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INVESTMENT DYNAMICS IN MAURITIUS: DOES FINANCIAL DEVELOPMENT MATTER?

Brian Muyambiri¹ and Nicholas M. Odhiambo

Abstract

This paper examines the impact of both bank-based and market-based financial development on investment in Mauritius between 1976 and 2014. Two models that are based on a flexible accelerator investment model are employed to evaluate the relationship between investment and financial development. One model postulates that both bank-based financial development and market-based financial development enhance the response of investment to an increase in the demand for output. The other model contends that there is no such enhancement for either type of financial development on investment. The study makes use of the ARDL bounds testing approach. For both tested models, results indicate that bank-based financial development has only a negative direct effect on investment in the long run. In contrast, market-based financial development is found to have a positive accelerator-enhancing effect on investment in the shortrun. Implications are that, for Mauritius, only market-based financial development enhances the response of investment to an increase in the demand for output, while bank-based financial development has a negative direct effect on investment in the long run.

Keywords: *Mauritius, Investment, Bank-based financial development, Market-based financial development*

JEL Classification Code: *G10, G20, E22*

1. Introduction

In economic circles, financial development has attracted substantial discussion as an avenue through which there will be increased economic growth in an economy. The

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emphasis has been on the causal relationship between bank-based and market-based financial development and economic growth². However, the impact of bank-based and market-based financial development on investment has received limited attention. Most of the research that has been conducted on this topic has been panel regression-based and did not divide the effect on investment between the two types of financial development (see Fowowe, 2011; Schich and Pelgrin, 2002; Misati and Nyamongo, 2011; Dutta and Roy, 2009 and Ndikumana, 2000).

This paper aims to evaluate the effects of both bank-based and market-based financial development on investment for the Republic of Mauritius. The paper differs fundamentally from previous studies in that it has divided financial development into bank-based and market-based financial development. In addition, it is based on time series analysis rather than the much popular panel regression approach, which tends to mask individual country differences.

Also, the paper tests the finance--investment relationship with the aid of two models that assume a different relationship structure between financial development and investment. One model postulates an accelerator enhancing effect of bank-based financial development and market-based financial development on investment, while the other model assumes a direct relationship. In addition, this article circumvents the limitations associated with studies that have investigated the impact of financial development on investment, that is, over-reliance on bank-based proxies of financial development while giving little or no attention to market-based proxies. It also circumvents the use of residual-based cointegration tests or maximum likelihood tests,

² See Nyasha and Odhiambo (2014) and Nyasha and Odhiambo (2015) for a comprehensive discussion.

which are inappropriate if the sample is small and all variables used in the estimation need to be integrated of the same order.

The rest of the paper is organised as follows: Section 2 gives an overview of financial development and investment in Mauritius. Section 3 summarises the related literature on financial development and investment. Section 4 presents the empirical model specification, the estimation technique, and the empirical results from the regression estimation and analysis; while section 5 presents the conclusion to the study.

2. Financial Development and Investment in Mauritius

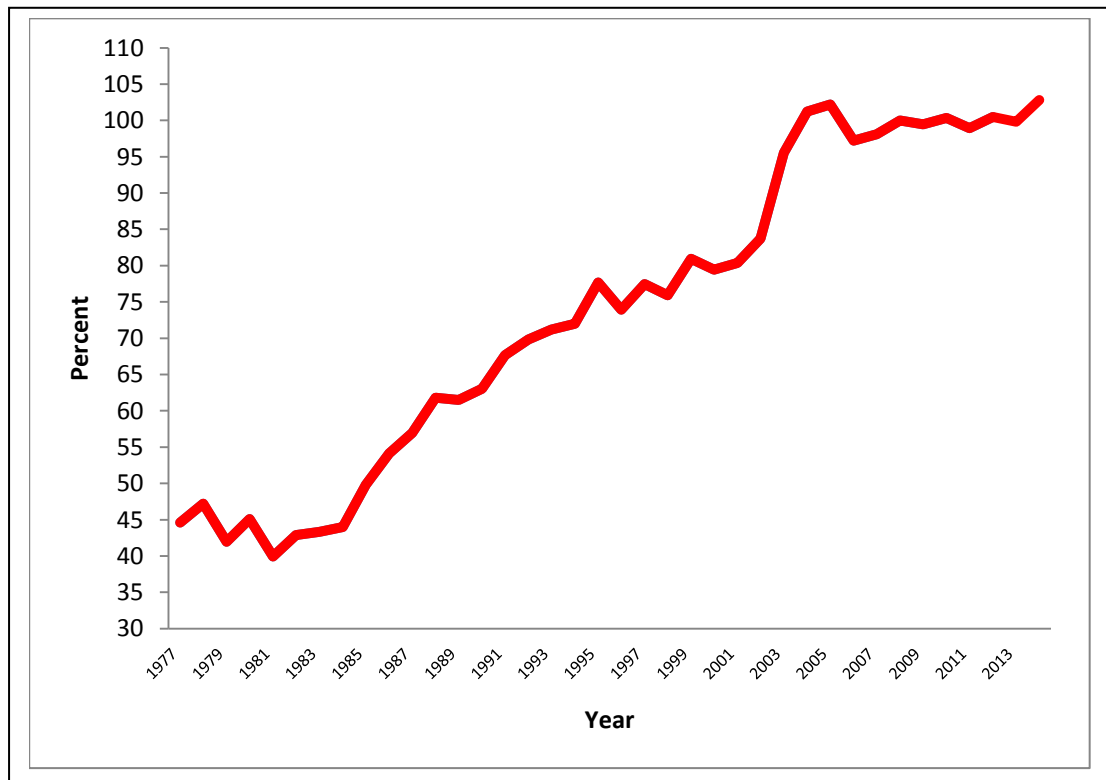
Financial development in Mauritius³ has been progressive and multifaceted. The progression of financial development in Mauritius has led to extensive diversification of products and services. Of note is the introduction of services such as leasing and asset management; private equity; stockbroking; investment services; specialist services in cross-border transactions; trustee and fiduciary services; wealth management and private banking; and remittance services. Other noteworthy occurrences include the emergence of non-bank financial institutions; banking sector mergers and acquisitions; and the development of the offshore banking sector (Jankee, 1999, 2006). To evaluate the financial and investment landscape in Mauritius, a discussion of selected financial development and investment indicators is given in this section.

The ratio of broad money, M2, to GDP is the measure of financial development that shows the real size of the financial sector in a country. A higher ratio of M2 to GDP

³ For a fuller discussion on the chronological evolution of the financial system in Mauritius, see Muyambiri, B and Odhiambo, N.M. (2016).

implies a larger financial sector and improved financial intermediation. In addition to being a measure of financial deepening, the M2 to GDP ratio is a measure of money supply relative to the size of the economy. Figure 1 gives the trend of M2 to GDP from 1977 to 2014.

Figure 1: Ratio of M2 to GDP



Source: World Bank, World Development Indicators, 2016

Prior to the gradual liberalisation of the financial sector, the M2/GDP ratio for Mauritius averaged just above 40%. By 1986, with the liberalisation of exchange controls on both current and capital transactions, the M2/GDP ratio increased to above 50%. Due to increased offshore banking services provision, the size of the Mauritian financial services sector appears to have continuously gained prominence over the years. By the early 1990s, it was more than 60% of the GDP, hitting the 80% mark by the year 2000. It progressively improved, reaching its maxima of 102% by 2005, and, since then, has been on a steady, maintained average of 100% of GDP.

