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South Africa's Financial Development and its Role in Investment

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Abstract: This study investigates the impact of financial development on investment in South Africa between 1976 and 2014. The model estimated is based on the flexible accelerator investment model. Composite indices for bank-based and market-based financial development indicators are used as explanatory variables. The estimated model postulates that both bank-based financial development and market-based financial development have an accelerator-enhancing effect on investment. Results show that market-based financial development has a positive impact on investment in the long run, while bank-based financial development has a negative effect in the short run. Implications are that, for South Africa, market-based financial development has a positive accelerator-enhancing effect on investment in the long run. In contrast, bank-based financial development is found to have a negative accelerator enhancing effect on investment in the short run.

Key words: South Africa, Investment, Bank-based financial development, Market-based financial development, Flexible accelerator model

JEL Classification Codes: G10, G20, E22

1. Introduction

Empirical economic research on the effect of bank-based and market-based financial development on investment has been relatively limited and has been concentrated on panel data studies. Furthermore, the generally accepted consensus is that financial development has a positive impact on investment. This notion is

mainly explained by the attested emphasis on the effect of financial development on economic growth, without evaluating the relationship between finance and investment. However, theory seems to validate the view that financial development affects economic growth through its impact on investment.

When assessing the views and agenda of financial development and economic growth, Levine (1997) concurred that financial development affects economic growth through investment. Levine (1997) starts with a review of all the ideas and views of other economists (other than Levine) on the topic. Emphasis is on the effect of financial development on economic growth; whether the effect is plausible; and the direction of causality. Is financial development a fundamental ingredient in achieving greater economic growth? Walter Bagehot (1873), John Hicks (1969), and Joseph Schumpeter (1912) are quoted in support of a positive effect of financial development on economic growth. On the other hand, Joan Robinson (1952) contends that finance is a by-product of economic growth and not the other way round. Also, Levine notes how development economists are sceptical about the role of the financial system and how they have ignored it in their articles. Despite the above arguments, Levine gives his conclusion on the matter hesitantly. He argues that *'the preponderance of theoretical reasoning and empirical evidence suggests a positive, first-order relationship between financial development and economic growth... There is even evidence that the level of financial development is a good predictor of future rates of economic growth, capital accumulation, and technological change'*. Therefore, financial development is taken as a determinant of investment (capital accumulation). Levine adopts Merton and Bodie's (1995) assertions that the primary function of financial systems is facilitating the allocation of resources across space and time in an uncertain environment. The motivation for these functions and their effect on economic growth are then extensively discussed using two channels. These channels are given as capital accumulation and technological innovation, in summary, reiterating again the importance of investment.

The illustrated motivations of financial development are mainly focusing on capital accumulation and technological innovation, which is part and parcel of either private investment or public investment, or both. Hence, there is a need for a summative and conclusive study on the theoretical underpinnings of investment vis-a-vis the construed effects/impact of financial development.

Given the above-mentioned background, this study aims to address the knowledge gap, specifically for South Africa, in modelling and assessing the impact of financial development on investment. In addition, the study adopts time series modelling techniques for a single country to avoid losing individual country-

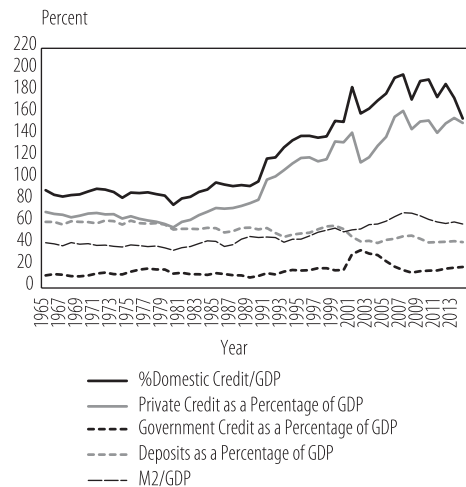
specific characteristics that are usually lost in panel regression. Furthermore, this study's splitting of financial development into bank-based and market-based offers an added advantage in the analysis of the impact of financial development on investment - not to mention the study's associated implications for the conduct of macroeconomic policy in South Africa and/or similar countries. With the help of the less restrictive autoregressive distributed lag (ARDL) bounds testing approach, the study evaluates the impact of bank-based and market-based financial development on investment in South Africa. In addition, the study evaluates whether or not both bank-based and market-based financial developments have an accelerator enhancing effect on investment. The rest of the paper is organised as follows: Section 2 gives an overview of financial development in South Africa. Section 3 gives the related literature review. Section 4 presents the data and methodology. Section 5 gives the empirical results and the discussion of the results, while Section 6 presents the conclusion to the study.

