ISSN 2349-7807

International Journal of Recent Research in Commerce Economics and Management (IJRRCEM)
Vol. 2, Issue 1, pp: (56-60), Month: January - March 2015, Available at: www.paperpublications.org

The Egg or the Chicken First? Saving-Growth Nexus in Lesotho

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Abstract: **The paper is motivated by the divergent views in literature pertaining to the direction of causality between savings and economic growth. Using the annual time series data for the period 1980 to 2010 the paper investigates the long-run and causal relationship between savings and economic growth in Lesotho using the ARDL bounds test approach. As per the cointegration results, there exists a long-run relationship between savings and economic growth in Lesotho. Granger causality results, however, indicate that savings precede and drive economic growth in Lesotho, both in the short-run and long-run, and not the other way round. Hence policies aimed at enhancing economic growth in Lesotho should stimulate and spur meaningful savings levels.**

Keywords: **ARDL Bounds Test Approach, Granger Causality, Savings, Economic Growth, Lesotho.**

1. INTRODUCTION

The direction of causality between savings and economic growth in literature is inconclusive and has and continues to be a subject of debate. There are four divergent views on direction of causality between savings and economic growth, namely one-way causality from savings to economic growth, one-way causality from economic growth to savings, a two-way causality and no causality between the two respectively. A unidirectional causality running from savings to economic growth suggests that savings precede and drive economic growth. Endogenous growth models advocate for a savings led growth and exhibit that higher savings are a catalyst to an increased rate of steady-state growth of an economy (see Harrod, 1939; Solow, 1956). Some empirical studies such as Jappelli and Pagano (1994) and Olajide (2009) also support the argument that increases in savings induce economic growth. As per this hypothesis, policies aimed at enhancing economic growth should stimulate and spur meaningful savings levels.

A unidirectional causality from economic growth to savings suggests that economic growth causes growth of savings. Proponents of Keynesian hypothesis argue that economic growth leads to increases in incomes which in turn lead to increased level of saving in the economy. The works of Sinha and Sinha (1998), and Agrawal (2001) provide evidence that economic growth drives savings. According to this hypothesis, therefore, policies that induce saving may have little or no effect on economic growth. However, policies that aim at boosting savings levels should accelerate economic growth.

Savings and economic growth bi-directional causality, however, implies that the two are interrelated, such that one may precede or cause the other and that they may complement each other. The findings of Anoruo and Ahmad (2001) that there is a bi-directional causality in the cases of Cote d'Ivoire and South Africa support the two-way causality hypothesis. Mavrotas and Kelly (2001) also found a bi-directional causality in Sri Lanka. Lastly, no causality between savings and economic growth implies that there is no causal relationship between the two. Therefore policies pursued to accelerate one may not necessarily boost the other. Mavrotas and Kelly (2001) presented evidence that there is no causality between savings and economic growth in India.

According to the literature, however, the direction of causality between savings and economic growth is inconclusive, as different studies in different countries by different authors have varying conclusions. Some studies have found savings to cause economic growth, while some have found the reverse. Some studies found feedback between the two and others

independence. This motivates the paper to determine the direction of causality between savings and economic growth in the case of Lesotho.

The rest of the paper is organized as follows. Section two presents data and empirical methodology used in the study. Section three presents empirical results and analysis, and finally section four concludes the study.

2. DATA AND EMPIRICAL METHODOLOGY

The study uses annual time series data for the period 1980 to 2010. The data on economic growth (proxied by real GDP) and savings (proxied by gross domestic savings) respectively are extracted from the World Bank Development indicators.

The study employs autoregressive distributed lag (ARDL) bounds testing approach to cointegration developed by Pesaran and Shin (1999) and later extended by Pesaran et al. (2001) to examine the long-run and causal relationship between savings and economic growth in Lesotho for the period 1980-2010. The ARDL bounds test approach to cointegration has several advantages that have recently made it popular and preferred to other traditional cointegration techniques such as Engel and Granger (1987) and Johansen and Juselius (1990). The ARDL approach to cointegration performs better in small samples such as in our case. Unlike Johansen's cointegration technique that requires that variables under consideration be integrated of the same order the ARDL allows the undertaking of cointegration analysis regardless of whether the variables are integrated of order zero [I(0)], or order one [I(1)]. Furthermore, since the ARDL method can identify dependent and explanatory variables, it gives estimates that are consistent because it avoids problems related to endogeneity.