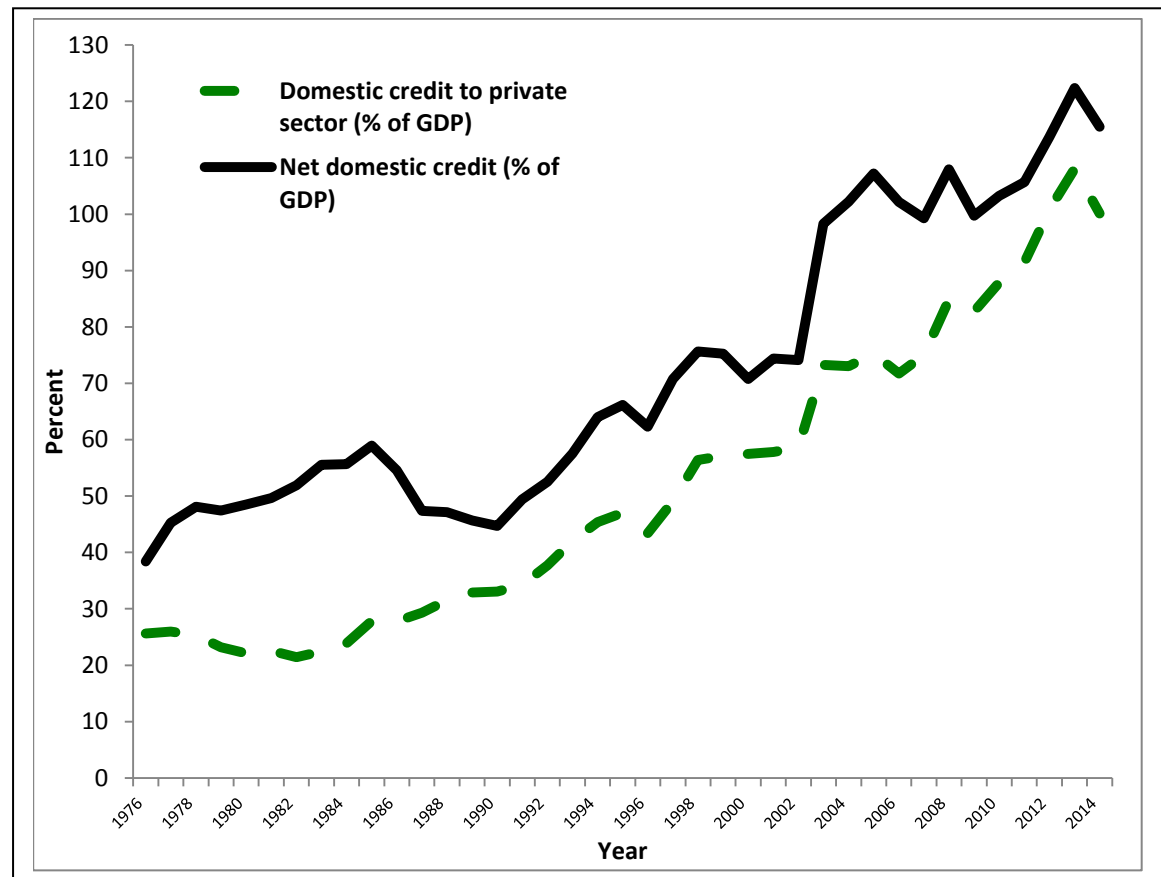
Given the resultant leap brought about by financial liberalisation, it seems that the trends before 1986 show a holding back of the capacity of the financial sector. This may be due to financial repression, which tended to distract rather than promote financial sector investment and business initiatives. After the changes in policy (domestic and international liberalisation) between 1986 and 1994, the financial sector began to turn potential into reality.

In addition, according to the M2/GDP ratio, the level of financial deepening appears to have improved extensively. With banks diversifying into non-bank financial services -- which include leasing, factoring, asset management, private equity, stockbroking, registry, investor services business, specialist services in cross border transactions, specialist finance and lending, trustee and fiduciary services, Islamic banking, remittance services, wealth management, and private banking -- the increased financial widening and deepening was inevitable. Therefore, the resurgent increase in the M2/GDP ratio also shows that the size of the financial sector also increased comprehensively, even relative to other sectors, as it is now counted as one of the main economic sectors in Mauritius. The effect of financial liberalisation is noticeable and was mainly steered by macroeconomic stability and the achievement of prudential regulation and supervision and, more so, by the gradual approach to financial liberalisation (Galbis, 1994: 98).

Despite the measures of financial development already discussed in preceding sections, there is need to assess other measures that pertain to credit provision in the market. Financial development should lead to increased credit provision to all sectors by the financial sector, especially after financial liberalisation. Therefore, the extent to

which the financial sector is a provider of loanable funds to both the public and private sector is a necessary and good measure of the level of financial development. The two measures of financial sector deepening and development for assessing credit provision in Mauritius that are employed in this section are the net domestic credit to GDP ratio and the domestic credit to the private sector to GDP ratio. The net domestic credit to GDP ratio is the sum of net claims on the central government and claims on other sectors of the domestic economy, expressed as a percentage of GDP. The domestic credit to private sector refers to financial resources provided to the private sector, such as through loans, purchases of non-equity securities, and trade credits and other accounts receivable that establish a claim for repayment (WDI, 2016). Figure 2 gives trends on credit, specifically trends of domestic credit to private sector to GDP and net domestic credit to GDP.

Figure 2: Trends of Credit



Source: *Financial Structure Database- Beck, Demirgüç-Kunt, & Levine (2000, 2010) Čihák, Demirgüç-Kunt, Feyen, and Levine (2012).*

The domestic credit to the private sector to GDP ratio trend shows that, despite maintaining above 20% levels, it marginally declined from 1976 to 1985. The net domestic credit to GDP ratio in the same period (1976 to 1985) was generally ascending upwards. With the advent of the financial liberalisation period, the domestic credit to the private sector to GDP ratio shows a gradual ascent, which is only matched by the net domestic credit to GDP ratio after 1990. In addition, the gap between the two ratios has narrowed after financial liberalisation. Financial development, spurred by financial liberalisation, has opened the door for sectors not previously included in the private markets. In addition, increased competition for credit has translated into an appreciation of the private sector as creditworthy, unlike

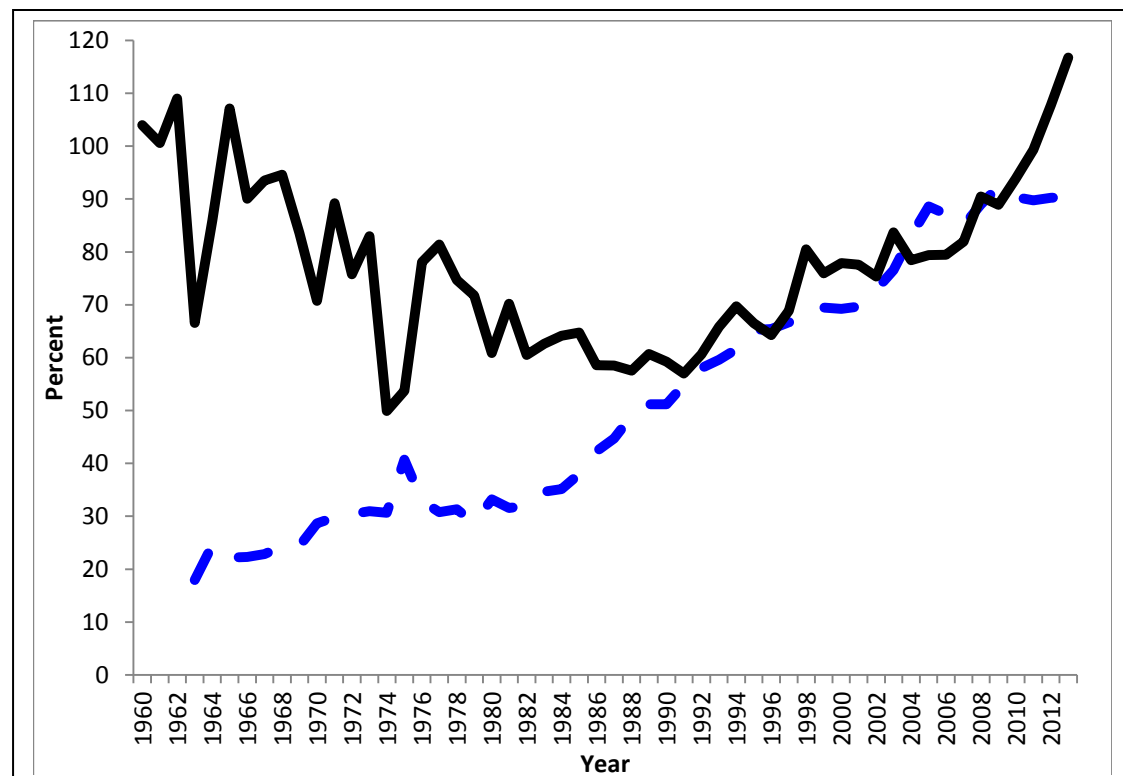
the status quo before liberalisation. However, it should be noted that increased financial sector competition might lead to decreased savings and even investment as a result of indulging in excessive credit provision for consumption purposes. This may be due to short-termism, preference for high returns, and prevailing liquidity in the banking sector (Adegbite and Adetiloye, 2013: 214). In the banks' lending decisions for investment purposes, the ability to repay is a significant determinant of getting credit -- not to mention the profitability of the sector and the associated long-term risks.