2. Financial Development and Investment Dynamics in South Africa

The dynamics of financial development¹ and investment in South Africa show a progressive trend, especially in the provision of credit by the financial sector.

The level of financial development in South Africa has been improving since the early 1990s. However, not all financial indicators increased sharply between 1990 and 2014. Only domestic credit and private credit increased sharply, rising from below the 100% level to above the 120% level. The M2/GDP ratio increased from 40% in 1965 to 59% in 2014. The government credit to GDP ratio increased from 11% in 1965 to 19% in 2014. However, the share of total deposits as a percentage of GDP decreased from 60% in 1965 to

Figure 1: Trends on Credit, Deposits, and Broad Money



Source: IMF – IFS Statistics Compact Disc, January 2016

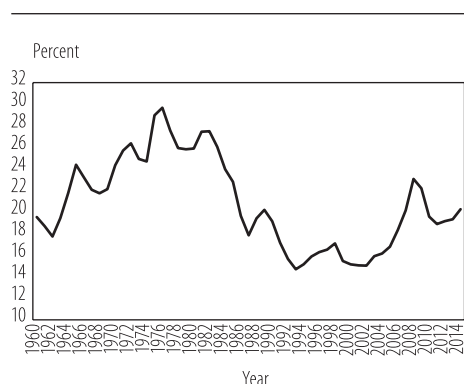
¹ For a full discussion on the evolution of the financial system in South Africa, see Muyambiri & Odhiambo (2014).

42% in 2014. Graph 1 summarises trends of credit, deposits, and broad money for South Africa between 1965 and 2014.

The ratio of domestic credit to GDP is an indicator of financial depth and development. The ratio of domestic credit to GDP and the ratio of private credit to GDP appear to closely mirror each other, which tends to imply that private credit forms a greater part of all forms of domestic credit. On the other hand, deposits in South Africa have decreased from 60% in 1965 to 42% in 2014. Deposits act as a proxy for the supply of loanable funds available to the banks for lending purposes (Dutta & Roy, 2009). A look at the deposits to domestic credit ratio shows an increase in the efficiency of financial intermediaries in credit creation and provides evidence of financial development in the South African economy, especially after 1990 (Muyambiri & Odhiambo, 2014).

On the other hand, investment trends, proxied by the ratio of gross fixed capital formation (GFCF) as a ratio of GDP, show decreasing levels in the later years compared with the earlier years. From 1960 to 1982, the level of domestic investment was increasing. Investment levels increased from 20% in 1960 to 28% in 1982. From 1983 to 2002, investment has been decreasing, reaching 15% in 2002 and eventually increasing from 2003 onwards. A gradual increase from 2003 lasted until the level of investment reached 22% in 2008 after which it started to slump again until it reached 19% by 2012.

Figure 2: Trends in Investment



Source: IMF – IFS Statistics Compact Disc, January 2016

Before the late 1980s, capital investment and employment creation accounted for most of the growth in the economy (Muyambiri & Odhiambo, 2014). In the 1990s, a decline in employment and low investment meant that labour augmentation contributed negatively to growth, and capital investment contributed only weakly to growth (Ramachandran, Clarke, Kaplan, Habyarimana & Ingram, 2007). The strongest contributor to growth in the 1990s was productivity growth due to technological change (Federke, 2005). The trend in investment spending tends to partially follow that of savings as a percentage of GDP. It is probable that these declining annual

investment rates from 1980 onwards may well be ascribed to the low and declining savings rate. Graph 2 shows the trend in investment for South Africa.

Despite some improvements in the investment climate - that is, decreased interest and inflation rates, reduced corporate tax rates, and generally increasing profits - investment rates, although increasing, failed to exceed 24% of GDP between 1994 and 2014 (Muyambiri & Odhiambo, 2014). The probable causes of such below-expectation investment rates may be the unstable exchange rate, which tended to impose high costs on exporters; the high skilled worker labour cost; burdensome labour regulations; and the high cost of crime (Ramachandran, et al., 2007: 2). However, the bulk of the overall decline in the investment effort since the 1970s is due to the reduction in public investment (Rodrik, 2008).

