .0060077 Equation Log-likelihood 108.9235

Akaike Info. Criterion 100.9235 Schwarz Bayesian Criterion 94.4799

DW-statistic 2.1102

****

b)

Error Correction Representation for the Selected ARDL Model

ARDL(1,0,0,0) selected based on Schwarz Bayesian Criterion

```
*******************************************************************************
Dependent variable is dLGDPC
37 observations used for estimation from 1982 to 2018
*******************************************************************************
Regressor          Coefficient      Standard Error       T-Ratio[Prob]
dLFM                -.060510         .023046          -2.6256[.013]
dLINV                .054154         .043406           1.2476[.222]
dLPG                -.52066          .12164           -4.2803[.000]
dT                .9005E-3         .9044E-3           .99576[.327]
ecm(-1)             -.099687         .076519           -1.3028[.202]
*******************************************************************************
List of additional temporary variables created:
dLGDPC = LGDPC-LGDPC(-1)
dLFM = LFM-LFM(-1)
dLINV = LINV-LINV(-1)
dLPG = LPG-LPG(-1)
dT = T-T(-1)
ecm = LGDPC +   .60700*LFM   -.54324*LINV +   5.2229*LPG +   5.1581*C -.009033
5*T
*******************************************************************************
R-Squared                    .59414   R-Bar-Squared                .52868
S.E. of Regression           .016464  F-Stat.   F(5,31)      9.0763[.000]
Mean of Dependent Variable   .0020324 S.D. of Dependent Variable    .023981
Residual Sum of Squares      .0084029 Equation Log-likelihood      102.7161
Akaike Info. Criterion       96.7161  Schwarz Bayesian Criterion    91.8833
DW-statistic                 1.8169
*******************************************************************************
```

c)

Error Correction Representation for the Selected ARDL Model

ARDL(1,1,1,0) selected based on Schwarz Bayesian Criterion

****

Dependent variable is dLGDPC

37 observations used for estimation from 1982 to 2018

****

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
dLFID	.23913	.13090	1.8268[.077]
dLINV	.099168	.043791	2.2646[.031]
dLPG	-.19939	.068279	-2.9202[.006]
dT	-.0063846	.0017750	-3.5970[.001]
ecm(-1)	-.17470	.084947	-2.0566[.048]

****

List of additional temporary variables created:

dLGDPC = LGDPC-LGDPC(-1)

dLFID = LFID-LFID(-1)

dLINV = LINV-LINV(-1)

dLPG = LPG-LPG(-1)

dT = T-T(-1)

ecm = LGDPC -3.6886*LFID + .39370*LINV + 1.1413*LPG -6.9422*C + .0365

46*T

****

R-Squared	.72496	R-Bar-Squared	.65857
S.E. of Regression	.014013	F-Stat. F(5,31)	15.2879[.000]
Mean of Dependent Variable	.0020324	S.D. of Dependent Variable	.023981
Residual Sum of Squares	.0056944	Equation Log-likelihood	109.9143
Akaike Info. Criterion	101.9143	Schwarz Bayesian Criterion	95.4706
DW-statistic	2.3863		

****

d)

Error Correction Representation for the Selected ARDL Model

ARDL(1,1,0,0) selected based on Schwarz Bayesian Criterion

```
*******************************************************************************
Dependent variable is dLGDPC
37 observations used for estimation from 1982 to 2018
*******************************************************************************
Regressor          Coefficient      Standard Error       T-Ratio[Prob]
dLFIE               .052036          .043321           1.2012[.239]
dLINV               .023627          .044397           .53219[.598]
dLPG               -.13361           .089483          -1.4931[.146]
dT                .1769E-3          .8213E-3          .21537[.831]
ecm(-1)            -.22513           .084703          -2.6579[.012]
*******************************************************************************
List of additional temporary variables created:
dLGDPC = LGDPC-LGDPC(-1)
dLFIE = LFIE-LFIE(-1)
dLINV = LINV-LINV(-1)
dLPG = LPG-LPG(-1)
dT = T-T(-1)
ecm = LGDPC   -.70506*LFIE   -.10495*LINV +   .59347*LPG   -7.6622*C -.7857E-3
*T
*******************************************************************************
R-Squared                    .62436   R-Bar-Squared                .54923
S.E. of Regression           .016101   F-Stat.   F(5,31)      9.9727[.000]
Mean of Dependent Variable   .0020324   S.D. of Dependent Variable     .023981
Residual Sum of Squares      .0077772   Equation Log-likelihood       104.1475
Akaike Info. Criterion       97.1475   Schwarz Bayesian Criterion     91.5093
DW-statistic                 1.8153
*******************************************************************************
```