The removal of high required reserves, the improved real time payment systems, and the opening up of the economy to offshore banking are some of the reasons why the level of credit provision as a share of GDP has been increasing in Mauritius. The removal of high reserve requirements has enabled banks to have extra funds available for credit. The improved real time payment systems has made it quite easy not to hold on to unusually large excess reserves and has led to increased financial intermediation. The opening up of the economy through offshore banking activities has opened up the banking sector to new markets and has helped the financial sector to have extensive offshore banking activities (Moriera, 1999: 16).

The level of deposits relative to the economic output, as a measure of financial development, is expected to be growing as the economy expands and as liberalisation policies are put in place. Deposits to financial institutions are liabilities that these institutions use to create money from themselves, and they also earn profit from such financial intermediation. Furthermore, the increased mobilisation of deposits relative to the GDP implies confidence with the banking industry and increased efficiency in

either payment systems or savings, or both. The two ratios used to evaluate if the financial sector is an efficient mobiliser of deposits are the bank deposits to GDP ratio and the bank credit to bank deposits ratio. Figure 3 gives trends on the bank deposits to GDP and bank credit to bank deposits for Mauritius.

Figure 3: Bank Deposits to GDP and Bank Credit to Bank Deposits (%)



Source: *Financial Structure Database- Beck, Demirgüç-Kunt, & Levine (2000, 2010), Čihák, Demirgüç-Kunt, Feyen, and Levine (2012).*

From the above-illustrated trends, although the ratio of bank deposits to GDP started at just above 20% in the early 1960s, it gradually ascended through the years to reach 90% by 2011. Notably, the ratio of bank deposits to GDP grew at an increasing rate with the advent of financial liberalisation in the mid-1980s, from which time it surpassed the 40% mark. By 1993, deposits accounted for more than 60% of GDP. The increasing trend of deposits relative to GDP can best be explained by the opening up of the financial services sector both domestically and internationally (increased

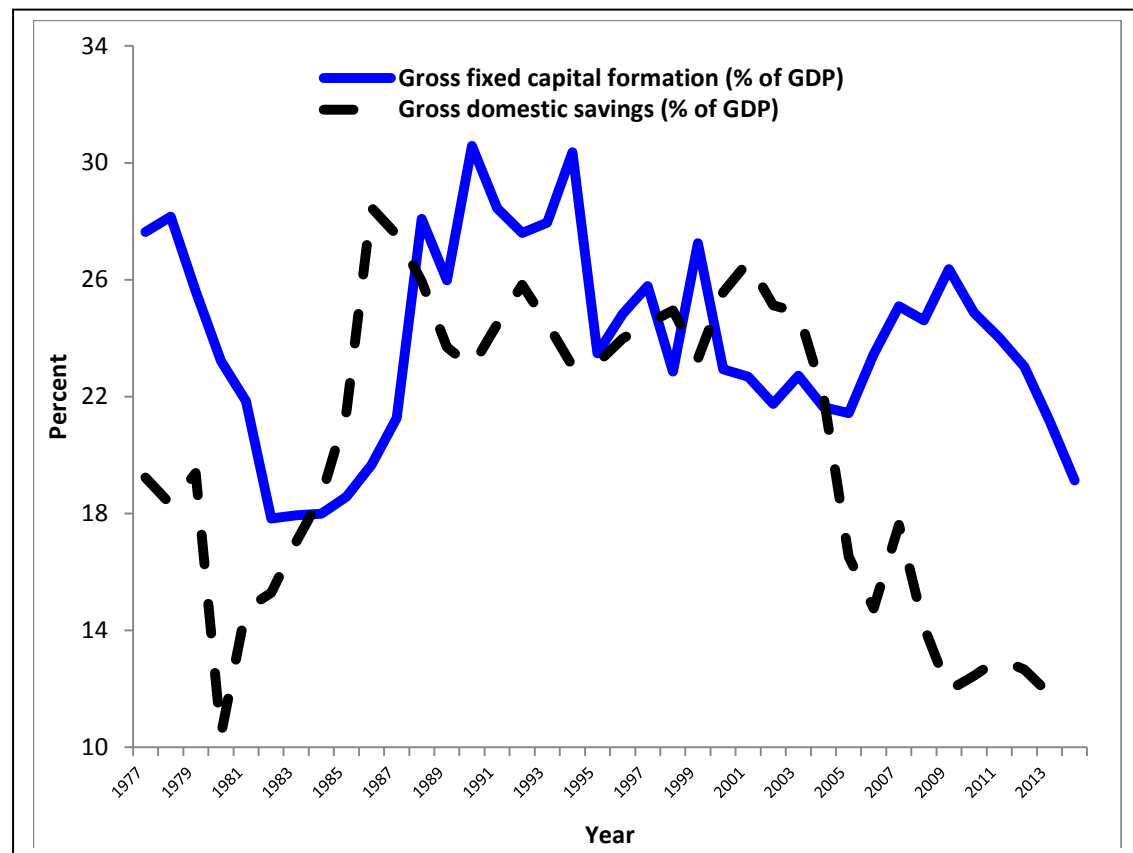
offshore banking activities) and, more so, by the increasing real interest rate, which was boosted by stable inflation rates.

On the other hand, the bank credit to bank deposits ratio reveals that the banking sector was far more efficient in converting deposits into credit in the earlier years than it was in the later years. The maximum share of credit it managed to obtain was 109% in 1962. From then on, it has experienced stretches of declines (rather than inclines) as the ratio of credit to deposits mostly averaged between 60% and 80% from 1961 to 1990. From 1991, the ratio of bank deposits to GDP has been on a general ascent, although it did not manage to eclipse the levels that existed in the early 1960s.

Domestic investment trends proxied by the ratio of gross fixed capital formation (GFCF) over GDP show a mixed picture for the period under discussion. From 1979 to 1987, investment levels slumped to below 28% of the GDP, only to recover to the 28% level in 1988. From 1988 to 1994, investment appears to have been on an upward trend, reaching a maximum of 31% (1994). From 1995, investment levels in relation to the GDP, despite intermittently rising here and there, started to decline, although they did reach the below 20% levels of the early 1980s. By 2005, the level of investment was 21% of GDP, compared with 31% in 1994. By 2014, the level of investment appears to have been decreasing to 1982 levels as it hit the 19% mark, 1% higher than the 1982 level. The significant improvements in the financial sector have seen the Mauritian private sector increase investment in offshore financial services, particularly in India and some countries in the Southern Africa region (Phiri and Kannan, 2014: 9). Domestic savings, on the other hand, were declining and low before 1981. From 1981 to 1986, they were on an upward trend, starting at 10% of

GDP and ending at 28% of GDP. Increased savings seem to have induced an increase in investment between 1981 and 1986. Although having decreased marginally from 1987 to 2003, savings were maintained at an average of about 25% of GDP. From 2004, the level of savings as a ratio of the GDP has been decreasing, reaching 12% of GDP by 2014.