3. Literature review

Financial development, savings, government spending, monetary policy, and many other issues have been taken in most theoretical discussions as underlying factors in the achievement of components required for economic growth. Investment has been taken as one of the fundamental requirements for such economic growth. Furthermore, a number of theories have emerged to explain investment behaviour in developed countries. One of the theories that have been used to explain investment behaviour is the one that is based on the acceleration principle of investment. The principle attests that, *ceteris paribus*, an increase in a country's output will require a proportionate increase in its stock of capital equipment - that is, the level of output or the changes in aggregate demand determines investment or the change in capital stock. The flexible accelerator model is a modification of the accelerator model. The connection between investment and output growth through the accelerator principle has been confirmed by many studies in the economic literature (see Greene & Villanueva, 1991; Ndikumana, 2000; 2005).

On the other hand, financial development has been explained in the theoretical literature as being an important determinant of economic growth through its assumed positive impact on investment or, as Levine (1997) concurs, through its positive effect on capital accumulation and technological innovation. In addition, the works of McKinnon (1973) and Shaw (1973) argued that financial liberalisation would lead to financial development. Financial development was taken to inadvertently raise allocative efficiency through higher savings, deposits, credit provision, and investment.

Despite theory alluding to the relationship between financial development and investment, there is still a need to empirically ascertain the state of the relationship between the two variables. For example, does the need for increased investment induced by output growth cause an increased demand for the functions and products of the financial sector (the accelerator-enhancing effect)? Is financial development a direct determinant of investment?

A limited number of studies have investigated the impact of financial development on investment. Masih (1979), in his study on the role of financial institutions in financing private investment in Pakistan, found private investment to be positively related to the availability of funds rather than to the price of funds (interest rates). Masih (1979) used the following variables: long-term loans and investments of all financial institutions to private large-scale manufacturing sector, long-term loans and investments of all financial institutions to the entire private sector, total loans, total deposits, demand deposits, time deposits, gross private fixed investment (large-scale manufacturing sector), gross private fixed investment (whole private sector), borrowings from the State Bank of Pakistan, holdings of securities, loans to the government by banks, deficit financing by the government, a dummy variable for change in government, and excess liquid-asset holdings by banks. The methodology employed was ordinary least squares supported by structural equation modelling. In a later study for the same country (Pakistan), Ali, Shamsi, Panhwar & Bashir, R (2013) asserted that financial development positively impacts on domestic private investment. Ali et al. (2013) empirically investigated the relationship between financial sector development and domestic private investment in Pakistan. The study made use of ordinary least squares, using domestic private investment, real per capita GDP, terms of trade, liquid liabilities, bank asset ratio, and private sector credit to GDP as variables. Credit to private sector and liquid liabilities were found to be the most significant factors affecting investment.

In their study on 80 countries, King & Levine (1993) found that financial development indicators had a positive and significant impact on investment. Their methodology was based on simple correlations, cross-country regressions, and sensitivity analyses. The financial development indicators used in their study were the ratio of liquid liabilities of the financial system to GDP, the ratio of deposit money bank domestic assets to deposit money bank domestic assets plus central bank, domestic assets, the ratio of claims on the nonfinancial private sector to total domestic credit (excluding credit to money banks), and the ratio of claims on the nonfinancial private sector to GDP. The level of investment was measured by the rate of physical capital accumulation and the ratio of gross national investment divided by output.

Rousseau (1999), with the aid of time series econometric techniques, found that expansion of the financial superstructure played a leading role in the rapid expansion of output and investment in Japan. However, Rousseau (1999) avoided the standard financial development indicators. The model estimate made use of non-intermediary holdings of corporate stocks and bonds, GNP per capita, currency in circulation, mid-year population, assets of insurance companies, loan agricultural cooperatives, assets of savings institutions, assets of special banks, and assets of commercial banks. For measuring investment, gross domestic fixed investment and private domestic fixed investment were utilised.

Xu (2000) validated the importance of investment as an important channel through which financial development affects growth. Xu (2000) studied 41 countries as he assessed financial development, investment, and economic growth. The study made use of real GDP, real domestic investment, the index of financial development, liquid liabilities/GDP, and total bank deposits/GDP.

Valderrama (2003), in his study on the relationship between banking structure and investment in Austria, found that financial variables (specifically the liquid-assets-to-capital-ratio) were important determinants of investment, even more important than the user cost of capital. The variables used in the study were the cash level, a deflator of gross investment, the user cost of capital, the ratio of liquid assets to capital, liquidity ratios, and bank size.

Finance (2004) studied the interrelationships between asset-based financing, investment, and economic growth in Canada. With the aid of an exploratory approach, the study made use of several financial development indicators, investment indicators, and growth indicators. Financial services development, including, for the first time, asset-based financing, were found to raise investment.

