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FINANCIAL DEVELOPMENT, SAVINGS AND INVESTMENT IN SOUTH AFRICA: A DYNAMIC CAUSALITY TEST

Brian Muyambiri[1] and Nicholas M. Odhiambo

Abstract

This study investigates the causal relationship between financial development and investment in South Africa during the period from 1976 to 2014. The study incorporates both bank-based and market-based segments of financial sector development. In addition, composite indices for bank-based and market-based financial development indicators are used as explanatory variables. The study incorporates savings as an intermittent variable – thereby creating a simple trivariate Granger-causality model. Using the ARDL bounds testing approach to cointegration and the ECM-based Granger-causality test, the study finds a unidirectional causal flow from investment to financial development, but only in the short run. In the long run, the study fails to find any causal relationship between financial development and investment. These results apply irrespective of whether bank-based or market-based financial development is used as a proxy for financial sector development. The findings of this study have important policy implications.

1. Introduction

The argument about the direction of causality between financial development and investment has not been well investigated. However, from the limited empirical studies that have been performed, four main suppositions have emerged: i) financial

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development Granger-causes investment; ii) investment Granger-causes financial development; iii) there is bidirectional causality between financial development and investment; and iv) no causal relationship exists between the two variables.

The first and most popular empirical finding is that financial development Granger-causes investment. Studies that support this assertion include Rousseau (1999), Xu (2000), Caporale *et al.* (2004, 2005), Rousseau and Vuthipadadorn (2005), Chaudry (2007), Carp (2012), Hamdi *et al.* (2013), and Asongu (2014). Of these studies, only Caporale *et al.* (2004, 2005) and Carp (2012) used market-based financial development indicators. Rousseau (1999), Xu (2000), Rousseau and Vuthipadadorn (2005), Hamdi *et al.* (2013), and Asongu (2014) used only bank-based financial development indicators in their analysis. Chaudry (2007) used both bank-based and market-based financial indicators to evaluate the same causal relationship.

Odhiambo (2010), however, found that investment Granger-causes financial development. Odhiambo (2010) studied the finance--investment--growth nexus in South Africa with the aid of an ARDL-bounds testing procedure. The author used three proxies to measure the level of financial development. These included liquid liabilities/GDP, private credit/GDP, and M2/GDP.

Studies that found the existence of bidirectional causality between financial development and investment include Shan *et al.* (2001), Shan and Jianhong (2006), Lu *et al.* (2007), Nazlioglu *et al.* (2009), and Huang (2011). The findings of Majid

(2008), Shan and Morris (2002), and Marques *et al.* (2013) support the hypothesis that there is no causal relationship between financial development and investment. However, no studies that have investigated the causal relationship between financial development and investment have made use of composite indices.

Although Odhiambo (2010) investigated the causal relationship between financial development and investment in South Africa, the study did not take into account the market-based side of financial development. In addition, Odhiambo (2010) did not make use of composite indices to check on the result of the individual measures of bank-based financial development.

This study diverges from the bulk of the aforementioned studies in a number of ways. First, it splits financial development into bank-based and market-based components and examines the causal flow between each component and investment. The aforementioned studies failed to make such a distinction. Second, unlike the bulk of previous studies that used one or a few indicators of bank-based financial development, which might not sufficiently capture the breadth and depth of a financial sector, this study makes use of both a bank-based financial development index and a market-based financial development index from a number of bank-based and market-based financial indicators, respectively. Third, this study adopts a trivariate Granger-causality framework that has been postulated to produce relatively bias-free estimates and robust results as compared to the rather popular bivariate framework. Savings are taken as the control variable. In addition, following in the steps of Ndikumana (2000), this study assumes an accelerator-enhancing relationship

between both bank-based financial development and market-based financial development, and investment.

Compared to the other countries in Southern Africa, South Africa's financial development[2] is unparalleled. Several historical milestones have contributed to the success story of South Africa. These include the gold-related economic boom of 1980; financial liberalisation, which started in 1980; the change of government in 1994; international acceptance; opening of the economy; purposeful management of monetary policy; decreased inflation levels; and increased banking supervision and regulation standards (Muyambiri and Odhiambo, 2014).