Figure 4: Trends in Investment



Source: World Bank, World Development Indicators, 2016

Increased consumption levels fuelled by reduced direct taxes and import duties can explain the decreased savings.

3. Literature Review

A limited number of studies have investigated the impact of financial development on investment, and even fewer have examined the effect of bank-based and market-based financial development on investment. However, the most prevalent outcome of this research has been that financial development has a positive impact on investment. Taking into consideration second variables of interest, Table 1 summarises the relevant literature on the impact of financial development on investment.

Table 1: Related Literature on the Impact of Financial Development on Investment

Author(s)	Title	Region/ Country	Variables	Methodology	Result
De Gregorio & Guidotti, 1995	Financial development and economic growth	112 countries	<ul style="list-style-type: none"> - Bank credit to the private sector to GDP - Economic growth - Investment rate - Literacy rate - Foreign investment - Inflation - GDP per capita - Government spending, 	Panel regression	Financial development positively impacts the efficiency, rather than the volume, of investment
Ndikumana, 2000	Financial determinants of domestic investment in	30 countries	<ul style="list-style-type: none"> - Real per capita GDP - Gross national product per capita (GNP) - GDP deflator growth rate - Total gross domestic investment 	Panel Regression	Positive relationship between domestic investment (total investment and private investment) and various

Author(s)	Title	Region/ Country	Variables	Methodology	Result
	Sub-Saharan Africa: Evidence from panel data		<ul style="list-style-type: none"> - Private investment to GDP - Total liquid liabilities to GDP (M3/GDP) - Total credit to the private sector to GDP - Total domestic credit provided by the banking sector to GDP - Claims on government and other public entities to GDP - Index of financial development 		indicators of financial development.
Leahy, Schich, Wehinger, Pelgrin, & Thorgeirsson,	Contributions of financial systems to growth in	21 countries	<ul style="list-style-type: none"> - Liquid liabilities - Private credit of deposit money banks provided to the private sector - Stock market capitalisation 	Panel Regression	Significant positive relationships between investment and financial development when financial

Author(s)	Title	Region/ Country	Variables	Methodology	Result
2001	OECD countries.		<ul style="list-style-type: none"> - Composite financial development indicator - Real private non-residential (or business sector) fixed capital formation. 		development is measured by stock market development or by private credit of deposit money banks and liquid liabilities
Bassanini, Scarpetta, & Hemmings, 2001	Economic growth: the role of policies and institutions. Panel data evidence from OECD countries	21 countries	<ul style="list-style-type: none"> - Level of inflation - Private credit of deposit money banks provided to the private sector to GDP - Stock market capitalisation to GDP - Physical capital accumulation - Rate of growth of the private final consumption deflator - General government current nominal tax 	Panel Regression	Credit provided by the banking sector appears to be only weakly associated with investment, while the stock market capitalisation has a stronger positive bearing on investment.

Author(s)	Title	Region/ Country	Variables	Methodology	Result
			<ul style="list-style-type: none"> and non-tax receipts in nominal GDP - Government nominal final consumption expenditure to nominal GDP. 		
Schich & Pelgrin, 2002	Financial development and investment: panel data evidence for OECD countries from 1970 to 1997	19 countries	<ul style="list-style-type: none"> - Level of real private business sector fixed capital formation - Real private gross domestic product - Real long-term interest rate - Ratio of a deflator of private non-residential fixed capital formation to an output price deflator - Liquid liabilities - Private credit of deposit money banks 	Panel Regression	Financial development is positively significantly related to investment levels, mainly explained strongest for stock market capitalisation, although the contribution of private credit issued by deposit money banks is also found to be positively significant

Author(s)	Title	Region/ Country	Variables	Methodology	Result
			<ul style="list-style-type: none"> - Stock market capitalisation 		
Lahcen, 2004	Financial liberalisation, saving, investment and growth in MENA countries	5 countries	<ul style="list-style-type: none"> - Liquid Liabilities to GDP - Deposit money bank assets to total financial assets - Private credit by deposit money Banks to GDP - Private credit by deposit money banks to total domestic credit - Reserves to total deposits money banks, - Real interest rates - Stock market capitalisation to GDP 	Panel Regression	Financial development indicators as well as on financial liberalisation index indicate a negative impact of financial depth on private investment

Author(s)	Title	Region/ Country	Variables	Methodology	Result
			<ul style="list-style-type: none"> - Stock market total value traded to GDP - Stock market turnover (total shares traded/market capitalisation) - Net Interest rate Margin - Overhead costs as a share of total assets - Market structure - Private saving rate - Private investment rate, Growth - Exchange rate overvaluation - Trade openness - Inflation rate - Secondary enrollment 		

Author(s)	Title	Region/ Country	Variables	Methodology	Result
			<ul style="list-style-type: none"> - Budget surplus as a share of GDP - Terms of trade - Share of population over 60 - Share of population under 15 		
Dutta, & Roy, 2009	The Impact of Financial Development on Domestic Investment: A Quantile Regression Approach	124 countries	<ul style="list-style-type: none"> - Gross domestic capital formation to GDP - Ratio of private credit by deposit money banks to GDP - Liquid Liabilities over GDP - Claims on domestic real nonfinancial sector by deposit money banks to GDP - Financial development index - Stock market indicators 	Panel regression approach	Financial sector development positively impacts domestic investment and the degree of responsiveness to financial development varies with varying levels of domestic investment across countries.

Author(s)	Title	Region/ Country	Variables	Methodology	Result
			<ul style="list-style-type: none"> - Remittances and indicators of deposit resources available to the banking sector - Growth of real GDP - Real interest rates - Imports plus exports over GDP - Government expenditure to GDP 		
Misati & Nyamongo, 2011	Financial development and private investment in Sub-Saharan Africa	18 countries	<ul style="list-style-type: none"> - GDP growth - Public investment - Fiscal deficit - Checks and balances - Corruption perception index - Economic freedom of the world 	Panel Regression	The study establishes a negative relationship between interest rate on deposits and private investment. In addition, a positive relationship between both the credit to the private

Author(s)	Title	Region/ Country	Variables	Methodology	Result
			<ul style="list-style-type: none"> - Stock market turnover - Credit to the private sector - Deposit rate - Informal index 		sector and the turnover ratio and private investment is found.
Fowowe, 2011	Financial sector reforms and private investment in Sub-Saharan African countries	14 countries	<ul style="list-style-type: none"> - Index of financial reforms - Growth in real GDP - Ratio of gross public investment to GDP - Ratio of gross private investment to GDP - Volatility of inflation. 	Panel Regression	Financial sector reforms (measured by an index) have had a positive effect on private investment in the selected countries,

Author(s)	Title	Region/ Country	Variables	Methodology	Result
Adeniyi, & Egwaikhide, 2013	Saving- Investment Nexus in Developing Countries: Does Financial Development Matter?	20 countries	- Credit to the Private Sector - Total Liquid Liabilities - Total Banking Sector Credit to the Private Sector - Aid - Domestic Investment Openness - Domestic Saving	Panel Regression	Positive and significant impact of credit provided to the private sector on domestic investment. All other financial variables did not exert any statistically significant influence on domestic investment
Ndikumana, & Mannah Blankson, 2015	Financing Domestic Investment in African	50 countries	- Domestic investment - GDP growth - Foreign direct investment - External debt	Panel Regression	Domestic savings and credit to the private sector prove to be the most robust sources of financing for domestic

Author(s)	Title	Region/ Country	Variables	Methodology	Result
	Countries: Does the Source of Financing Matter?		<ul style="list-style-type: none"> - Remittances - Trade - Domestic savings - Bank credit - Official development aid 		investment
Warman & Thirlwall 1994	Interest rates, saving, investment and growth in Mexico 1960–90: Tests of the financial	Mexico	<ul style="list-style-type: none"> - Gross fixed investment - Rate of interest - Supply of credit - Lagged change in GDP 	Time-series econometric techniques	Investment is positively related to the supply of credit from the banking system, but the net effect of interest rates on investment is negative.

