



Relationship Between Savings and Economic Growth in Cote d'Ivoire

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ABSTRACT

This study examines the relationship between domestic savings and economic growth in Cote d'Ivoire during the period from 1970 to 2016. The study employs the bounds testing approach to cointegration and the Granger causality test in the examination of this relationship. The results show that in the short and long run, domestic savings is positively and significantly related to economic growth. The Granger causality results favor the conventional view that savings precede and cause economic growth. The role played by domestic savings becomes crucial in supporting the economic growth of Cote d'Ivoire.

Keywords: Domestic Savings, Economic Growth, Causality, Causality, Cote D'ivoire

JEL Classifications: C32, E21, O40, O55

1. INTRODUCTION

The relationship between savings and economic growth has caught a great deal of attention among researchers and policy makers. The well-known growth models of Harrod (1939), Domar (1946), and Solow (1956) demonstrated that higher savings increases the domestic capital stock of the economy, which in turn leads to high economic growth rate. From this view, savings precede and cause economic growth. This conventional view has led to macroeconomic policy recommendations for development in many developing countries. Another view opined that economic growth occurs before savings and results in savings (Keynes, 1936; Carroll and Wei, 1994).

These two competing views have stimulated a burgeoning empirical literature. The evidence from this literature is however mixed across countries and econometric techniques. Four groups of results are reported in the empirical literature. The first supports the savings-led growth hypothesis (e.g., Sinha, 1999; Alguacil et al., 2004; Masih, and Peters, 2010; Bankole and Fatai, 2013;

Patra et al., 2017; Pickson et al., 2017; Siaw et al., 2017). The second supports the growth-led savings (e.g., Sinha and Sinha, 1998; Saltz, 1999; Attanasio et al., 2000; Agrawal, 2001; Anoruo and Ahmad, 2001; Mohan, 2006; Odhiambo, 2008; Abu, 2010). The third group of studies finds evidence supporting a bilateral causal relationship between savings and economic growth (e.g., Romm, 2005; Lean and Song, 2009; Singh, 2009; Tang and Chua, 2012; Adeleke, 2014; Najarzadeh et al., 2014; Tang and Tan, 2014). The fourth group of empirical studies failed to find any significant causal relationship between savings and growth (Mavrotas and Kelly, 2001; Baharumshah et al., 2003; Hundie, 2014; Sothan, 2014).

Investigating the causal nexus between savings and economic growth has important policy implications for developing countries (Alguacil et al., 2004). If savings precede and cause economic growth, then developing countries should adopt policies that promote savings. In this case, saving-promoting policies become relevant. Conversely, if it is economic growth that causes savings, then improving savings does not translate

into high economic growth. Despite the policy importance of the relationship between savings and economic growth, there is still very scanty of empirical studies for specific African countries. Also, existing empirical studies for African countries have yielded mixed and conflicting evidence. For example, Anoruo and Ahmad (2001) explored the causal relationship between domestic savings and economic growth for the Congo, Cote d'Ivoire, Ghana, Kenya, Nigeria, South Africa and Zambia for the period 1960-1997. They found a long-run relationship between the two variables. Furthermore, the results from the Granger causality tests revealed that economic growth causes domestic savings for all the countries under study except Congo where the reverse causality was found. For Cote d'Ivoire and South Africa, bi-directional was found. Odhiambo (2008) found that economic growth causes savings in Kenya. Abu (2010) studied the savings-economic growth nexus in Nigeria from 1970 to 2007. His findings rejected the Solow's hypothesis and accepted the Keynesian theory that economic growth causes savings. On the contrary, Bakare (2011) proved that the growth rate of national income is positively related to savings and capital formation in Nigeria. Bankole and Fatai (2013) also found evidence accepting the Solow's hypothesis that causality runs from savings to economic growth in Nigeria for the period 1980-2010. Adeleke (2014) found that there is bi-directional causality between savings and economic growth in Nigeria. In the case of South Africa, Romm (2005) confirmed that saving rate has direct as well as indirect effect on economic growth, whereas Odhiambo (2009) found growth-led savings to predominate in this country during the period 1950-2005. Konya (2005) investigated the causality between savings and growth in 84 countries from 1961 to 2000. He found a one-way causality from growth to savings in Niger, and a one-way causality from savings to growth in the Central African Republic. In all other African countries such as Benin, Burkina Faso, Cote d'Ivoire, Ghana, Senegal, and Togo there was no empirical evidence of Granger causality in either direction. Finally, Pickson et al. (2017) examined the case of Ghana during the period 1972-2013. There exists no long run relationship between gross domestic savings (GDS) and economic growth. The finding from Granger causality tests showed a unidirectional causation running from domestic savings to economic growth. Siaw et al. (2017) also found that domestic savings have positive significant impact on economic growth in Ghana during the period from 1970 to 2013.