The rest of the paper is organised as follows: Section 2 presents the trends in financial development, savings and investment in South Africa, Section 3 presents the data and the methodology; Section 4 gives the empirical results and the discussion of the results; while Section 5 presents the conclusion to the study.

2. Financial Development, Savings and Investment in South Africa

The advancement of the financial sector and investment in South Africa follow a peculiar trend. The trend is peculiar, because of the existing background during its proliferation. South Africa, in the late 1960s up to the late 1970s, was reeling under intensive international and regional pressure due to apartheid. Therefore, to avert capital flight and to maintain economic stability, repressive financial policies were

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[2] For a full discussion of South Africa's financial development and its chronological evolution, see Muyambiri and Odhiambo (2014).

adopted (Muyambiri and Odhiambo, 2014). However, after the de Kock Commission reports of 1978, and later of 1985, these repressive policies were gradually removed. After independence, given the widespread positive international acclaim, financial sector reforms extended the levels of financial liberalisation to highly accommodative levels. Figure 1 gives the trends of selected bank-based financial development indicators for South Africa for the period 1976 to 2014.

Figure 1 – Trends in Selected Bank-based Financial development Indicators in South Africa (1976-2014)
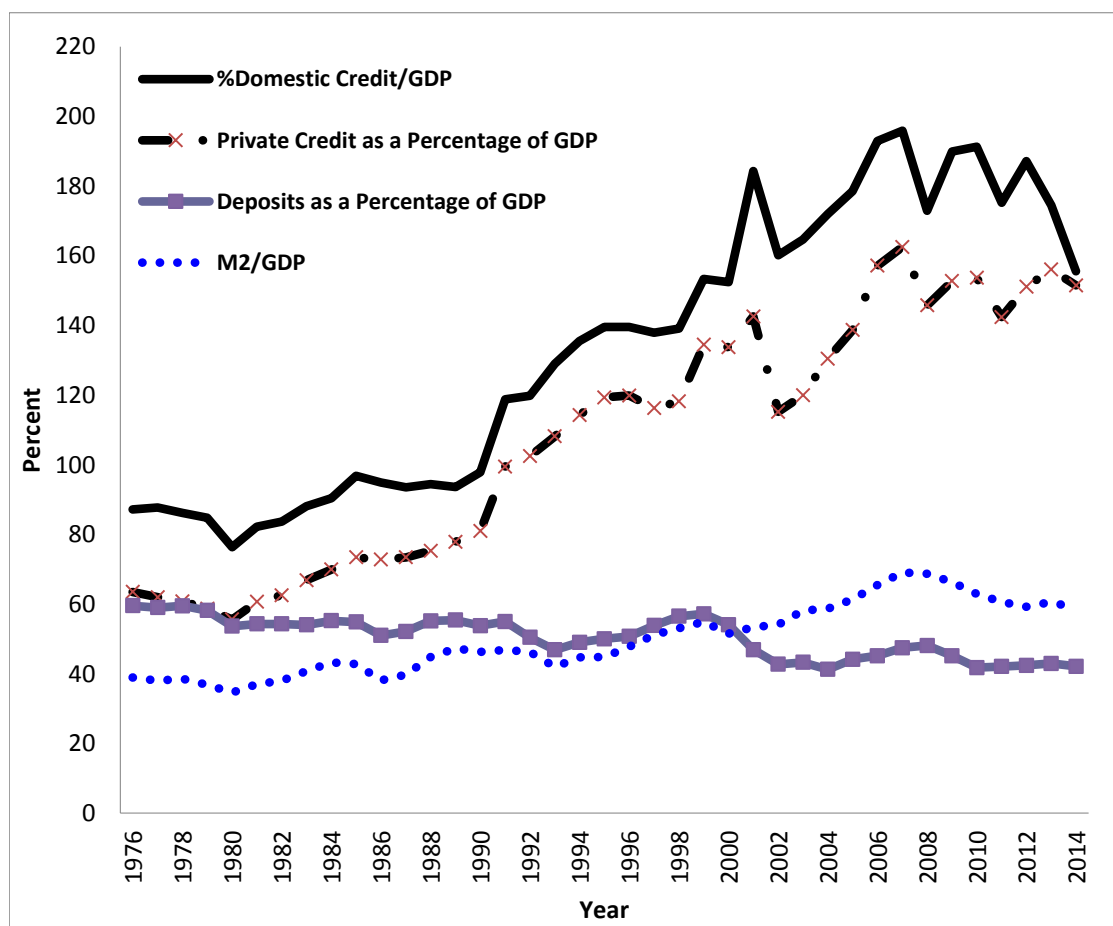
Source: IMF-IFS Statistics Compact Disc 2016.