Author(s)	Title	Region/ Country	Variables	Methodology	Result
	liberalisation hypothesis				
Matsheka 1998	Interest Rates, And The Saving- Investment Process In Botswana	Botswana	- Real deposit interest rate - Real private sector credit - The lagged accelerator	Time-series econometric techniques	Supply of credit has a positive effect on domestic investment through financial savings.
Uçan & Öztürk 2011	Financial determinants of investment for	Turkey	- Total gross domestic investment as a percentage of gross domestic products (GDP)	VAR	Results mainly indicate a positive relationship between total domestic investment and

Author(s)	Title	Region/ Country	Variables	Methodology	Result
	Turkey		<ul style="list-style-type: none"> - Private domestic investment as a percentage of GDP - Real per capita gross domestic product - Growth rate of GDP deflator - Discount rate (real interest rate), - Total credit to the private sector as a percentage of GDP - The ratio of broad money to GDP - Total domestic credit provided by the banking sector as a percentage of GDP - Claims on government as a percentage of GDP 		all four indicators of financial development (makes use of a composite index of financial development items). Inflation and real interest rate negatively affect total domestic investment.

Author(s)	Title	Region/ Country	Variables	Methodology	Result
			- A composite index of financial development		
Alem & Townsend, 2014	An evaluation of financial institutions: Impact on consumption and investment using panel data and the theory of risk-bearing	Thailand	<ul style="list-style-type: none"> - Investment - Headman response - Time to district centre - Geographic information service, 	Ordinary least squares, Instrumental Variables and Generalised Method of Moments	Bank-based financial development has a negative impact on investment shocks

4. Data and Methodology

The general model to be estimated is given as:

Model 1:

$$I_t = \rho_0 + \rho_1 D_t + \rho_2 BG_t + \rho_3 MG_t + \rho_4 R_t + \rho_5 S_t + \rho_6 I_{t-1} + \varepsilon_t \dots\dots\dots 1$$

Where: *I* is the annual growth rate of the gross fixed capital formation (a proxy for the level of domestic investment), *D* is the growth rate of real per capita GDP (a proxy for the rate of growth of the desired level of real output), *BG* is the accelerator interaction term for bank-based financial development, *MG* is the accelerator interaction term for market-based financial development, *R* is the real interest rate at, *S* is the gross domestic savings, and ε is the error term.

The indices for bank-based and market-based financial development were calculated using the method of means-removed averages. Three bank-based financial development indicators – namely, liquid liabilities as a ratio of GDP (M3), 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 bank-based financial development index (*B*). Liquid liabilities (M3) were used as a measure of the size of the bank-based financial sector, while domestic credit to private sector measures the importance of banks in the supply of credit to the private sector. Claims on central government measure the importance of banks in the supply of credit to the public sector.

Three market-based financial development indicators were used to calculate the market-based financial development indicator (M) – namely, stocks traded; total value as a percentage of GDP; market capitalisation of listed companies as a ratio of GDP; and stocks traded, turnover ratio (%). Market capitalisation of listed companies measures the market size, while stocks traded, total value, complements the market capitalisation ratio by showing whether market size is matched by trading. The Turnover ratio measures the total value of shares traded during the period, divided by the average market capitalisation for the period.

Multiplying each of these indices by the growth rate of real per capita GDP (a proxy for the rate of growth of the desired level of real output) gives the accelerator interaction terms for bank-based financial development (BG) and market-based financial development (MG).

Model 1 hypothesises that financial development enhances the effects of changes in aggregate demand, which is translated as a change in aggregate output. Following Ndikumana (2000), financial development is hypothesised as reducing liquidity constraints for investors, therefore leading to an increase in capital stock as investors respond to the increase in aggregate demand (proxied in this study by the growth rate of the real per capita GDP). Therefore, higher financial development should be associated with stronger accelerator effects.

Alternatively, assuming that there is no accelerator enhancing effect of both bank-based financial development and market-based financial development on investment, the following general model is estimated:

Model 2:

$$I_t = \rho_0 + \rho_1 D_t + \rho_2 B_t + \rho_3 M_t + \rho_4 R_t + \rho_5 S_t + \rho_6 I_{t-1} + \varepsilon_t \dots \dots \dots 2$$

Where all other variables are as already defined except B which is the index for bank-based financial development, and M which is the index for market-based financial development.

Model 2 hypothesises a direct relationship between financial development and investment. In other words, it is the development of the financial sector that leads to increased investment.

The associated ARDL representation of the cointegration test equation to be tested for each model is given by:

Model 1:

$$\begin{aligned} \Delta I_t = & \alpha_0 + \sum_{i=0}^n \alpha_{1i} \Delta D_{t-i} + \sum_{i=0}^n \alpha_{2i} \Delta BG_{t-i} + \sum_{i=0}^n \alpha_{3i} \Delta MG_{t-i} + \sum_{i=0}^n \alpha_{4i} \Delta R_{t-i} \\ & + \sum_{i=0}^n \alpha_{5i} \Delta S_{t-i} + \sum_{i=1}^n \alpha_{6i} \Delta I_{t-i} + \sigma_1 D_{t-1} + \sigma_2 BG_{t-1} + \sigma_3 MG_{t-1} \\ & + \sigma_4 R_{t-1} + \sigma_5 S_{t-1} + \sigma_6 I_{t-1} + \mu_{1t} \end{aligned} \dots \dots \dots 3$$

Model 2:

$$\begin{aligned} \Delta I_t = & \alpha_0 + \sum_{i=0}^n \alpha_{1i} \Delta D_{t-i} + \sum_{i=0}^n \alpha_{2i} \Delta B_{t-i} + \sum_{i=0}^n \alpha_{3i} \Delta M_{t-i} + \sum_{i=0}^n \alpha_{4i} \Delta R_{t-i} \\ & + \sum_{i=0}^n \alpha_{5i} \Delta S_{t-i} + \sum_{i=1}^n \alpha_{6i} \Delta I_{t-i} + \sigma_1 D_{t-1} + \sigma_2 B_{t-1} + \sigma_3 M_{t-1} \\ & + \sigma_4 R_{t-1} + \sigma_5 S_{t-1} + \sigma_6 I_{t-1} + \mu_{1t} \end{aligned}$$

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Where all other variables are as defined except Δ , which is the difference operator, $\alpha_0, \alpha_{i,1}-\alpha_{i,6}$ and $\sigma_{i,1} - \sigma_{i,6}$, are the respective coefficients, and μ_{1t} -is the error term.

The above model is estimated with the null hypothesis being of a cointegration relationship, that is:

$$H_0: \sigma_{i,1} = \sigma_{i,2} = \sigma_{i,3} = \sigma_{i,4} = \sigma_{i,5} = \sigma_{i,6} = 0 \dots\dots\dots 5$$

Tested against the alternative hypothesis of the existence of a cointegration relationship:

$$H_1: \sigma_{i,1} \neq \sigma_{i,2} \neq \sigma_{i,3} \neq \sigma_{i,4} \neq \sigma_{i,5} \neq \sigma_{i,6} \neq 0 \dots\dots\dots 6$$

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 as calculated and supplied by Pesaran et al. (2001:300). If the calculated F-statistic lies between the bounds, the test is inconclusive. If it is above the upper bound, the null

hypothesis of no level effect is rejected. If it is below the lower bound, the null hypothesis of no level effect cannot be rejected.