Uçan & Öztürk (2011) evaluated the financial determinants of investment for Turkey. The variables employed in this study were the total gross domestic investment as a percentage of the gross domestic product (GDP), private domestic investment as a percentage of GDP, real per capita gross domestic product, growth rate of GDP deflator, and discount rate (real interest rate). The financial development indicators included total credit to the private sector as a percentage of GDP and claims on government as a percentage of GDP. The ratio of broad money to GDP was used as a measure of the size of the financial sector. The relative importance of banks in the supply of credit was measured by the total domestic credit provided by the banking sector as a percentage of GDP. A composite index of financial development was also employed. Results from the study indicate that there is a positive relationship between total domestic investment and all four in-

dicators of financial development, as measured by the composite index of financial development items. The results, though similar in nature for total domestic investment and private investment, suggest stronger effects of financial factors on private investment than on total domestic investment. The findings also suggest that high financial development is a predictor of future levels of domestic investment. In addition, real interest rates were found to negatively affect total domestic investment.

Hassan (2015) evaluated the impact of monetary policy on private capital formation in Nigeria. Although the study's main focus was not the interaction between financial development and investment, the results showed that money supply (measured by M2) and domestic credit to the private sector had a positive, significant impact on private investment. Hassan (2015) made use of the gross domestic product growth rate, exchange rate, liquidity ratio, money supply and domestic credit to private sector, interest rate, monetary policy rate, and the cash reserve ratio, using the ordinary least square multiple regression technique.

In his study on financial determinants of domestic investment in 30 countries in sub-Saharan Africa, Ndikumana (2000) found, with the aid of panel regression, a positive relationship between domestic investment (total investment and private investment) and various indicators of financial development. The variables employed in the panel regression were the real per capita gross domestic product (GDP) and gross national product per capita (GNP), the growth rate of the GDP deflator, total gross domestic investment and private investment as a percentage of GDP, the ratio of total liquid liabilities of the financial system (M3) to GDP, total credit to the private sector as a percentage of GDP, total domestic credit provided by the banking sector as a percentage of GDP, claims on government and other public entities as a percentage of GDP, and a composite index of financial development. In addition, he assumed an accelerator-enhancing relationship between investment and financial development.

Of all the studies discussed so far, only Ndikumana (2000) assessed the accelerator enhancing effect of financial development on investment, with the aid of panel regression. Some of the studies evaluated were not focused on the impact of financial development on investment but mainly on the finance to growth relationship. The main drawback of Ndikumana's (2000) study is the use of panel data, which tends to mask individual country characteristics. In addition, for all the studies, there was no division of financial development into bank-based and market-based financial development in order to assess the effect of each of these variables on investment. However, the general consensus from the aforemen-

tioned discussion is that financial development seems to have a positive impact on investment.

Lahcen (2004) assessed the impact of financial liberalisation on savings, investment, and growth and found the existence of a negative effect of financial depth on private investment. The study involved five Middle East and North African (MENA) countries, that is, Egypt, Jordan, Morocco, Tunisia, and Turkey. The explanatory variables that Lahcen (2004) employed were the total liquid liabilities of financial intermediaries as a percentage of GDP; deposit money banks assets as a share of total assets; private credit by deposit money banks to GDP; private credit by deposit money banks to total domestic credit; and a financial liberalisation index constructed on the basis of the eight main dimensions of financial reforms instituted in the MENA countries. The bulk of the studies reviewed attest to the existence of a positive effect of financial development on investment.

4. Data and Methodology

The main data source was the World Development Indicators (World Bank, 2016). All the series were obtained from this source. The study used data for the period from 1976 to 2014.

4.1 Formulation of the General Model

Following the lead of Ramirez (1994), one can proceed to estimate a flexible accelerator model that captures the interplay between investment and financial development. The flexible accelerator model postulates that the desired capital stock K_t^* is proportional to the level of expected output Y_t^* .

$$K_t^* = \alpha Y_t^* \quad 1$$

Where K_t^* is the capital stock that the economy desires to have in period t , and Y_t^* is the expected level of output in period t .

The actual stock of capital is assumed to adjust to the difference between the desired stock in period t and the actual stock in the previous period $t - 1$:

$$\Delta INV_t = \beta (INV_t^* - INV_{t-1}) \quad 2$$

or

$$INV_t = \beta INV_t^* + (1 - \beta) INV_{t-1} \quad 3$$

β is the coefficient of adjustment where $0 \leq \beta \leq 1$

If $\beta = 1$ then there is instantaneous adjustment of capital stock to its desired level; otherwise if $\beta = 0$ no adjustment takes place at all.

ΔINV_t is the change in the actual domestic investment between 2 periods, that is, net domestic investment.