Notable from Figure 1, is the expansive proliferation of credit provision, especially after 1980 (the financial liberalisation policy inception period). The said notion of increased credit provision is shown by the trends in the domestic credit-to-GDP ratio, and the private credit-to-GDP ratio. Both these credit ratios show a continuous upsurge from 1980 onwards. The domestic credit-to-GDP ratio averaged 80% before 1981. From 1981 onwards, the domestic credit-to-GDP ratio show increased intermediation by the bank-based financial sector; as it continuously increased until it reached 152% by 2014.

The bulk of the increase in the domestic credit-to-GDP ratio was mainly due to increases in credit provision to the private sector, rather than the public sector. A look at the mirrored trend of the domestic credit-to-GDP ratio by the private credit-to-GDP ratio proves this assertion. In addition to the huge increase in credit provision, financial deepening and the size of the financial sector relative to the economy, as measured by the M2 to GDP ratio, also showed a marked improvement. The M2 to GDP ratio started at 37% in 1976; and it increased through the years – to end at 60% of GDP by 2014. This shows that the importance of the bank-based financial sector to the economy increased substantially. However, deposits (as measured by the deposits to GDP in Figure 1) have decreased from 60% in 1976 to 42% of GDP by 2014.

Summarily, bank-based financial development has been marked with increased credit provision and financial intermediation at the expense of decreased deposits in the whole economy.

Market-based financial development in South Africa, on the other hand, can be traced back to as early as 1887, when the Johannesburg stock exchange was established (Nyasha, 2014;25). The indicators of stock market development discussed herein are the total value of shares traded, as a percentage of the gross domestic product, the turnover ratio of stocks traded and the market capitalisation of listed companies, as a percentage of GDP of the Johannesburg Stock Exchange.

Figure 2 gives the trends of the selected market-based financial development indicators for South Africa for the period 1988 to 2012.

Figure 2 – Trends in Selected Market-based Financial development Indicators in South Africa (1988-2012)
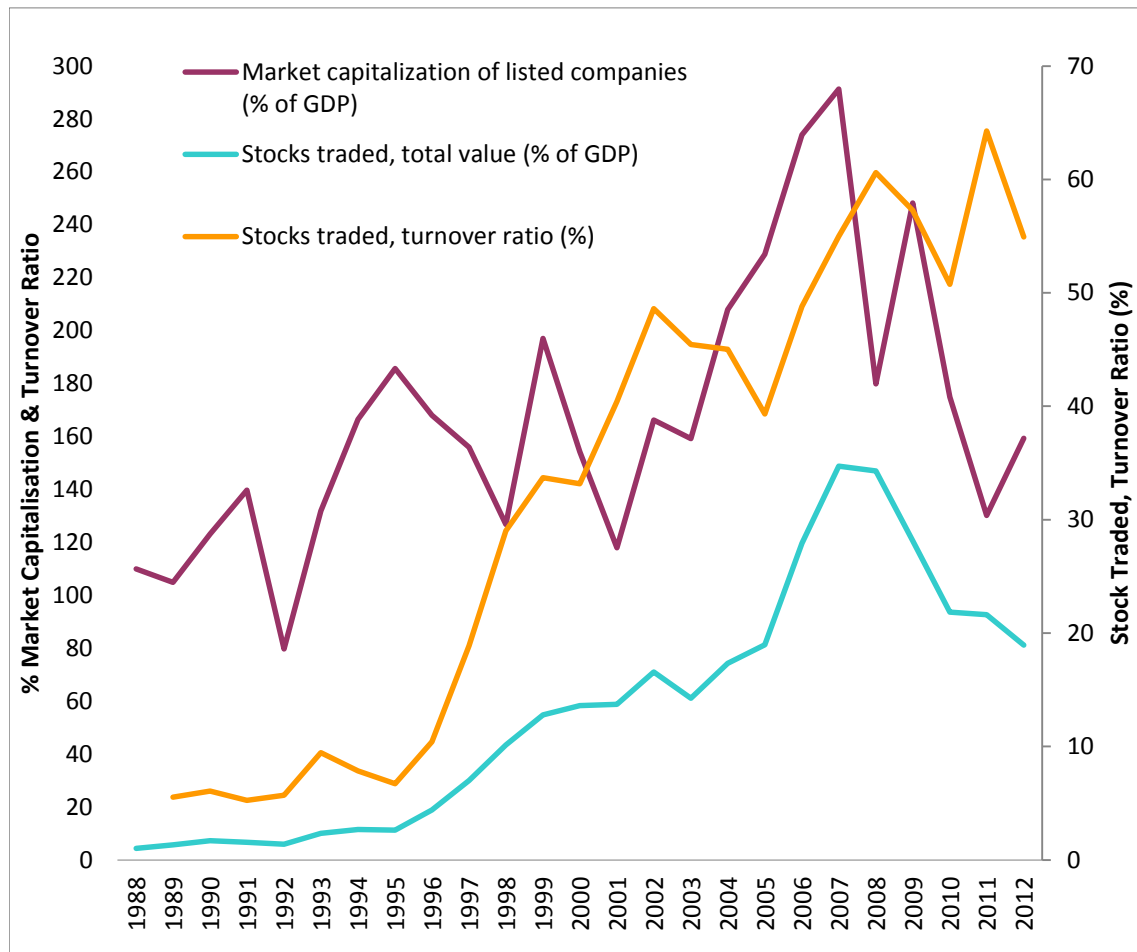
Source: World Bank, World Development Indicators, 2016.