A4. Diagnostic Checks: Structural breaks

Multiple breakpoint tests
Bai-Perron tests of L+1 vs. L sequentially determined breaks
Date: 10/23/21 Time: 15:03
Sample: 1975 2019
Included observations: 45
Breaking variables: DCRDFS DCRDP GFCF2 POP C
Break test options: Trimming 0.15, Max. breaks 5, Sig. level 0.05

Sequential F-statistic determined breaks: 4

Break Test	F-statistic	Scaled F-statistic	Critical Value**
0 vs. 1 *	28.24372	141.2186	18.23
1 vs. 2 *	5.191994	25.95997	19.91
2 vs. 3 *	4.240203	21.20102	20.99
3 vs. 4 *	5.097134	25.48567	21.71
4 vs. 5	1.176386	5.881929	22.37

* Significant at the 0.05 level.
** Bai-Perron (Econometric Journal, 2003) critical values.

Break dates:

	Sequential	Repartition
1	1999	1983
2	2008	1991
3	1984	1999
4	1991	2008

A5. Results with Dummy Variables.

Estimated Long Run Coefficients using the ARDL Approach
ARDL(1,1,1,1) selected based on Akaike Information Criterion
Dependent variable is LGDPC
38 observations used for estimation from 1981 to 2018

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
LFI	2.3182	2.2216	1.0435[.307]
LINV	-.54998	.75674	-.72678[.474]
LPG	-.21557	2.1643	-.099605[.921]
C	13.8578	36.2900	.38186[.706]
T	-.025860	.068040	-.38007[.707]

D84	.35244	.36910	.95487[.349]
D91	.091646	.11242	.81524[.423]
D99	.13239	.18418	.71882[.479]
D08	.011994	.098917	.12125[.904]

Error Correction Representation for the Selected ARDL Model
ARDL(1,1,1,1) selected based on Akaike Information Criterion
Dependent variable is dLGDPC

38 observations used for estimation from 1981 to 2018

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
dLFI	.18271	.089921	2.0319[.052]
dLINV	.12007	.047787	2.5125[.018]
dLPG	-3.8615	1.0551	-3.6599[.001]
dT	-.0039662	.0074921	-.52939[.601]
dD84	.054055	.015661	3.4516[.002]
dD91	.014056	.014322	.98144[.335]
dD99	.020306	.016805	1.2083[.237]
dD08	.0018395	.015336	.11995[.905]
ecm(-1)	-.15337	.13925	-1.1014[.280]

Estimated Long Run Coefficients using the ARDL Approach
ARDL(1,1,1,1) selected based on Akaike Information Criterion
Dependent variable is LGDPC

38 observations used for estimation from 1981 to 2018

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
LFID	1.4408	.65213	2.2094[.035]
LINV	-.14765	.17823	-.82839[.414]
LPG	-2.1026	.53893	-3.9014[.001]
C	45.6503	9.1661	4.9803[.000]
T	.024446	.012440	1.9651[.059]
D84	.12026	.079734	1.5083[.143]

ARDL(1,1,1,1) selected based on Akaike Information Criterion
Dependent variable is dLGDPC

38 observations used for estimation from 1981 to 2018

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
dLFID	.16621	.11962	1.3895[.175]
dLINV	.14390	.039777	3.6176[.001]
dLPG	-4.4014	.99080	-4.4423[.000]
dT	.0079912	.0058941	1.3558[.185]
dD84	.039312	.014875	2.6428[.013]
ecm(-1)	-.32689	.13634	-2.3975[.023]

Estimated Long Run Coefficients using the ARDL Approach
ARDL(1,1,1,1) selected based on Akaike Information Criterion
Dependent variable is LGDPC