In gross terms, the gross investment (GI) is given by:

$$INV_t^* = \Delta K_t^* + \lambda K_{t-1}^* \quad 4$$

That is, change in the actual capital stock, ΔK_t^* , in a period plus replacement investment ΔK_{t-1}^* , where λ is the rate of depreciation of the private capital stock.

Since $\Delta K_t^* = K_t^* - K_{t-1}^*$ then

$$INV_t^* = K_t^* - K_{t-1}^* + \lambda K_{t-1}^* \quad 5$$

Using lag operator notation

$$INV_t^* = [1 - (1 - \lambda)L]K_t^* \quad 6$$

Where L is the lag operator and is defined as, $LK_t^* = K_{t-1}^*$. Inverting equation 5, we can relate the stock of capital to the level of gross domestic investment

since $\Delta INV_t = \beta(INV_t^* - INV_{t-1})$; from 2

$$\Delta INV_t = \beta[1 - (1 - \lambda)L]K_t^* - INV_{t-1} = INV_t - INV_{t-1} \quad 7$$

$$INV_t = \beta[1 - (1 - \lambda)L]K_t^* - (1 - \beta)INV_{t-1} \quad 8$$

Substituting for K_t^* as given in equation 1 gives

$$INV_t = \alpha\beta[1 - (1 - \lambda)L]Y_t^* - (1 - \beta)INV_{t-1} \quad 9$$

Therefore, we can use equation 9 to specify desired investment not only as a function of the desired level of real output but also as a function of a number of other variables, such as gross savings, and bank based and market based financial development, among others. The desired level of real output can be estimated as the resulting growth in the real per capita GDP of the previous year. That is, since equations 5 and 6 show that gross domestic investment is dependent on lags of desired capital stock, which is in turn estimated as a function of desired output

growth in equation 9, it is safe to say - to a particular extent - that the previous year's output growth rate is a good estimator of the following year's expected growth². In addition, to test the accelerator effect of financial development on investment, there is a need to come up with a variable that associates the change in economic growth and financial development with investment - that is, the output growth rate multiplied by the financial development indicator (Ndikumana, 2000: 391).

Therefore, the general model to be estimated is given as:

$$INV_t = \rho_0 + \rho_1 DRO_t + \rho_2 BFA_t + \rho_3 MFA_t + \rho_4 RRI_t + \rho_5 GDS_t + \rho_6 INV_{t-1} + \varepsilon_t \quad 10$$

Where INV – is the annual growth rate of the gross fixed capital formation (a proxy for the level of domestic investment), DRO is the growth rate of real per capita GDP (a proxy for the rate of growth of the desired level of real output), BFA is the accelerator interaction term for bank-based financial development, MFA is the accelerator interaction term for market-based financial development, RRI is the real interest rate, GDS is the gross domestic savings, and ε is the error term.

Equation 10 hypothesises that financial development enhances the effects of changes in aggregate demand, which is translated as a change in aggregate output. Therefore, higher financial developments are supplemented by stronger accelerator effects.

The indices for the bank-based and market-based financial development accelerator terms were calculated using the following formula (see Ndikumana, 2000):

$$BFA_{t-1} = \left(\frac{1}{m} \sum_{j=1}^m \frac{BF_{j,t}}{\overline{BF}_j} \right) \times DRO_{t-1} \quad 11$$

Where BF is a financial development indicator and DRO is the desired output growth.

Three indicators of bank-based financial development were used to calculate the accelerator interaction term for bank-based financial development. The same number of indicators was used to calculate the accelerator interaction term for market-based financial development. Liquid liabilities as a ratio of GDP (M3),

² There is no need to account for depreciation exogenously because the assumption here is that all increases in GDP per capita arise from changes in the capital stock plus replacement capital (see equation 5).

domestic credit to private sector as a ratio of GDP, and claims on central government as a ratio of GDP were used to calculate the composite bank-based financial development index. Stocks traded; total value as a percentage of GDP; market capitalization of listed companies as a ratio of GDP; and stocks traded, turnover ratio (%) were used to calculate the composite market-based financial development index.

4.2. The Associated ARDL Model

The auto regressive distributed lag (ARDL) bounds testing approach was utilised to examine the cointegration relationship between financial development and investment. The ARDL bounds testing procedure was used because it assumes gradual adjustment (due to distributed lags and inclusion of earlier values of the dependent variable) of investment, as also postulated by the flexible accelerator.