Figure 2 shows that the stocks traded total value to GDP ratio has gradually increased from below 20% levels before 1997 to 149% by 2007. The global financial crisis of 2008 seems to have led to the stocks traded total value to GDP ratio's decline from the 2007 level of 149% to 81% by 2012. The same trend followed by the stocks traded total value to GDP ratio appears to have been followed by the market capitalisation to GDP ratio; although it was intermittent and at higher levels – for the latter, rather than the former ratio. The stocks traded turnover ratio also shows

increased trading on the Johannesburg Stock Exchange; as it increased from below 10% levels before independence to 55% by 2012.

Therefore, the increased liquidity and market capitalisation of the Johannesburg Stock Exchange vis-à-vis the economy shows the marked importance of the market-based financial sector in South Africa's financial development.

Trends in investment (proxied by the investment-to-GDP ratio) and savings (proxied by the savings-to-GDP ratio) are shown in Figure 3.

Figure 3 – Trends in Investment and Savings in South Africa (1976 - 2014)
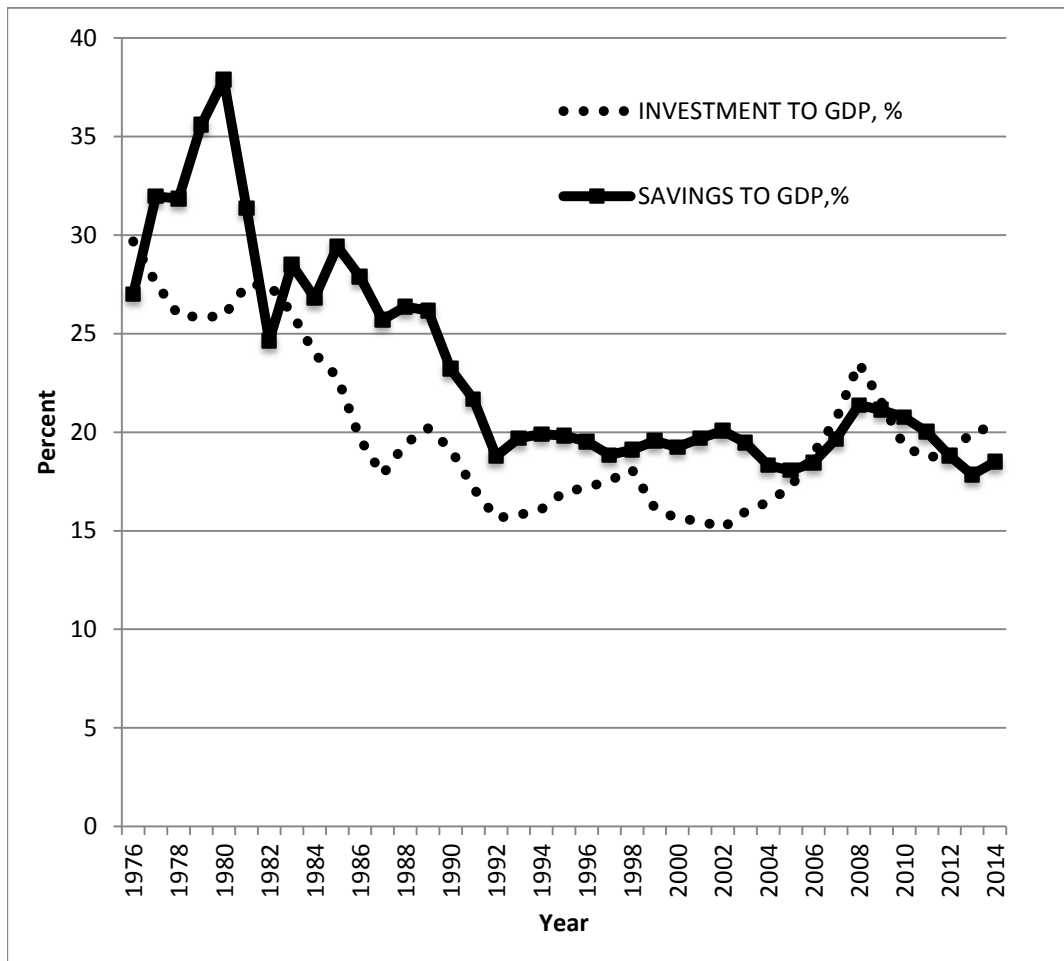
Source: World Bank, World Development Indicators, 2016.

The trends in investment reflect a declining tendency that started at 32% in 1976 and ended at 20% by 2014 – a 12% decrease. Otherwise, the same declining trend is also noted for savings; as it began with an upward trend from 1976 to 1980, only to end at 18% of GDP by 2014.