Once the variables included in the ARDL representations are found to be cointegrated, the following error correction model is estimated for each respective model:

For Model 1:

$$\Delta I_t = \alpha_0 + \sum_{i=0}^n \alpha_{1i} \Delta D_{t-i} + \sum_{i=0}^n \alpha_{2i} \Delta BG_{t-i} + \sum_{i=0}^n \alpha_{3i} \Delta MG_{t-i} + \sum_{i=0}^n \alpha_{4i} \Delta R_{t-i} + \sum_{i=0}^n \alpha_{5i} \Delta S_{t-i} + \sum_{i=1}^n \alpha_{6i} \Delta I_{t-i} + \xi_1 ECM_{t-1} + \mu_t$$

.....7

For Model 2:

$$\Delta I_t = \alpha_0 + \sum_{i=0}^n \alpha_{1i} \Delta D_{t-i} + \sum_{i=0}^n \alpha_{2i} \Delta B_{t-i} + \sum_{i=0}^n \alpha_{3i} \Delta M_{t-i} + \sum_{i=0}^n \alpha_{4i} \Delta R_{t-i} + \sum_{i=0}^n \alpha_{5i} \Delta S_{t-i} + \sum_{i=1}^n \alpha_{6i} \Delta I_{t-i} + \xi_1 ECM_{t-1} + \mu_t$$

.....8

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

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

The study used data for Mauritius for the period of 1976 to 2012. The main data source was the World Development Indicators (World Bank, 2016).

5. Empirical Results

To ensure that all the variables are integrated of an order equal to 0 or 1, the Augmented Dickey-Fuller Generalised Least Square, Perron (1997) PPURoot and Ng-Perron Modified unit root tests were employed. The ARDL bounds test can only be employed when all variables are integrated of an order equal to one or less. Results of the unit root tests are shown in Table 2 and confirm that all the variables under consideration are at most integrated of order 1.

Table 2: Unit Root Tests

MAURITIUS								
DICKEY-FULLER Generalised Least Square (DF-GLS)					Perron (1997) Unit Root Test (PPURoot)			
Variable	Stationarity in levels		Stationarity in differences		Stationarity in levels		Stationarity in differences	
	No trend	With trend	No trend	With trend	No trend	With trend	No trend	With trend
I	-2.667***	-3.055**	-	-	-4.350	-4.631	-8.273***	-8.262***
D	-3.155***	-5.415***	-	-	-6.876***	-7.148***	-	-
BG	-2.588**	-5.911***	-	-	-6.817***	-6.952***	-	-
MG	-2.759***	-3.843***	-	-	-2.921	-2.862	-10.823***	-10.547***
B	-1.201	-2.393	-2.684***	-2.972*	-2.974	-2.478	-5.194*	-5.783*
M	-1.492	-1.725	-5.794***	-5.954***	-3.676	-3.255	-7.079***	-7.889***
R	-1.092	-1.023	-9.835***	-10.117***	-3.313	-3.907	-11,116***	-10.950***
S	-1.129	-1.512	-4.589***	-5.506***	-3.746	-3.543	-7.028*	7.816*

Ng-Perron Modified Unit Root Test

	MZa				MZt			
Variable	Stationarity in levels		Stationarity in differences		Stationarity in levels		Stationarity in differences	
	No trend	With trend	No trend	With trend	No trend	With trend	No trend	With trend
I	-10.428**	-12.072	-17.51***	-17.394**	-2.162**	-2.439	-2.939***	-2.928**
D	-13.530**	-18.570**	-	-	-2.594***	-3.042**	-	-
BG	-10.356**	-18.892**	-37.62***	-22.26**	-1.167	-2.113	-4.311***	-3.325***
MG	-10.651**	-16.301*	-	-	-2.296**	-2.681*	-	-
B	-2.264	-12.513	-17.361***	-15.357*	-1.058	-1.917	-1.778**	-2.862**
M	-3.943	-7.376	-18.477***	-18.483**	-1.382	-1.557	-3.039***	-3.038**
R	-1.721	-2.691	-14.587***	-14.173***	-0.917	-1.015	-2.692***	-2.649*
S	-3.269	-4.533	-16.779***	-17.720**	-1.041	-1.434	-2.885***	-2.976**
	MSB				MPT			
Variable	Stationarity in levels		Stationarity in differences		Stationarity in levels		Stationarity in differences	
	No trend	With trend	No trend	With trend	No trend	With trend	No trend	With trend

I	0.207**	0.202	-0.167***	0.168**	2.811**	7.640	1.470***	5.365**
D	0.192**	0.164**	-	-	1.833**	4.934**	-	-
BG	0.381	0.232	-0.114***	-0.149**	7.879	10.082	0.723***	4.162**
MG	0.216**	0.165**	-	-	2.343**	6.593***	-	-
B	0.467	0.153 **	0.091***		10.775	10.103	-2.580**	4.382**
M	0.350	0.211	0.164***	0.164***	6.231	12.960	1.325***	4.940**
R	0.533	0.377	0.185*	0.177*	14.066	29.230	1.709***	6.501*
S	0.319	0.317	0.172***	0.168**	7.267	19.552	1.501***	5.146**

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

Given the confirmation of the order of integration to be at most 1, the next step is to test the possibility of cointegration among the variables using the ARDL bounds testing procedure. The empirical results of the ARDL bounds tests for cointegration are reported in Table 3.

Table 3; Bounds F-Test for Cointegration

	DEPENDENT VARIABLE	FUNCTION	F-STATISTIC	COINTEGRATION STATUS		
MODEL 1	I	F (I D, BG, MG, R, S)	10.8086***	Cointegrated		
MODEL 2	I	F (I D, B, M, R, S)	4.4014**	Cointegrated		
Asymptotic Critical Values						
	1%		5%		10%	
<i>Pesaran et al., 2001: 300 Table CI(iii) case III</i>	I (0)	I (1)	I (0)	I (1)	I (0)	I (1)
	3.41	4.68	2.62	3.79	2.26	3.35

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

The results indicate that the computed F-statistic is greater than the upper critical bound at the 5% level of significance for all models. This implies that there is cointegration between the series, and it confirms that investment, growth, bank-based financial development, market-based financial development, savings, and real interest

rates are cointegrated over the study period. Following the confirmation of cointegration, the optimal lag selected, based on the Schwarz Bayesian Criterion (SIC), is ARDL (1,1,0,0,1,1) for Model 1 and ARDL (1,1,1,0,0,1) for Model 2.

The estimated long-run and short-run coefficients for both estimated ARDL models are given in Table 4. Panel A of Table 4 gives the long-run results, while Panel B gives the short-run results.

Table 4: Estimated Long Run and Short Run coefficients

PANEL A ESTIMATED LONG-RUN COEFFICIENTS							
MODEL 1				MODEL 2			
ARDL (1,1,0,0,1) selected based on Schwarz Bayesian Criterion				ARDL (1,1,1,0,0,1) selected based on Schwarz Bayesian Criterion			
Dependent variable is I				Dependent variable is I			
Regressor	Coefficient	T-Ratio	Prob. Values	Regressor	Coefficient	T-Ratio	Prob. Values
D	0.23946	0.26757	0.794	D	-0.049643	-0.065775	0.949
BG	-2.2363	-1.5745	0.144	B	-0.15110**	-2.8793	0.014
MG	1.2140	1.5872	0.141	M	0.030512	1.2664	0.229
R	-0.73888*	-2.1783	0.052	R	-0.29812	-1.0278	0.324
S	0.39484	1.2346	0.243	S	-0.22501	-0.62971	0.541
C	26.0946***	4.6171	0.001	C	36.2084	5.6097	0.000
PANEL B ESTIMATED SHORT-RUN COEFFICIENTS							

MODEL 1				MODEL 2			
Dependent variable is dI				Dependent variable is dI			
Regressor	Coefficient	T-Ratio	Prob. Values	Regressor	Coefficient	T-Ratio	Prob. Values
dD	0.88718*	1.7669	0.099	dD	0.51167	1.3078	0.211
dBG	-1.7874	-1.4937	0.157	dB	-0.011142	-0.12408	0.903
dMG	0.97035*	1.7893	0.095	dM	0.027026	1.3704	0.191
dR	-0.44204**	-2.1890	0.046	dR	-0.26406	-1.1713	0.260
dS	-0.38863	-0.96891	0.349	dS	-0.64249	-1.5206	0.149
ecm(-1)	-0.79930**	-2.9282	0.011	ecm(-1)	-0.88575***	-3.4272	0.004
R-Squared	0.64104	R-Bar-Squared	0.34734	R-Squared	0.67027	R-Bar-Squared	0.42297
DW-statistic	2.2679			DW-statistic	1.8049		

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

The long-run results from the accelerator-enhancing relationship (Model 1) show that both bank-based and market-based financial developments are statistically insignificant. Therefore, this implies that both types of financial development do not have any output related accelerator effect on investment in the long run. The short-run results of the accelerator-enhancing relationship (Model 1) show that market-based financial development is the only type of financial development that has a positive and statistically significant effect on investment.