The ARDL representation of the cointegration test equation to be tested is therefore expressed as:

$$\begin{aligned} \Delta INV_t = & \alpha_0 + \sum_{i=0}^n \alpha_{1i} \Delta DRO_{t-i} + \sum_{i=0}^n \alpha_{2i} \Delta BFA_{t-i} + \sum_{i=0}^n \alpha_{3i} \Delta MFA_{t-i} + \sum_{i=0}^n \alpha_{4i} \Delta RRI_{t-i} \\ & + \sum_{i=0}^n \alpha_{5i} \Delta GDS_{t-i} + \sum_{i=1}^n \alpha_{6i} \Delta INV_{t-i} + \sigma_1 DRO_{t-1} + \sigma_2 BFA_{t-1} + \sigma_3 MFA_{t-1} \\ & + \sigma_4 RRI_{t-1} + \sigma_5 GDS_{t-1} + \sigma_6 INV_{t-1} + \mu_{1t} \end{aligned} \quad 12$$

Where all other variables are as defined, Δ is the difference operator, α_0 is a constant, ξ_p , $\alpha_{i,1} - \alpha_{i,6}$ and $\sigma_{i,1} - \sigma_{i,6}$ are the respective coefficients, and μ_{1t} is the error term.

The variables in equation 12 are first subjected to a cointegration test to establish whether there is a long-run equilibrium relationship. The null hypothesis of no cointegration relationship, that is:

$$H_0: \sigma_1 = \sigma_2 = \sigma_3 = \sigma_4 = \sigma_5 = \sigma_6 = 0 \quad 13$$

is tested against the alternative hypothesis of the existence of a cointegration relationship:

$$H_1: \sigma_1 \neq \sigma_2 \neq \sigma_3 \neq \sigma_4 \neq \sigma_5 \neq \sigma_6 \neq 0 \quad 14$$

The null hypothesis indicates the non-existence of the long-run relationship. The calculated F-statistic is validated against the lower and upper bound critical values (see Pesaran et al., 2001: 300).

If the variables included in equation 2 are found to be cointegrated, the following error-correction model will be estimated:

$$\begin{aligned} \Delta INV_t = & \alpha_0 + \sum_{i=0}^n \alpha_{1i} \Delta DRO_{t-i} + \sum_{i=0}^n \alpha_{2i} \Delta BFA_{t-i} + \sum_{i=0}^n \alpha_{3i} \Delta MFA_{t-i} + \sum_{i=0}^n \alpha_{4i} \Delta RRI_{t-i} \\ & + \sum_{i=0}^n \alpha_{5i} \Delta GDS_{t-i} + \sum_{i=1}^n \alpha_{6i} \Delta INV_{t-i} + \xi_1 ECM_{t-1} + \mu_t \end{aligned} \quad 15$$

Where all other variables are as defined, ECM is the error correction term and μ_t is the residual term.

The speed of adjustment parameter (the lagged error-correction term, ξ_1) was expected to be statistically significant and negative to further substantiate the existence of a cointegration relationship.

5. Empirical Results

5.1 Stationarity Tests

In this study, the Augmented Dickey-Fuller Generalised Least Square, Perron (1997) PPUroot, and Ng-Perron Modified unit root tests were used to confirm that the variables under discussion were at most integrated of order 1. The confirmation of the order of integration of less than or equal to one ensures that the ARDL bounds test is an appropriate estimation technique. The test results of the variables in levels and in first differences are shown in Table 1.

Table 1: Stationarity Tests

	Dickey-Fuller Generalised Least Square (DF-GLS)			
	Stationarity in levels		Stationarity in differences	
	No trend	Trend	No trend	Trend
INV	-1.164	-1.710	-3.279***	-4.516***
DRO	-3.870***	-4.097***	-	-
BFA	-1.569	-2.089	-2.371**	-3.883**
MFA	-1.588	-2.083	-5.201***	-5.249***
RRI	-1.329	-1.404	-4.297***	-4.316***
GDS	-1.168	-1.739	-4.636***	-4.760***