This paper examines the relationship between savings and economic growth in Cote d'Ivoire using annual data for the period 1970-2016. It uses cointegration and Granger causality tests that to test whether the conventional wisdom that savings cause economic growth holds or not. The results are sensitive to the choice of variables used as proxies for economic growth and savings. This may explain the failure of consensus in the empirical literature.

The remainder of the paper is organized as follows. Section 2 describes the data used for the empirical analysis and outlines the econometric methodology. Section 3 reports and discusses the empirical findings of the study. Section 4 concludes the study and provides some policy recommendations.

2. MODEL, DATA AND METHODOLOGY

2.1. Model and Data Description

According to the conventional belief drawn from the Solow (1956), Romer (1986) and Lucas (1988), higher savings precede economic growth. As such, the empirical model to be estimated is specified as follows:

$$GDP_t = \theta_0 + \theta_1 GDS_t + e_{1t} \quad (1)$$

where GDP represents economic growth and GDS is a proxy for savings.

On the other hand, the Keynesian model states that increase in income leads to a growth in domestic savings. To model this relation, the empirical model is specified as follows:

$$GDP_t = \phi_0 + \phi_1 GDP_t + e_{2t} \quad (2)$$

In both equations, the coefficients θ_1 and ϕ_1 represent the degree of responsiveness of economic growth to savings and that of savings to economic growth, respectively, and e_{1t} and e_{2t} are the error terms in the respective models.

2.2. Data Description

This study utilizes annual time series data spanning the period 1970-2016 to investigate the relationship between savings and economic growth. An important issue in testing causality between variables is the definition and measurement of the variables. One may choose to work with variables in levels or ratios. Following existing literature, different measures of savings are used in this study. We use real GDSs (hereafter GDS) and GDSs as share of GDP i.e. savings rate (hereafter SAVGDP). For economic growth, we use real GDP and real GDP growth rate. Thus, the study examines three causal relationships. The first is among real GDSs and real GDP. The second is between savings rate and real GDP while the third is between savings rate and real GDP growth rate. Real domestic savings and real GDP are in constant local currency units and converted into natural logarithms in the econometric analysis. The data were drawn from the World Development Indicators of the World Bank.

Table 1 provides descriptive statistics and correlations of the variables. It can be observed that log of real GDP has an average level of 29.828 while GDSs consumption in log averaged 28.264. GDSs account for 21.718% to GDP while economic growth rate averaged 3.159% over the sample period.

As can be seen from Figure 1, domestic savings in Cote d'Ivoire exhibit considerable fluctuations over the sample period. After the pic of 33.6% of GDP in 1977, the savings-GDP ratio declined, falling to around 10.4% in 1991. This was followed by periods of fluctuations until 2012, with an average of 19% over the sub-period 1991-2012. After 2012, the savings ratio increased year on year reaching a level of 32.8% in 2016. There is a positive relationship between real GDP and real domestic savings. However, correlation does not mean causality. A positive

correlation can be compatible with both the Solow's model prediction and the Keynesian view.