The ARDL framework for savings and economic growth is expressed as follows:

$$\Delta GDS_t = \alpha_0 + \sum_{i=1}^{m} \alpha_{1i} \Delta GDS_{t-i} + \sum_{i=0}^{m} \alpha_{2i} \Delta RGDP_{t-i} + \alpha_3 GDS_{t-1} + \alpha_4 RGDP_{t-1} + \varepsilon_t, \quad (1)$$

$$\Delta RGDP_t = \beta_0 + \sum_{i=1}^{m} \beta_{1i} \Delta RGDP_{t-i} + \sum_{i=0}^{m} \beta_{2i} \Delta GDS_{t-i} + \beta_3 RGDP_{t-1} + \beta_4 GDS_{t-1} + \varepsilon_t, \quad (2)$$

Where Δ is the first difference operator, GDS is savings, $RGDP$ is economic growth, m is the lag length, α's and β's are parameters to be estimated, and ε is a white-noise error term.

The F-test is used to determine the existence of the long-run relationship in equations 1 and 2 by testing for the joint significance of the coefficients of the lagged levels of the variables GDS and $RGDP$. The null and the alternative hypotheses of the long-run relationship in equation 1 are $H_0: \alpha_3 = \alpha_4 = 0$ and $H_1: \alpha_3 \neq \alpha_4 \neq 0$ respectively. In equation 2, when economic growth is the dependent variable, the null and the alternative hypotheses of the long-run relationship are $H_0: \beta_3 = \beta_4 = 0$ and $H_1: \beta_3 \neq \beta_4 \neq 0$ respectively. Two sets of critical values, lower and upper bound values, for large sample data sets are developed by Pesaran et al. (2001). Narayan (2005) reports small sample critical values. The upper bound critical values are estimated assuming that all variables in the ARDL model are integrated of order one [I(1)], and the lower bound critical values are computed assuming that the variables are integrated of order zero [I(0)]. At any chosen significance level if the computed *F*-statistic falls between the lower and upper bound critical values, the decision about cointegration between the underlying variables is inconclusive. However, if the computed *F*-statistic exceeds the upper bound critical value the null hypothesis is rejected and the decision is that the underlying variables are cointegrated. On the other hand if the computed *F*-statistic is less than the lower bound critical value the null hypothesis is not rejected and it is concluded that the variables are not cointegrated.

If the variables in question are cointegrated as per the cointegration test results then the implication is that there exists causality in at least one direction. After establishing cointegration status between savings and economic growth, the study uses the Granger causality test (Granger, 1969) to determine short-run and long-run causal relationships between the two variables. The study uses the following error-correction specification to test for causality:

$$\Delta GDS_t = \alpha_0 + \sum_{i=1}^{m} \alpha_{1i} \Delta GDS_{t-i} + \sum_{i=0}^{m} \alpha_{2i} \Delta RGDP_{t-i} + \lambda_1 EC_{t-1} + \varepsilon_t, \quad (3)$$

$$\Delta RGDP_t = \beta_0 + \sum_{i=1}^{m} \beta_{1i} \Delta RGDP_{t-i} + \sum_{i=0}^{m} \beta_{2i} \Delta GDS_{t-i} + \lambda_2 EC_{t-1} + \varepsilon_t, \quad (4)$$

where EC_{t-1} is the lagged error-correction term. The error-correction specification in testing for causality is advantageous because it allows testing for short-run as well as long-run causality. The lagged differenced regressors help capture short-

run causality and the lagged error-correction term helps capture long-run causality. In line with equations 3 and 4 the following null hypotheses can help determine granger causality between savings and economic growth:

i) For long-run Granger causality: ($H_0 = \lambda_1 = 0$ and $H_0 = \lambda_2 = 0$)

ii) For short-run Granger causality: ($H_1 = \alpha_{2i} = 0$and $H_1 = \beta_{2i} = 0$)

3. EMPIRICAL RESULTS AND ANALYSIS

Stationarity test:

The study uses both Augmented Dickey-Fuller (ADF) and Phillips-Perron unit root tests to test for stationarity nature of the variables. However, the necessity of performing the unit root test is to verify that none of the variables in question are integrated of any order higher than one since the ARDL bounds testing approach to co integration collapses for variables that are integrated of order two and above. Tables I and II present unit root tests results respectively. As per the results both variables, savings and economic growth, are non-stationary at level but become stationary after first differencing. That is, both unit root test results show that the two variables are I(1), a condition that allows us to proceed to the ARDL co integration test.

