

Does Supply-Leading Hypothesis Holds in South Africa? Evidence from ARDL Estimation Technique

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Abstract. Using ARDL bound test procedure the present study investigates whether economic growth influences financial sector development through stock market development in South Africa for the period of 2005 to 2014. The finding shows that growth of the economy enhances financial sector development through stock market medium in South Africa both in short run and long-run phenomenon. The finding confirmed the existence of Joan Robison (1952) supply leading hypothesis in the country investigated. The policy implication is that the authority in this country needs to put additional efforts in policies that will boost the overall performance of the economy considering its positive influence on financial sector development via stock market boost. Effective policies that will enhance the competitiveness of the stock market performance are essential ingredient that will boost the performance of the stock market and hence will have multiplier effect on the overall economy.

Keywords. Financial Development, Economic growth, ARDL, Cointegration, South Africa.

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1. Introduction

The debate over finance-growth nexus among economists and finance researchers is quite long deliberating as some believed financial development causes economic growth, whereas the antagonists argues that improvement in the economic activities promoted financial sector development. The most renowned proponent of demand-following hypothesis Schumpeter (1934) argued that technological invention is the momentum that promotes long-run economic growth and the cause of such invention is the capability of financial sector to extend loans to the entrepreneurs. McKinnon (1973) and Shaw (1973) were the initial contributors that shows the essential function of banking system that is free from financial constraints which includes; interest rate ceilings, high reserve requirements and interrupted credit system. These policies are more widely common in less developed economies though they occur also in some advanced economies. They argued that financial suppression interrupt savings and investments, whereas financial system liberalization promote financial deepening and increase competition in the financial sector which also promote economic growth (See also Goldsmith (1969); Galbis (1977); Fry (1978); Greenwood & Jovanovic (1990) and Thakor (1996) for more elaboration on supply-leading hypothesis). Despite the relevance and importance of stock market in the

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development of financial sector and overall economic growth as well as South Africa's position in the financial market of Africa, few studies examine its relevance with regards to economic growth and other determinants.

However, Joan Robinson (1952) believed that expansion of economic activities creates a demand for numerous types of financial services and this influence financial system positively. The main argument based on supply-leading hypothesis is that "*where enterprise leads finance follows*". Kuznets (1995) also reconfirmed Robinson's hypothesis as he recommends that when the economic real sector grows and approaches the transitional growth stage, the businesses requires more of financial services. Thus, financial development relies on the level of economic development not economic growth depends on financial development. A sound financial sector is an integral part of successful economy because stability in the sector will lead to enhance economic growth. The more effective the financial sector, the more availability of competitive financial products and services that if utilized efficiently could lead to more and sustainable growth. Successful stock market can positively influence financial sector and hence improve the performance of the overall economy. Stock market assist firms more especially blue chip companies to raise external finances that helped them to expand their operations. The role of economic growth onstock market development forSouth Africa is worth studying because Johannesburg stock exchange market is the most sophisticated and strongest in the entire African continent. Therefore investigating the contribution of economic growth to its advancement is very essential as no much studies conducted about this nexus despite the fact that South African economy is among the most promising in the emerging market economies.

2. Literature review

Most of the earlier studies on the growth-finance nexus focus more about bank based financial indicators such as private sector credit as a ratio of GDP, bank deposit ratio to nominal GDP, ratio of liquid liability to GDP, and so on. However, the increase in the volume of shares traded in the global stock markets gave some researchers an insight to consider stock market indicators in determining financial sector development on other macroeconomic variables. For instance, the global stock market capitalization rose from \$4.7 to \$15.2 trillion between the mid-80s and mid-90s (Demirguc-Kunt & Levine, 1996). The aggregate volume of shares traded in the less developed countries stock markets grew over twenty-five fold between 1983 and 1992 (Singh, 1997).When stock market is well established, it can offer various types of financial services than banking system and it may hence provide different type of incentives to investment and growth than the banking sector development (Levine & Zervos, 1996). Several empirical findings supported supply-leading hypothesis, study by King & Levine (1993) is among the pioneering ones which apply simple cross-country ordinary least square (OLS) regression across 80 countries and suggest that financial development certainly affect economic growth. Same result was found by Chistopoulos & Tsionas (2004) who assess the cointegrating relationship between the development of banking sector and economic growth across 10 developing economies. They used panel cointegration approach and concluded that there is unidirectional relationship running from financial development to economic growth. The role of stock market on economic growth is examined by Atje & Jovanovic (1993) and the finding shows that transaction volume in the stock market has an ultimate impact on the growth of the economy. Furthermore, consequent studies reconfirmed these results by concentrating on the two financial development indicators i.e. market-based and bank based (check for example, Levine & Zervos, 1998; Demirguc-Kunt &