Table 1: Descriptive statistics and correlation matrix

Variables	lnGDP	lnGDS	SAVGDP	ΔlnGDP
Panel A: Summary statistics				
Mean	29.828	28.264	21.718	3.159
Median	29.774	28.287	20.794	2.542
Maximum	30.481	29.369	33.627	12.916
Minimum	29.167	27.488	10.383	-10.957
Standard deviation	0.278	0.395	5.717	4.755
Skewness	-0.124	0.483	0.070	-0.191
Kurtosis	3.263	4.018	2.662	3.265
Jarque-Bera	0.258	3.862	0.262	0.424
Probability	0.878	0.144	0.877	0.808
Panel B: Correlation matrix				
lnGDP	1.000			
lnGDS	0.695*	1.000		
SAVGDP	-0.017	0.693*	1.000	
ΔlnGDP	-0.012	0.359*	0.552*	1.000

GDP: Real gross domestic product, GDS: Real gross domestic savings, SAVGDP: Gross domestic savings as share of GDP, and ΔlnGDP is GDP growth rate

Table 2: Results of unit root tests

Series	Level		First difference	
	PP	KPSS	PP	KPSS
lnGDP	-2.388	0.085	-4.273*	0.139
lnGDS	-1.581	0.150	-5.654*	0.163
SAVGDP	-2.000	0.189*	-6.592*	0.211

2.3. Econometric Methodology

The first step of our empirical analysis involves carrying out unit root tests on both variables of interest. Further, the study employs the autoregressive distributed lag (ARDL) bounds test developed by Pesaran et al. (2001) to determine whether there exists a long-run relationship between savings and economic growth. This approach has many advantages over other traditional alternative methods such as the two-step procedure of Engle and Granger (1987) and Johansen (1988). It has been shown to have superior properties in small sample size. The ARDL bounds testing approach to cointegration is based on the following equation:

$$\Delta GDP_t = \gamma_0 + \gamma_1 GDP_{t-1} + \gamma_2 GDS_{t-1} + \sum_{i=1}^m \phi_{1i} \Delta GDP_{t-i} + \sum_{i=0}^n \phi_{2i} \Delta GDS_{t-i} + e_t \tag{3}$$

The presence of a long-run relationship is tested by restricting coefficients of lagged level variables equal to zero. That is, the null hypothesis of no long-run relationship is $H_0: \gamma_1 = \gamma_2 = 0$. This hypothesis is tested by the mean of an *F*-test. The asymptotic critical values are provided by Pesaran et al. (2001). The lag structure was selected using the akaike information criterion with maximum lag length on each variable set to five.