Table 1: Stationarity Tests - continuing

Perron (1997) Unit Root Test (PPURoot)				
	Stationarity in levels		Stationarity in differences	
	No trend	Trend	No trend	Trend
INV	-3.546	-4.546	-5.231**	-5.324*
DRO	-4.422	-4.537	-5.503**	-5.501*
BFA	-4.391	-4.583	-6.451***	-6.413***
MFA	-4.615	-4.789	-7.067***	-7.606***
RRI	-4.065	-5.005	-5.417**	-5.306*
GDS	-3.763	-5.101	-7.579***	-7.626***
Ng-Perron Modified Unit Root Test				
MZa				
Variable	Stationarity in levels		Stationarity in differences	
	No trend	Trend	No trend	Trend
INV	-2.835	-7.426	-12.751**	-31.515***
DRO	-5.255	-13.557	-18.261***	-17.770***
BFA	-5.238	-15.166*	-18.15***	-17.544**
MFA	-12.710**	-14.177*	-	-
RRI	-2.382	-3.429	-17.382***	-17.385***
GDS	-5.918*	-316.347***	-	-
MSB				
Variable	Stationarity in levels		Stationarity in differences	
	No trend	Trend	No trend	Trend
INV	0.406	0.246	0.196**	0.126***
DRO	0.308	0.191	0.165***	0.167**
BFA	0.309	0.180*	0.166***	0.168**
MFA	0.198**	0.186*	-	-
RRI	0.457	0.371	0.169***	0.169**
GDS	0.277*	0.040***	-	-
MZt				
Variable	Stationarity in levels		Stationarity in differences	
	No trend	Trend	No trend	Trend
INV	-1.151	-1.828	-2.499**	-3.967***
DRO	-1.619	-2.590	-3.022***	-2.976**
BFA	-1.616	-2.734*	-3.012	-2.956**
MFA	-2.519**	-2.631*	-	-
RRI	-1.091	-1.274	-2.946***	-2.947**
GDS	-1.642*	-12.574***	-	-
MPT				
Variable	Stationarity in levels		Stationarity in differences	
	No trend	Trend	No trend	Trend
INV	8.523	12.457	2.023**	2.909***
DRO	4.664	6.797	1.341***	5.227**
BFA	4.682	6.120	1.349***	5.227**
MFA	1.935**	6.611*	-	-
RRI	10.279	25.91	1.415***	5.247**
GDS	4.378*	0.294***	-	-

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

The ARDL bounds test is applicable since the results reported in Table 1 show that the variables are confirmed to be stationary either in levels or in first differences.

5.2 Cointegration and ARDL-ECM Results

The long-run relationship amongst the variables in the general model was examined using the ARDL bounds testing procedure. The results of the Bounds F-test are reported in Table 2.

Table 2: Bounds F-Test for Cointegration

Dependent Variable	Function		F-Statistic	Cointegration Status		
INV	F(INV DRO, BFA, MFA, RRI, GDS)		5.2406***	Cointegrated		
Asymptotic Critical Values						
	1%		5%		10%	
Pesaran et al 2001:300 Table	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
CI(iii) Case III	3.41	4.68	2.62	3.79	2.26	3.35

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

The F-test results suggest that there is a long run relationship between INV, DRO, BFA, MFA, RRI, and GDS. The estimation of the ARDL model was done with the aid of the Schwarz Bayesian Criterion (SIC) in order to choose the optimal lag. The Schwarz Bayesian Criterion was used because it was more parsimonious than the Akaike Information Criterion. The structure of the model chosen with the aid of the SIC is ARDL (1,0,0,1,0,0). The long-run coefficients are reported in Table 3 while those for the short run are reported in Table 4.

Table 3: Estimated Long-Run coefficients

MODEL 1: Estimated Long-Run Coefficients				
ARDL (1,0,0,1,0,0) selected based on Schwarz Bayesian Criterion				
Dependent variable is INV				
Regressor	Coefficient	Standard Error	T-Ratio	Prob. Values
DRO	3.0081	1.8662	1.6119	0.127
BFA	-1.3979	0.88335	-1.5825	0.133
MFA	0.53800**	0.20569	2.6156	0.019
RRI	0.21017	0.20186	1.0412	0.313
GDS	0.97442**	0.37593	2.5920	0.020
C	-4.6960	8.4291	-0.55712	0.585

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

Table 4: Error Correction Representation

MODEL 1: Error Correction Representation for the Selected ARDL Model				
ARDL(1,0,0,1,0,0) selected based on Schwarz Bayesian Criterion				
Dependent variable is dINV				
Regressor	Coefficient	Standard Error	T-Ratio	Prob. Values
dDRO	0.77602**	0.41732	1.8596	0.080
dBFA	-0.36064*	0.20395	-1.7683	0.095
dMFA	0.059806	0.038930	1.5362	0.143
dRRI	0.054219**	0.047547	1.1403	0.270
dGDS	0.25138**	0.098213	2.5595	0.020
ecm(-1)	-0.25798***	0.079019	-3.2647	0.005
R-Squared	0.93480		R-Bar-Squared	0.90627
DW-statistic	2.2270			

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

The long-run results reported in Table 3 show that the coefficient for market-based financial development is statistically significant and positive. The coefficient for bank-based financial development was found to be statistically insignificant. The coefficient for savings is statistically significant and positive.