In both the long run and the short run, real interest rates were found to have a negative and statistically significant effect on investment. The level of desired output growth was also found to have a positive short-run effect on investment.

The result for model 2 (no accelerator enhancing effect of financial development on investment) shows that only bank-based financial development has a negative and statistically significant effect on investment in the long run. Market-based financial development was found to be statistically insignificant. Therefore, implications are that bank-based financial development has a direct effect on investment in the long run, while market-based financial development does not. All other variables were found to be insignificant for Model 2.

For both models, the coefficient for the error correction term ($ecm(-1)$) was also found to be negative and significant, as expected. The estimated models 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	MODEL 1		MODEL 2	
	LM Version	Prob. Values	LM Version	Prob. Values
A: Serial Correlation	1.0422	0.307	0.44886	0.503
B: Functional Form	1.9201	0.166	1.3630	0.243
C: Normality	0.12029	0.942	0.67830	0.712
D: Heteroscedasticity	0.12068	0.728	0.54987	0.458

The plot of the Cumulative Sum of Recursive Residuals (CUSUM) and the Cumulative Sum of Squares of Recursive Residuals (CUSUMQ) for both models is given in Tables 6 and 7.

Table 6; Plot of CUSUM and CUSUMQ – MODEL 1

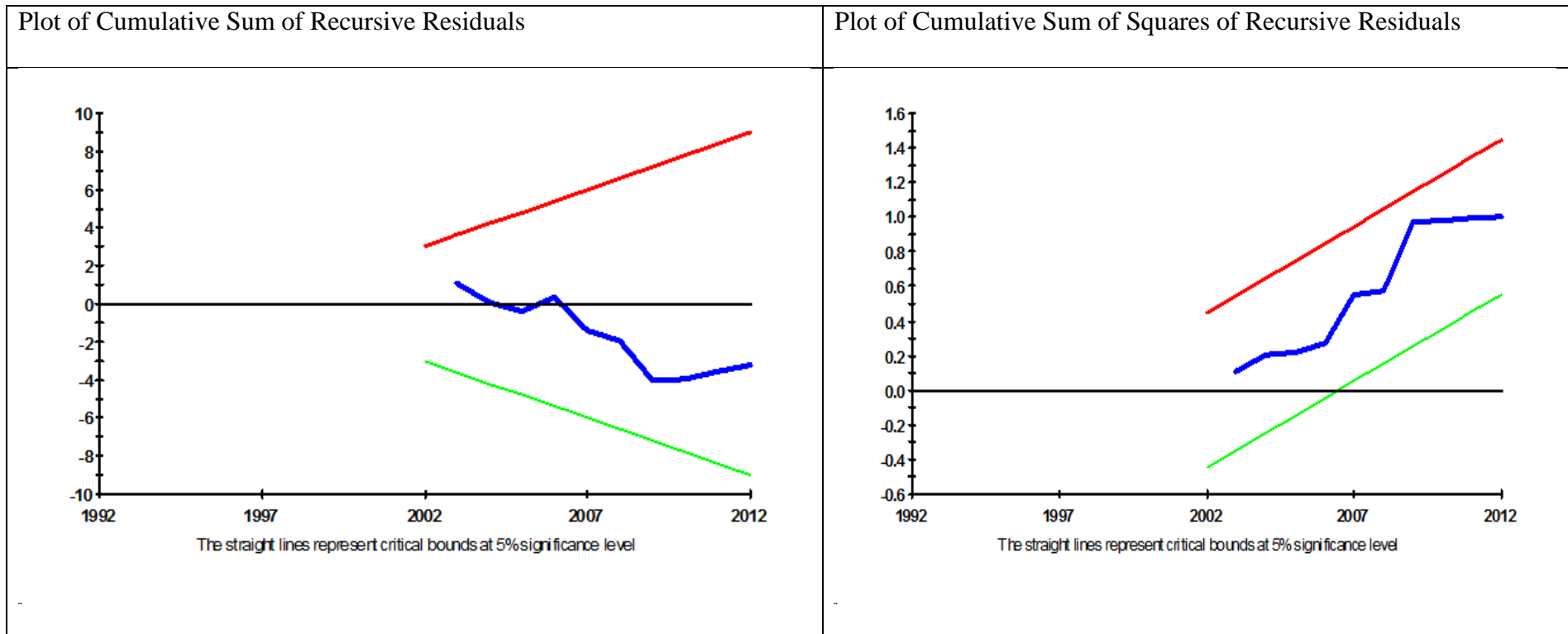
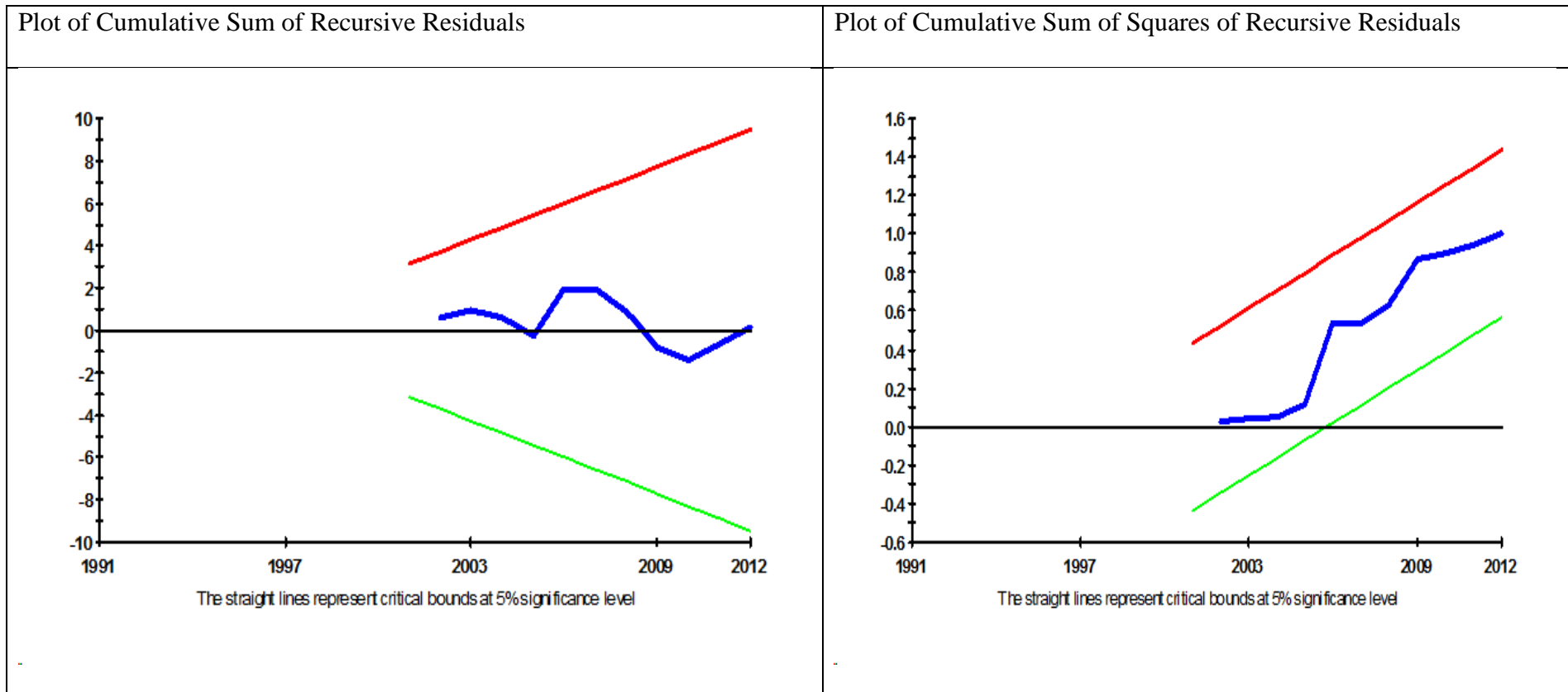