Financial development trends for South Africa for the period 1976 to 2014 show the increased importance of the financial sector to the economy. However, investment and savings seem to have been negatively affected during the same period.

3. Methodology

This study utilises a trivariate Granger-causality model within an ARDL-bounds testing framework in order to evaluate the causal relationship between bank-based financial development, market-based financial development, and investment. The ARDL model used in this study can be expressed as follows (see Nyasha, 2015):

Model A: Investment and bank-based financial development

$$\Delta INV_t = \propto_0 + \sum_{i=1}^{n} \propto_{1i} \Delta INV_{t-i} + \sum_{i=0}^{n} \propto_{2i} \Delta BFA_{t-i} + \sum_{i=0}^{n} \propto_{3i} \Delta GDS_{t-i} + \alpha_4 BFA_{t-1}$$

$$+ \alpha_5 GDS_{t-1} + \alpha_6 INV_{t-1} + \varepsilon_{1t} \ldots \ldots \ldots \ldots 1$$

$$\Delta BFA_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta BFA_{t-i} + \sum_{i=0}^{n} \beta_{2i} \Delta INV_{t-i} + \sum_{i=0}^{n} \beta_{3i} \Delta GDS_{t-i} + \beta_4 BFA_{t-1}$$

$$+ \beta_5 GDS_{t-1} + \beta_6 INV_{t-1} + \varepsilon_{2t} \ldots \ldots \ldots \ldots 2$$

$$\Delta GDS_t = \rho_0 + \sum_{i=1}^{n} \rho_{1i} \Delta GDS_{t-i} + \sum_{i=0}^{n} \rho_{2i} \Delta INV_{t-i} + \sum_{i=0}^{n} \rho_{3i} \Delta BFA_{t-i} + \rho_4 BFA_{t-1}$$

$$+ \rho_5 GDS_{t-1} + \rho_6 INV_{t-1} + \varepsilon_{3t} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots .3$$