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Maksimovic, 1998). Ang (2008) also assess the linkage of financial development with economic growth in Malaysia using six-equation model. The finding support supply-leading hypothesis as it is the growth of financial market that promotes increase of output through both private savings and investments. The results also shows some support for the endogenous hypothesis of financial deepening and growth models that financial development leads to higher growth through enhanced investment efficiency. Rachdi (2011) examine finance-growth nexus for six OECD and four MENA countries and applied GMM technique for the time period 1990 to 2006. The finding reveals that financial development influences economic growth positively for the two different regions. While the error correction term for MENA shows uni-directional causality, in OECD it indicated bi-directional causality. While some studies supports Schumpeterian supply-leading hypothesis, other findings supports Robinson's demand-following hypothesis. For instance study by Ang & McKibbin (2007) that assess the weather financial development leads growth of the economy in small open Malaysian economy for the period of 1960 to 2001. They used both cointegration and causality tests and concluded that when the financial system is liberalized by removing repressionist policies, it leads to stimulate financial sector development. The results also indicated that the relationship between financial depth and economic development is positive, and based on causality the result reconfirmed Robinson's demand following as output growth stimulate higher financial depth in the long-run.

However, some empirical findings related to finance-growth nexus neither support supply leading hypothesis nor demand-following hypothesis as the results are in-between. For example, Samargandi et al., (2014) applied ARDL bound testing and examine the links between financial development and economic growth in oil rich Saudi Arabia and concluded that the relationship is positive on the non-oil sector, while it is neither negative nor insignificant in case of oil sector. This highlight that the finance-growth nexus maybe different when the economy is highly controlled by the natural resources. Law & Singh (2014) applied innovative dynamic panel data technique and examine finance-growth relationship across 87 developed and developing countries. The findings suggested that the positive effect of financial development on economic growth is only to a given level of the economy and when it goes beyond such level more financial development influences growth negatively.

3. Data and methodology

This study used monthly data from January, 2005 to May, 2014, stock market development as proxied by share prices and exchange rates is obtained from Reserve Bank of South Africa (RBSA), while real GDP and inflation variables were obtained from world development indicators (WDI, 2015), World Bank date base.

Econometric model specification

Following Khan et al., (2005), Fosu and Magnus (2006) the ARDL form of vector error correction model (VECM) can be specified below;

$$\Delta \ln SM_t = \beta_0 + \beta_1 \ln SM_{t-1} + \beta_2 \ln GDP_{t-1} + \beta_3 \ln ER_{t-1} + \beta_4 \ln INF_{t-1} + \sum_i^p \gamma_i \Delta \ln SM_{t-1} + \sum_j^q \delta_j \Delta \ln GDP_{t-j} + \sum_l^p \varphi_l \Delta \ln ER_{t-l} + \sum_m^q \eta_m \Delta \ln INF_{t-m} + \varepsilon_t \quad (1)$$

Where; $\ln SM_t$ is the log of stock market as proxied by share prices, $\ln GDP_t$ is the log of real GDP, $\ln ER_t$ is the log of exchange rates, and $\ln INF_t$ is the inflation rate and subscript t denote time period. The first stage is to estimate equation (1) using OLS and then proceed to conduct Wald test of F-test that is meant to show

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joint significance of the coefficients of lagged variables with the aim of assessing whether there exist long-run relationship among the variables. The next is to test the null hypothesis of $H_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$, the hypothesis stated that there is no cointegration between the variables against the alternate hypothesis $H_a \neq \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq 0$ that stated there is cointegration among the variables. The F-statistics is then compared with the critical value as suggested by Pesaran et al., (2001). If the value of F-statistics is above the upper critical value the null hypothesis of no cointegration is rejected which implies the existence of cointegration between the variables. On the other hand, if F-statistics is less than the lower critical value the null hypothesis cannot be rejected which suggests no cointegration. However, if the value of F-statistics falls between lower and upper bounds the result becomes indecisive.