Figure 1: Domestic savings and economic growth over the period 1970-2016

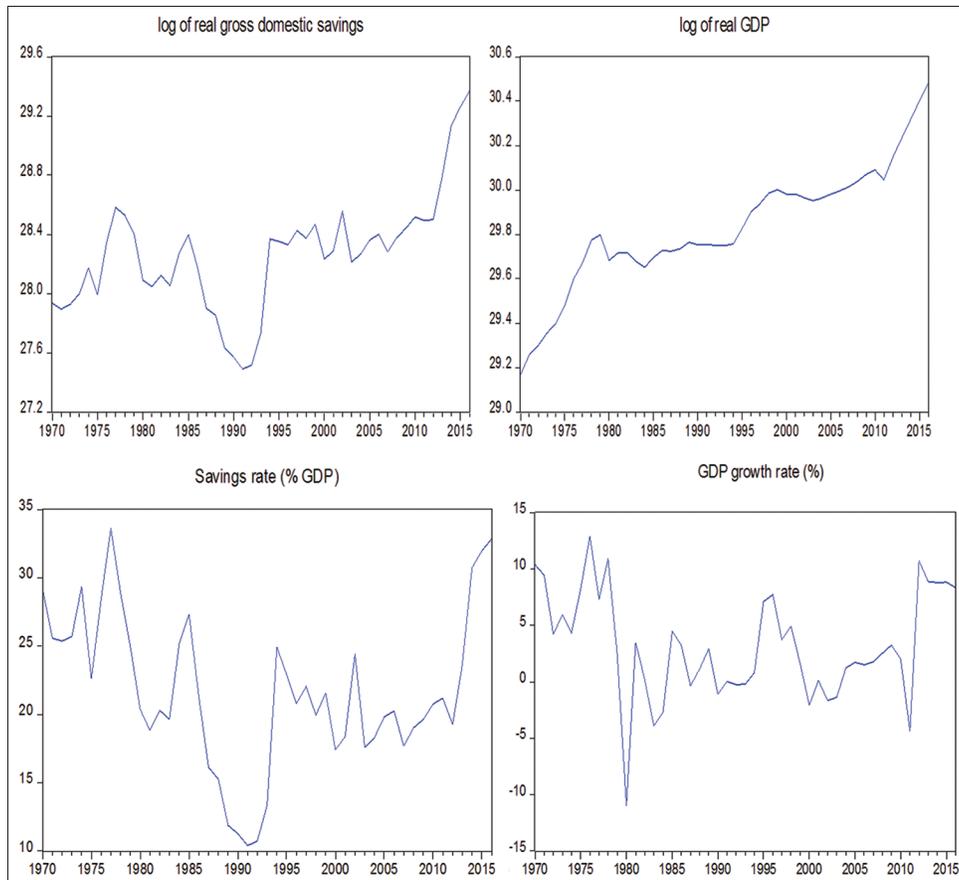


Table 3: Results of the ARDL cointegration test

F_stat.	Model	Value	Diagnostic tests		
			x ² (Normality)	x ² (Heteroscedasticity)	x ² (Correlation)
F _{GDP/GDS}	ARDL (4,0)	5.597*	0.158	0.199	0.351
F _{GDS/GDP}	ARDL (1,1)	3.643	0.730	0.331	0.722
F _{GDP/SAVGDP}	ARDL (4,1)	6.726*	0.335	0.183	0.339
F _{SAVGDP/GDP}	ARDL (1,1)	4.379	0.173	0.911	0.922
Critical values (T=47)					
		Lower bounds I (0)	Upper bounds I (1)		
5%		4.68	5.15		
10%		4.05	4.49		

GDP: Real gross domestic product, GDS: Real gross domestic savings, SAVGDP: Gross domestic savings as share of GDP. Lag length on each variable is selected using the AIC criterion with maximum lag set to 5. Critical values are from Pesaran et al. (2001). *Indicates the rejection of the null hypothesis of no cointegration at the 5% level of significance

Table 4: Long-run and short-run relationships

Dependent variable is lnGDP		
Regressors	Long run	Short run
lnGDS	0.216* (2.910)	0.076* (2.536)
SAVGDP	0.014* (2.501)	0.002 (1.589)

GDP: Gross domestic product, GDS: Gross domestic savings, SAVGDP: Gross domestic savings as share of GDP. The asterisk *Denotes statistical significance at the 5% level

The ARDL approach tests whether or not a long-run relationship exists between the variables, but not the direction of causality. To provide information on the direction of causal relationships among the variables, we employ the Granger-causality methodology suggested by Toda and Yamamoto (1995). This approach has the advantage of not requiring pre-testing for cointegration among the variables. It makes inference valid irrespective of the integration and cointegration properties of the variables. The basic idea of this approach is to artificially augment the correct VAR order, p , with d extra lags, where d is the maximum order of integration of the variables. Thus, the model to be estimated is specified as follows:

$$GDP_t = \alpha_1 + \sum_{i=1}^{p+d} \gamma_{1i} GDP_{t-i} + \sum_{i=1}^{p+d} \phi_{1i} GDS_{t-i} + e_{1t} \quad (4)$$

$$GDS_t = \alpha_2 + \sum_{i=1}^{p+d} \gamma_{2i} GDP_{t-i} + \sum_{i=1}^{p+d} \phi_{2i} GDS_{t-i} + e_{2t} \quad (5)$$

Once this augmented level VAR is estimated by OLS, a standard Wald test is applied to the first lagged p explanatory variables to make causal inference. The null hypothesis that savings do not cause GDP is $\phi_{11} = \phi_{12} = \dots = \phi_{1p} = 0$. Similarly, GDP does not cause savings if $\gamma_{21} = \gamma_{22} = \dots = \gamma_{2p} = 0$. The computed Wald-statistic has an asymptotic Chi-square distribution with the degree of freedom equal to the number of constraints.