However, the estimated short-run function, as presented in Table 4, has a statistically significant and negative coefficient for bank-based financial development. The coefficient for market-based financial development was found to be statistically insignificant in the short run. However, coefficients for the desired output growth and savings are statistically significant and positive.

The results of both long-run and short-run estimated functions show statistical significance of the effect of either type of financial development on investment. Therefore, there is a confirmed accelerator-enhancing effect of financial development on investment. Specifically, market-based financial development has a positive effect on investment in the long run, while bank-based financial development has a negative effect on investment in the short run. This implies that an increase in market-based financial development leads to an increase in investment only in the long run.

On the other hand, an increase in bank-based financial development leads to a decrease in the level of investment in the short run. These relationships are based on the attestation that both types of financial development affect investment through output changes (accelerator effects).

Consequently, bank-based financial development has a negative accelerator-enhancing effect on investment in the short run, while market-based financial development has a positive accelerator enhancing effect in the long run. Given the results, policy should focus on encouraging and expanding market-based financial development so as to positively impact investment in the long run.

Savings is statistically significant and positive, both in the short run and in the long run. The desired output growth was only found to be significant and positive in the short run. Therefore, savings are a positive determinant of investment in South Africa, both in the long run and in the short run, while the desired output growth has only positive short-run effects. The real interest rate was found to be statistically insignificant, both in the short run and in the long run. The coefficient for the ECM (-1) is negative and statistically significant, as expected. The estimated model passed all the diagnostic tests (see Table 5) performed for serial correlation, functional form, normality, and heteroscedasticity.

Table 5: ARDL – VECM Diagnostics Tests

Test Statistics	LM Version	Prob. Values	F Version	Prob. Values
A: Serial Correlation	0.63129	0.427	0.405211	0.534
B: Functional Form	0.81136	0.368	0.52484	0.480
C: Normality	0.68833	0.709	Not applicable	
D: Heteroscedasticity	0.091366	0.762	0.084072	0.775

In addition, the Cumulative Sum of Recursive Residuals (CUSUM) and the Cumulative Sum of Squares of Recursive Residuals (CUSUMQ) in Figures 1 and 2, respectively, shows that both models are stable and confirm stability of the long-run coefficients for the regressors at the 5% level of significance.

Figure 3: Plot of Cumulative Sum of Recursive Residuals

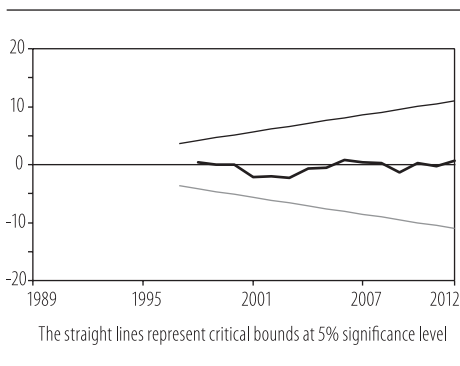
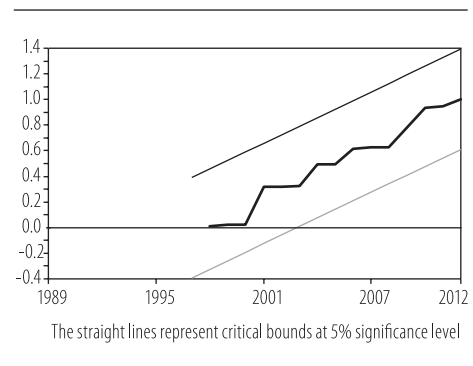


Figure 4: Plot of Cumulative Sum of Squares of Recursive Residuals



6. Conclusion

This paper investigated the accelerator-enhancing effects of bank-based and market-based financial development on investment in South Africa between 1976 and 2014. Financial development was split into bank-based financial development and market-based financial development. Amongst other variables, composite indices for bank-based and market-based financial development indicators were used as explanatory variables. The ARDL bounds testing procedure was employed to evaluate the relationship between investment and financial development. Both types of financial development were found to have statistically significant effects on investment. Market-based financial development was found to have a positive effect on investment in the long run, while bank-based financial development had a negative effect on investment in the short run. These results imply that, in South Africa, bank-based financial development has a negative accelerator enhancing effect on investment in the short run, while market-based financial development has a positive accelerator enhancing effect in the long run. In other words, the impact of financial development on investment is determined by changes in desired output. These results imply that it is market-based financial development rather than bank-based financial development that plays a significant, positive, long-run role in propelling South Africa's investment.

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