The next step is to test long-run coefficients of ARDL as shown below:

$$\ln SM_t = \beta_0 + \sum_{i=1}^p \gamma_i \ln SM_{t-1} + \sum_{j=0}^{q_1} \delta_j \ln GDP_{t-j} + \sum_{l=0}^{q_2} \varphi_l \ln ER_{t-l} + \sum_{m=0}^{q_3} \eta_m \ln INF_{t-m} + \varepsilon_t \quad (2)$$

We applied SBC criteria for selecting appropriate lag length of the ARDL model for the variables under investigation. Lastly, we use error correction model so as to determine the dynamics of the variables in the short-run:

$$\Delta \ln SM_t = \beta_0 + \sum_{i=1}^p \gamma_i \Delta \ln SM_{t-1} + \sum_{j=0}^q \delta_j \Delta \ln GDP_{t-j} + \sum_{l=0}^q \varphi_l \Delta \ln ER_{t-l} + \sum_{m=0}^q \eta_m \Delta \ln INF_{t-m} + \vartheta ecm_{t-1} + \varepsilon_t \quad (3)$$

After estimating ECM we then followed Pesaran (1997) to test for stability of the long-run coefficients together with dynamics in the short-run, these stability tests are cumulative sum of recursive residuals(CUSUM) and the cumulative sum of squares of recursive residuals(CUSUMSQ).

4. Empirical findings

The nature of time series data requires the variables to be in stationary in order to proceed with the estimation; therefore we tested the four variables and get their order of integration as shown in the table 1 below:

Table 1. Results of the ADF and PP unit root tests from 2005-2014

Variables	Augmented Dickey Fuller		Phillips Perron	
	Constant Without Trend	Constant With Trend	Constant Without Trend	Constant With Trend
	<u>Level</u>			
lnSM_t	-3.00**	-5.08***	-3.37**	-5.00***
lnGDP_t	-2.86*	-3.49**	-1.78	-2.00
lnER_t	-1.44	-2.28	-1.42	-2.34
lnINF_t	-0.57	-3.88**	-0.40	-1.31
	<u>First Difference</u>			
lnSM_t	-2.97**	-3.24*	-19.7***	-23.4***
lnGDP_t	-2.37	-2.39	-2.31	-2.34
lnER_t	-10.92***	-10.87***	-10.92***	-10.87***
lnINF_t	-7.74***	-7.72***	-7.63***	-7.60***

Notes. The ADF and PP test equations include both constant and trend terms. The Schwarz information criterion (SIC) is used to select the optimal lag order in the ADF test equation. The values in brackets are corresponding p-values ***shows significance level at 1%, *5%, and **10% respectively.

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ADF and PP unit root tests in table 1 indicated that stock market, GDP and inflation are all stationary at level which means are I(0) variables while exchange rate is non-stationary at level but became stationary after taking first difference which means is an I(1) variable. With the combination of I(0) and I(1) variables ARDL is the most suitable method to apply (Pesaran, et al. 2001).

4.1. Cointegration test

Table 2. ARDL bound test estimation result

Model for estimation	Lag length	F-statistics	Significance level	Critical bound	
				F-statistics I(0)	F-statistics I(1)
$F_{SM}(GDP ER INF)$	4	6.19	1%	3.65	4.66
			5%	2.79	3.67
			10%	2.37	3.20

Notes: Asymptotic critical value bounds are obtained from table F-statistic in appendix CI, Case II: intercept and no trend for $k = 3$ (Pesaran et al. (2001) p.300). N.B: we use * to represent 10%, ** 5% and *** 1% for hypothesis rejection respectively.