3. EMPIRICAL RESULTS

As a first step of our empirical analysis, we test for the order of integration of the series using the PP test of Phillips and

Perron (1988) and the KPSS test of Kwiatkowski et al., (1992). The results displayed in Table 2 suggest that the variables are non-stationary in their level but become stationary after differencing.

The results of the bounds test are displayed in Table 3. The result shows that the null of no cointegration between the variables is rejected in the case where GDP is taken as the dependent variable. However, when GDS and savings rate (SAVGDP) are taken as dependent variables, the null hypothesis of no cointegration cannot be rejected. This therefore implies that there is a long-run relationship between these variables when GDP is the dependent variable. All diagnostic tests do not exhibit any evidence of violation of the classical linear regression model assumptions.

Given the above results, we further estimate the long and short run relationships between the variables. The long and short run estimated coefficients are provided in Table 4. The results indicate that there is a positive relationship between savings and economic growth in Cote d'Ivoire in both the short run and long run. The impact of savings on GDP is stronger in the long run than in the short run. Specifically, a 1% change in savings in the long run yields a 0.216% increase in real GDP while in the short run, a one percent change in savings results in a 0.076% increase in real GDP. When savings ratio is considered as proxy for savings, the results indicate that a one percent change in savings-GDP ratio in the long run results in a 0.014% increase in real GDP while the short run impact is insignificant. These findings suggest that a higher growth of savings contributes to a higher growth rate of real GDP in the long run.

The granger causality test statistics results are presented in Table 5. The results show that domestic savings cause economic growth regardless of the proxies for savings and economic growth. Therefore the relationship between domestic savings and real GDP is unidirectional in nature with causality running from savings to growth. This result is consistent with the Solow's model prediction that savings precede and cause economic growth, but contradicts with Konya (2005) who found no causal link between the two variables. There is bi-directional causality between savings rate and economic growth rate. This finding is consistent with Anoruo and Ahmad (2001).

Table 5: Results of granger causality tests

Hypothesis	Lag (p)	Chi-square	Probability
Real savings does not cause real GDP	2	7.332*	0.025
Real GDP does not cause real savings	2	2.433	0.296
Savings rate does not cause real GDP	2	9.937*	0.007
Real GDP does not cause savings rate	2	2.928	0.231
Savings rate does not cause GDP growth rate	1	4.895*	0.026
GDP growth rate does not cause savings rate	1	4.884*	0.027

The lag length of the variables was selected according to the akaike information criterion (AIC). *Indicate significance at the 5% level. GDP: Gross domestic product

4. CONCLUSION

This paper has examined the relationship between savings and economic growth in Cote d'Ivoire during the period from 1970 to 2016. The study employed the bounds testing approach to cointegration that is more reliable in studies involving relatively shorter sample sizes. The results show that in both the short and long run, domestic savings are positively related to economic growth. Specifically, this positive relationship is strongest in the long run. Further, the Toda and Yamamoto methodology of Granger causality was carried out to discover the direction of causality among the variables. The results favor the traditional view that savings precede and cause economic growth. We therefore conclude that the savings-growth nexus in Cote d'Ivoire follows the prediction of Solow's growth model.

The role played by domestic savings becomes crucial in supporting the economic growth of Cote d'Ivoire. Cote d'Ivoire has an aspiration to achieve a status of an emerging country by 2020. Because of uncertainties in the international environment, Cote d'Ivoire should highly depend on domestic savings as the main source of financing its economic growth. Therefore the Ivorian government needs to formulate policies that would promote savings and allocate domestic resources to growth-led sectors in order to generate high economic growth rate for social and human development.

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