Model B: Investment and market-based financial development

$$\Delta INV_t = \omega_0 + \sum_{i=1}^{n} \omega_{1i} \Delta INV_{t-i} + \sum_{i=0}^{n} \omega_{2i} \Delta MFA_{t-i} + \sum_{i=0}^{n} \omega_{3i} \Delta GDS_{t-i} + \omega_4 MFA_{t-1}$$

$$+ \omega_5 GDS_{t-1} + \omega_6 INV_{t-1} + \varepsilon_{4t} \ldots \ldots \ldots 4$$

$$\Delta MFA_t = \varphi_0 + \sum_{i=1}^{n} \varphi_{1i}\Delta MFA_{t-i} + \sum_{i=0}^{n} \varphi_{2i}\Delta GDS_{t-i} + \sum_{i=0}^{n} \varphi_{3i}\Delta INV_{t-i} + \varphi_4 MFA_{t-1}$$

$$+ \varphi_5 GDS_{t-1} + \varphi_6 INV_{t-1} + \varepsilon_{5t} \ldots \ldots \ldots 5$$

$$\Delta GDS_t = \gamma_0 + \sum_{i=1}^{n} \gamma_{1i}\Delta GDS_{t-i} + \sum_{i=0}^{n} \gamma_{2i}\Delta MFA_{t-i} + \sum_{i=0}^{n} \gamma_{3i}\Delta INV_{t-i} + \gamma_4 MFA_{t-1}$$

$$+ \gamma_5 GDS_{t-1} + \gamma_6 INV_{t-1} + \varepsilon_{6t} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots 6$$

Where

INV = annual growth rate of the gross fixed capital formation (a proxy for the level of domestic investment), BFA = accelerator-enhanced bank-based financial development index, MFA = accelerator-enhanced market-based financial development index, GDS = gross domestic savings, and ε = error term. Three bank-based financial development indicators are used to calculate the bank-based financial development indicator (BFA) – namely, liquid liabilities as a ratio of GDP (M3), domestic credit to private sector as a ratio of GDP, and domestic credit provided by financial sector (% of GDP) as a ratio of GDP. The resultant index is multiplied by the GDP per capita growth rate to get the accelerator-augmented index, BFA. Three market-based financial development indicators are used to calculate the market-based financial development indicator, MFA – stocks traded, total value as a percentage of GDP, market capitalisation of listed companies as a ratio of GDP, and the turnover ratio. The resultant index is multiplied by the GDP per capita growth rate to get the accelerator-augmented index, MFA.

After substantiation of cointegration between the variables employed, the causal relationship between investment and either bank-based financial development or market-based financial development is investigated with the aid of a trivariate Granger-causality approach. Following Nyasha (2015), the respective trivariate causality models for both Models A and B are estimated as follows:

Model A: Investment and bank-based financial development

$$\Delta INV_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i}\Delta INV_{t-i} + \sum_{i=1}^{n} \alpha_{2i}\Delta BFA_{t-i} + \sum_{i=1}^{n} \alpha_{3i}\Delta GDS_{t-i} + \alpha_4 ECT_{t-1}$$

$$+ \mu_{1t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 7$$

$$\Delta BFA_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i}\Delta INV_{t-i} + \sum_{i=1}^{n} \beta_{2i}\Delta BFA_{t-i} + \sum_{i=1}^{n} \beta_{3i}\Delta GDS_{t-i} + \beta_4 ECT_{t-1}$$

$$+ \mu_{2t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 8$$

$$\Delta GDS_t = \rho_0 + \sum_{i=1}^{n} \rho_{1i}\Delta INV_{t-i} + \sum_{i=1}^{n} \rho_{2i}\Delta BFA_{t-i} + \sum_{i=1}^{n} \rho_{3i}\Delta GDS_{t-i} + \rho_4 ECT_{t-1}$$

$$+ \mu_{3t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 9$$

Model B: Investment and market-based financial development

$$\Delta INV_t = \omega_0 + \sum_{i=1}^{n} \omega_{1i}\Delta INV_{t-i} + \sum_{i=1}^{n} \omega_{2i}\Delta MFA_{t-i} + \sum_{i=1}^{n} \omega_{3i}\Delta GDS_{t-i} + \omega_4 ECT_{t-1}$$