TABLE I: ADF UNIT ROOT TEST RESULTS

Variables	Level		1st difference	
	ADF Statistic	Critical Value (5%)	ADF Statistic	Critical Value (5%)
GDS	-2.0527	-3.5731	-5.4728	-3.5867
RGDP	0.7052	-3.5731	-6.4217	-3.5867

TABLE II: PHILLIPS-PERRON UNIT ROOT TEST RESULTS

Variables	Level		1st difference	
	PP Statistic	Critical Value (5%)	PP Statistic	Critical Value (5%)
GDS	-2.9463	-3.5670	-10.1211	-3.5796
RGDP	0.3928	-3.5670	-14.3433	-3.5796

Co integration test:

Before using the newly developed ARDL bounds testing approach to cointegration to determine the existence of long-run relationship between savings and economic growth, we determine the optimal lag length using VAR lag order selection criteria. Table III presents lag length selection results. The results indicate an appropriate lag length of one.

TABLE III: VAR LAG ORDER SELECTION CRITERIA RESULTS

Lag	LogL	LR	FPE	AIC	SC	HQ
o	-1284.922	NA	1.20e+36	88.75323	88.84742	88.78276
1	-1189.858	170.4584*	2.26e+33*	82.47300*	82.75589*	82.56159*
2	-1187.583	3.766823	2.55e+33	82.59191	83.06339	82.73957

*N.B: * indicates lag order selected by the criterion*

After determining the lag length we proceed to the cointegration test. Table IV presents cointegration test results. According to the results when savings (*GDS*) is a dependent variable, computed *F*-statistic lies below the lower bound critical value at 10% significance level hence the null hypothesis of no cointegration cannot be rejected. However, when economic growth (*RGDP*) is a dependent variable computed *F*-statistic is above the upper bound critical value at 5%

significance level hence the null hypothesis of no cointegration is rejected. Therefore, there exists only one cointegrating relationship between savings and economic growth.

TABLE IV: BOUNDS TEST FOR COINTEGRATION RESULTS

Dependent Variable	F-statistic	95% bounds		90% bounds	
		I(0)	I(1)	I(0)	I(1)
ΔGDS	2.5616	5.5107	6.3780	4.3679	5.1615
ΔRGDP	12.3878	5.5107	6.3780	4.3679	5.1615

Granger Causality:

When two variables are cointegrated then Granger causality exists between them in at least one direction. Since bounds test results indicated that no long-run relationship exists between savings and economic growth when savings is a dependent variable, we exclude the lagged error correction term when estimating equation 3 to test for causality. The long-run relationship, however, exists between the two variables when economic growth is a dependent variable and the lagged error correction term is included when estimating equation 4 to test for causality. Causality test results are presented in table V. The results indicate that there is no short-run Granger causality from economic growth to savings as the corresponding *F*-statistic is statistically insignificant. On the other hand, savings Granger causes economic growth both in the short-run and long-run. This is evident from the corresponding statistically significant *F*-statistic and negative statistically significant lagged error-correction term. The results therefore support the endogenous growth models hypothesis that savings precede and drive economic growth. Hence policies aimed at enhancing economic growth in Lesotho should stimulate and spur meaningful savings levels.

TABLE V: GRANGER CAUSALITY TEST RESULTS

Dependent Variable	Causal flow	Short-run (or weak) Granger causality test		Long-run Granger causality test	
		F-statistic	P-value	EC_{t-1}	P-value
ΔGDS	RGDP to GDS	0.135493	0.937934	-	-
ΔRGDP	GDS to RGDP	7.111545	0.000633	-.105458	0.0000

4. CONCLUSION

Using the annual time series data for the period 1980 to 2010 the paper investigates the long-run and causal relationship between savings and economic growth in Lesotho using the ARDL bounds test approach. As per the cointegration results there exists a long-run relationship between savings and economic growth in Lesotho. Granger causality results, however, indicate that savings precede and drive economic growth in Lesotho, both in the short-run and long-run, and not the other way round. Hence policies aimed at enhancing economic growth in Lesotho should stimulate and spur meaningful savings levels.

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