The above results show that stock market, GDP, exchange rate and inflation have long-run association as the value of calculated F-statistics (6.19) is greater than the upper bound of the critical value suggested by Pesaran et al., (2001) for large sample size. This gave us a chance to reject the null hypothesis of no cointegration at 1% ($H_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$) and accept alternate hypothesis ($H_a = \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq 0$) that indicated the presence of cointegration among the variables under study. As we established the long-run relationship between the variables, we then move and estimated our equation (2) to obtain the long-run coefficients whose result is shown in table 3 below:

Table 3. Estimated long-run coefficients from error correction model based on SBC
Dependent variable (Δlsm_t)

Regressors	Coefficients	T-ratio (p-values)
Constant	-32.1	-1.70(0.92)
$\ln GDP_t$	8.31	2.08(0.04)**
$\ln ER_t$	-0.02	-0.07(0.95)
$\ln INF_t$	1.39	4.61(0.00)***

Note: *, **, and *** indicate significance at 10%, 5% and 1%, for hypothesis rejection respectively.

The long-run relationship shows that GDP is statistically significant on stock market development as 1% increase in GDP could lead to 8.31% increase in stock market development, therefore null hypothesis was rejected at 5% level of significance. Inflation is positive and also statistically significant on stock market performance as null hypothesis was rejected at 1% significance level, this means 1% increase in inflation could lead to 1.39% increase in stock market development in South Africa, while exchange rate is statistically negative and insignificant. The finding of this research therefore empirically confirmed the existence of supply-leading hypothesis in South African economy.

Table 4. Estimated short-run coefficients from error correction model based on SBC
Dependent variable ($\Delta lns m_t$)

Regressors	Coefficients	T-ratio (p-values)
$\Delta \ln SM_t$	-0.37	-3.29(0.00)***
$\Delta \ln GDP_t$	115.9	1.88(0.06)*
$\Delta \ln ER_t$	-0.86	-2.28(0.00)***

$\Delta \ln INF_t$	9.53	2.28(0.02)**
ECM(-1)	-0.51	-4.94(0.00)***

Notes. *, **, and *** indicate significance at 10%, 5% and 1%, respectively.

In the short-run the result seems different as the all the variables are statistically significant albeit exchange rate that is negatively significant on stock market development. The error correction term that reconfirmed the existence of long-run relationship among the variables reveals what is expected from the theory, that is ECM is less than one, negative and statistically significant which shows convergence of all the variables to attain long-run equilibrium (Banerjee, et al. 1998).

Table 5. ARDL diagnostic tests results

Test statistics	LM version	F-version
1: Serial correlation	CHSQ(12) = 22.8[0.03]**	F(12, 77) = 1.72 [0.08]
2: Functional form	CHSQ(1) = 1.32 [0.25]	F(1, 88) = 1.09 [0.29]
3: Normality	CHSQ(2) = 0.74 [0.69]	N/A
4: Heteroscedasticity	CHSQ(1) = 0.05 [0.82]	F(1, 106) = 0.04 [0.83]

Note: * 1%, **5%, and ***10% are used to test the significance level for hypothesis rejection

- 1: Langrange multiplier test of residual serial correlation.
- 2: Ramsey's misspecification test using squarer of the fitted values.
- 3: Jacque-Bera test for normality.
- 4: Autoregressive conditional heteroskedasticity test.

In order to confirm the consistency of our model several diagnostics tests was conducted and the result is reported in table 5 above, the result suggested that our model pass the entire four diagnostic time series tests of serial correlation, functional form, normality and heteroscedasticity as we cannot reject null hypothesis. The stability of the model is shown by figure 1 and 2 based on cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUM of squares), this means the model is highly stable as the blue lines of CUSUM and CUSUMSQ falls within the critical bounds.

5. Conclusion and policy recommendations

The present article examined the dynamic relationship between economic growth, exchange rate, inflation and stock market development for the period of 2005-2014 in South Africa based on ARDL bound testing approach. The empirical result reveals that variables are cointegrated as null hypothesis of no cointegration was rejected at 1% level. The long-run coefficient result reported that economic growth and inflation positively influences stock market development while exchange rates do not have any effect on it in the long-run. The policy recommendation remains that authorities in this country should place more emphasis on policies that will improve the overall economic performance considering its positive and significant effect on financial sector development via stock market development.

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