$$+ \mu_{4t} \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots 10$$

$$\Delta MFDG_t = \varphi_0 + \sum_{i=1}^{n} \varphi_{1i}\Delta INV_{t-i} + \sum_{i=1}^{n} \varphi_{2i}\Delta MFA_{t-i} + \sum_{i=1}^{n} \varphi_{3i}\Delta GDS_{t-i}$$

$$+ \varphi_4 ECT_{t-1} + \mu_{5t} \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots 11$$

$$\Delta SAV_t = \gamma_0 + \sum_{i=1}^{n} \gamma_{1i}\Delta INV_{t-i} + \sum_{i=1}^{n} \gamma_{2i}\Delta BFA_{t-i} + \sum_{i=1}^{n} \gamma_{3i}\Delta GDS_{t-i} + \gamma_4 ECT_{t-1}$$

$$+ \mu_{6t} \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots 12$$

Where

$\alpha_0, \beta_0, \rho_0, \omega_0, \varphi_0$ and γ_0 are respective constants; Δ is the difference operator; $\alpha_1 - \alpha_6, \beta_1 - \beta_6, \rho_1 - \rho_6, \omega_1 - \omega_6, \varphi_1 - \varphi_6, \gamma_1 - \gamma_6$ are the respective coefficients; and $\varepsilon_{1t} - \varepsilon_{6t}, \mu_{1t} - \mu_{6t}$- are the error terms.

A negative statistical significant coefficient of the error correction term (ECT_{t-1}) assures the convergence of the estimated system of variables in the models, and it also indicates the long-run causality among the variables (Shahbaz *et al.,* 2012.). However, only in situations where there is cointegration among the variables was the error correction term included in the above-illustrated regression. The t-statistic for the

coefficient of the lagged error correction term is used to assess the significance of the long-run causal relationship among the variables. Short-run causality is gauged with the help of given differenced variables by using the F-statistic to assess the significance of the relationship.

The main data source is the World Development Indicators (World Bank, 2016). All the series data are obtained from this source. The study uses data for the period of 1976 to 2014.

4. Empirical Results

Savings ratio was added as an intermittent variable to form a trivariate Granger-causality model. The Granger-causality test was split into two models. The first model (Model A) tested the causality between investment and bank-based financial development and included the following variables: investment, bank-based financial development, and saving. The second model (Model B) examined the causal relationship between investment and market-based financial development and included the following variables: investment, market-based financial development, and savings. The ARDL bounds test requires all variables to be integrated to the maximum order of 1. Otherwise, the inclusion of higher order integrated variables leads to the order 0 or order 1. Unit root tests were employed to ensure that this condition was met. The Dickey-Fuller generalised least squares (DF-GLS), the Perron (1997) unit root test (PPURoot), and the Ng-Perron modified unit root test confirm that all variables were integrated of order 0 or order 1 (*see Table 3 in Appendix*). Therefore, the required condition of maximum order of integration of 1 was satisfied.

Before the causal relationship was examined, the first step was to establish the existence of cointegration, if any, among the variables of interest. To establish if there was cointegration in the variables under study, the bounds F-test was employed. If there was cointegration, the estimated causality model would contain the error correction term as one of the regressors, and the opposite would also be true (i.e., no cointegration, no error correction term in the estimated model). The results of the bounds F-test for both bank-based financial development (Model A) and market-based financial development (Model B) are given in Table 1.

Table 1: Bounds F-Test for Cointegration

SOUTH AFRICA							
Model A: Investment (INV), Bank-Based Financial Development (BFA), and Savings (GDS)				**Model B: Investment (INV), Market-Based Financial Development (MFA), and Savings (GDS)**			
Dependent Variable	**Function**	**F-statistic**	**Cointegration Status**	**Dependent Variable**	**Function**	**F-statistic**	**Cointegration Status**
INV	F(INV|BFA, GDS)	5.921**	Cointegrated	INV	F(INV|MFA, GDS)	5.923**	Cointegrated
BFA	F(BFA|INV, GDS)	1.439	Not Cointegrated	MFA	F(MFA|INV, GDS)	1.386	Not Cointegrated
GDS	F(GDS|INV, BFA)	4.984**	Cointegrated	GDS	F(GDS|INV, MFA)	6.792***	Cointegrated
Asymptotic Critical Values							
Pesaran et al. 2001:300 Table CI(iii) Case III	1%			5%		10%	
	I(0)	I(1)		I(0)	I(1)	I(0)	I(1)
	5.15	6.36		3.79	4.85	3.17	4.14

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

Results from Table 1 show that four of the six equations estimated had cointegrated variables. This was confirmed by the respective F-statistics for each function vis-à-vis the asymptotic critical values.