Table 7; Plot of CUSUM and CUSUMQ – MODEL 2



The Cumulative Sum of Recursive Residuals (CUSUM) and the Cumulative Sum of Squares of Recursive Residuals (CUSUMQ) for Models 1 and 2 in Table 6 and 7, respectively, show that both models are stable and confirm stability of the long-run coefficients for the regressors at the 5% level of significance.

6. Conclusion

This paper examined the impact of both bank-based and market-based financial development on investment in Mauritius between 1976 and 2014. Two models were employed to evaluate the relationship between investment and financial development. One model postulated that both bank-based financial development and market-based financial development enhance the response of investment to an increase in the demand for output. The other model contended that there is no such enhancement for both types of financial development on investment. With the aid of composite indices, the study split financial development into bank-based and market-based financial development. The study made use of the ARDL bounds testing approach. For both tested models, results indicate that bank-based financial development has only a negative direct effect on investment in the long run. In contrast, market-based financial development was found to have a positive accelerator-enhancing effect on investment in the shortrun. Implications are that, for Mauritius, only market-based financial development enhances the response of investment to an increase in the demand for output, while bank-based financial development has a negative direct effect on investment in the long run.

REFERENCES

- Adegbite, E.O. and Adetiloye, K.A., 2013. Financial Globalisation and Domestic Investment in Developing Countries: Evidence from Nigeria. *Mediterranean Journal of Social Sciences*, 4(6): 213 – 221
- Adeniyi, O., & Egwaikhide, F. O. 2013. Saving-Investment Nexus in Developing Countries: Does Financial Development Matter?. *Journal of Economic Development*, 38(2): 119-140.
- Alem, M., & Townsend, R. M. 2014. An evaluation of financial institutions: Impact on consumption and investment using panel data and the theory of risk-bearing. *Journal of econometrics*, 183(1): 91-103.
- Bassanini, A., Scarpetta, S., & Hemmings, P. 2001. Economic growth: the role of policies and institutions. Panel data evidence from OECD countries. Available on <http://www.oecd-ilibrary.org/content/workingpaper/424300244276?crawler=true&mimetype=application/pdf> . Accessed 29 September 2015
- Beck, T., Demirgüç-Kunt, A., & Levine, R. 2000. A new database on the structure and development of the financial sector. *The World Bank Economic Review*, 14(3): 597-605.
- Beck, T., Demirgüç-Kunt, A., & Levine, R. 2010. Financial institutions and markets across countries and over time: The updated financial development and structure database. *The World Bank Economic Review*, 24(1): 77-92.
- Čihák, M, Demirgüç-Kunt, A., Feyen, F., and Levine, R. 2012. Benchmarking Financial Development Around the World, *World Bank Policy Research Working Paper* 6175

- De Gregorio, J., & Guidotti, P. E. 1995. Financial development and economic growth. *World development*, 23(3): 433-448.
- Dutta, N., & Roy, S. 2009. The Impact of Financial Development on Domestic Investment: A Quantile Regression Approach. *Indian Macroeconomics Annual*, 6:107-130.
- Fowowe, B. 2011. Financial sector reforms and private investment in Sub-Saharan African countries. *Journal of Economic Development*, 36(3): 79-97.
- Galbis, V., 1994. *Sequencing of financial sector reforms: a review* (No. 94-101). International Monetary Fund.
- Jankee, K. 1999. Financial Liberalisation and Monetary Control Reform in Mauritius. *Research Journal—University of Mauritius*, 2: 9-28
- Jankee, K. 2006. Banking Controls, Financial Deepening and Economic Growth in Mauritius. *African Review of Money Finance and Banking*, 75-96.
- Lahcen, A. C. H. Y. 2004. *Financial liberalisation, saving, investment and growth in MENA countries* (No. 0411004). EconWPA.
- Leahy, M., Schich, S., Wehinger, G., Pelgrin, F., & Thorgeirsson, T. 2001. Contributions of financial systems to growth in OECD countries. [Online] Available from <<http://www.oecd-ilibrary.org/docserver/download/5lgsjvhvj800q.pdf?expires=1443604390&id=id&accname=guest&checksum=7E4B595059615F9A32B72A799EEAB956>>[Accessed 30 September 2015]
- Matsheka, T. C. 1998. Interest Rates, And The Saving-Investment Process In Botswana. *African Review of Money Finance and Banking*: 5-23.

- Misati, R. N., & Nyamongo, E. M. 2011. Financial development and private investment in Sub-Saharan Africa. *Journal of Economics and Business*, 63(2): 139-151.
- Moriera, E. P. 1999. Financial Liberalisation and the Sequencing of Reforms: African Countries Experiences. *A program for the African Development Bank*.
- Muyambiri, B and Odhiambo, N.M. 2016. The Sequencing Of Reforms And Bank-Based Financial Development In Mauritius, *Journal of Accounting and Management*, 6(1):pp. 89 – 114.
- Ndikumana, L. 2000. Financial Determinants of Domestic Investment in Sub-Saharan Africa: Evidence of Panel Data. *World Development*, 28(2): 381-400.
- Ndikumana, L., & Mannah Blankson, T. 2015. Financing Domestic Investment in African Countries: Does the Source of Financing Matter? *Political Economy Research Institute* WP391: 1-28
- Nyasha, S. and Odhiambo, N.M., 2014. Bank-based financial development and economic growth: A review of international literature. *Journal of Financial Economic Policy*, 6(2):112-132.
- Nyasha, S. and Odhiambo, N.M., 2015. Economic growth and market-based financial systems: a review. *Studies in Economics and Finance*, 32(2): 235-255.
- Pesaran, M. H., Shin, Y., & Smith, R. (2001). Bound testing approaches to the analysis of level relationship. *Journal of Applied Econometrics*, 16 (3), 289-326.
- Phiri M & Kannan A. 2014. Mauritius 2014, African Economic Outlook , Available from

<http://www.africaneconomicoutlook.org/fileadmin/uploads/aeo/2014/PDF/CN_Long_EN/Maurice_EN.pdf>[Accessed 15 January 2014}

Schich, S., & Pelgrin, F. 2002. Financial development and investment: panel data evidence for OECD countries from 1970 to 1997. *Applied Economics Letters*, 9(1): 1-7.

Uçan, O., & Öztürk, Ö. 2011. Financial determinants of investment for Turkey. *Journal of Economic and Social Studies*, 1(1): 83-110.

Warman, F., & Thirlwall, A.P. 1994 Interest rates, saving, investment and growth in Mexico 1960–90: Tests of the financial liberalisation hypothesis, *The Journal of Development Studies*, 30(3): 629-649, DOI: 10.1080/00220389408422330

World Bank. 2016. *Global Development Finance* (Washington: World Bank).