38 observations used for estimation from 1981 to 2018

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
LFIE	.43008	.28897	1.4883[.148]
LINV	-.075893	.21791	-.34827[.730]
LPG	-1.9774	.82655	-2.3923[.024]
C	43.0526	14.1150	3.0501[.005]
T	.035757	.014234	2.5121[.018]
D84	.18734	.14168	1.3222[.197]

Error Correction Representation for the Selected ARDL Model
ARDL(1,1,1,1) selected based on Akaike Information Criterion
Dependent variable is dLGDPC

38 observations used for estimation from 1981 to 2018

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
dLFIE	.051196	.038310	1.3364[.191]
dLINV	.10856	.047897	2.2664[.031]
dLPG	-3.1593	1.2466	-2.5343[.017]
dT	.0087289	.0062224	1.4028[.171]
dD84	045733	.016189	2.8250[.008]
ecm(-1)	-.24412	.13722	-1.7790[.085]

A6. Model stability: CUSUM of Squares test results

Figure 1: CUSUM from LDCRDFS Results

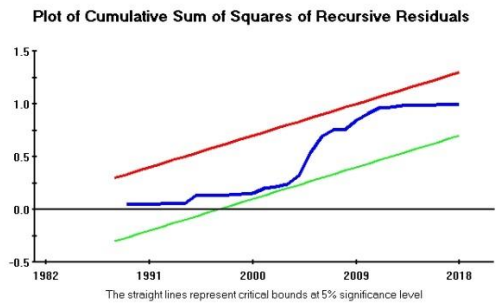

Figure 2: CUSUM from LSTRD Results

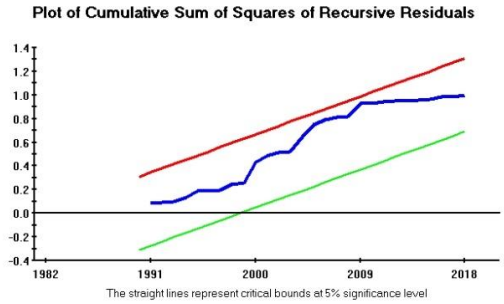

Figure 2:CUSUM from LFI Results

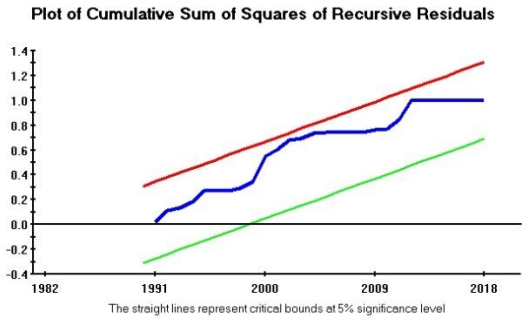

Figure 4: CUSUM from LFM Results

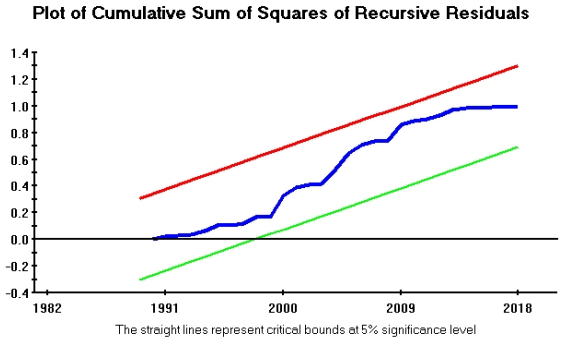

Figure 3: CUSUM from LFID Results

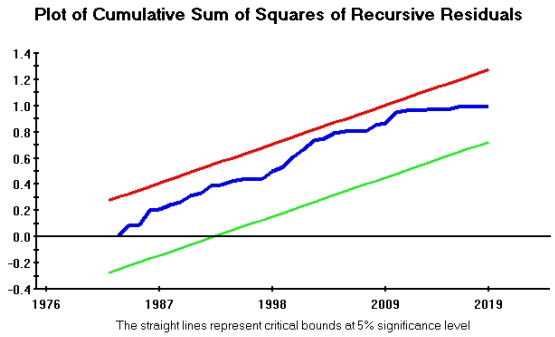

Figure 6: CUSUM from LFIE Results