The results of the Granger-causality test are presented in Table 2.

Table 2: Granger-Causality Test Results

SOUTH AFRICA								
Model A: Investment (INV), Bank-Based Financial Development (BFA), and Savings (GDS)					**Model B: Investment (INV), Market-Based Financial Development (MFA), and Savings (GDS)**			
Dependent Variable	**F-statistics (probability)**			ECT_t [t-statistics]	**Dependent Variable**	**F-statistics (probability)**			ECT_t [t-statistics]
	ΔINV_t	ΔBFA_t	ΔGDS_t			ΔINV_t	ΔMFA_t	ΔGDS_t	
ΔINV_t	-	0.241 (0.628)	2.418* (0.060)	-0.117*** [-3.744]	ΔINV_t	-	1.565 (0.262)	3.492* (0.094)	-0.222* [-1.855]
ΔBFA_t	7.372*** (0.002)	-	5.652*** (0.008)	-	ΔMFA_t	3.393** (0.058)	-	0.183 (0.834)	-
ΔGDS_t	2.962* (0.096)	1.421 (0.257)	-	-0.264** [-2.642]	ΔGDS_t	2.409 (0.118)	3.856** (0.038)	-	-0.722* [-2.200]

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

Results from Model A reveal that there is unidirectional causality from investment to bank-based financial development in the short run. Other results show that there is unidirectional causality from savings to bank-based financial development in the short run. In addition, for both the short run and the long run, there is bidirectional causality between savings and investment. On the other hand, the results for Model B show that there is short run unidirectional causality from investment to market-based financial development. Other results show short-run and long-run unidirectional causality from savings to investment and from market-based financial development to savings. The results of this study confirm Odhiambo's (2010) findings that investment Granger-causes financial development.

In summary, the results imply that for South Africa, investment Granger-causes both bank-based and market-based financial development. There is no long-run causal relationship between investment and both types of financial development.

5. Conclusion

The causal relationship between financial development, split into bank-based and market-based financial development, and investment has been empirically examined for the period of 1976 to 2014. The causal relationship between financial development and investment has been assessed with the aid of a trivariate Granger-causality model. The savings ratio has been included as an intermittent variable in order to address the problem of omission-of-variable bias. The empirical results of this study show that there is unidirectional causal flow from investment to financial development, but only in the short run. In the long run, the study failed to find any causal relationship

between financial development and investment. These results applied irrespective of whether bank-based or market-based financial development was used as a proxy for financial sector development. The study, therefore, recommends that policies that are geared towards promoting investment should be intensified in order to further stimulate the financial sector in South Africa in the short run.

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Appendix

Table 3: 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***
BFA	-3.801***	-4.092***	-	-
MFA	-3.162***	-3.454**	-	-
GDS	-1.168	-1.739	-4.636***	-4.760***

Perron (1997) Unit Root Test (PPURoot)

	Stationarity in levels		Stationarity in differences	
	No trend	**Trend**	**No trend**	**Trend**
INV	-3.546	-4.546	-5.230933**	-5.324*
BFA	-4.391	-4.583	-6.45145***	-6.413***
MFA	-4.615	-4.789	-7.06664***	-7.606***
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***
BFA	-15.349***	-16.356*	-	-
MFA	-12.710**	-14.177*	-	-
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***
BFA	0.180**	0.174*	-	-
MFA	0.198**	0.186*	-	-
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***
BFA	-2.769***	-2.841*	-	-
MFA	-2.519**	-2.631*	-	-
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***
BFA	1.601***	5.681*	-	-
MFA	1.935**	6.611*	-	-
GDS	4.378*	0.294***	-	-

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