THE EGG OR THE CHICK FIRST; SAVING OR GDP GROWTH: CASE FOR KENYA

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Abstract

This paper adopts the Hendry Model with a two-step method to model a saving function for Kenya. The Model uses a complex dynamic specification that includes lagged dependent and the independent variables. The paper finds that a 1% increase in GDP growth rate leads to a 0.5% increase in private saving in the long run which is consistent with the life cycle hypothesis. A striking result in the saving function is the positive effect that population growth rate seems to have on private savings which puts into question the notion of a smaller population as a mobilization tool for private saving. Even though consumption seems to have a significant negative effect on private savings in the short run, in the long run, it does not seem to have any significant effect. Causality tests support a uni-directional causality from per capita GDP to private saving and a bi-directional causality between Gross Domestic Saving and Investment.

INTRODUCTION

A number of growth models advocate for a causal relationship between rate of saving and economic growth. In the endogenous growth models for example, higher saving rate increases the steady-state growth rate of the economy. Such models will tend to conclude that part of the reason why countries remain poor is because of the low rate of saving in such countries. The objective of this paper is to (a) establish if there is a relationship between Gross Domestic Saving (GDS) and GDP growth rate on the one hand and share of investment on the other (b) estimate a private savings function for Kenya for the period 1960-2005, (c) determine the impulse response of a shock in savings and the effects of such a shock on GDP and investment.

Saving is not only considered important for investment but it is also an important aspect for macroeconomic stabilization (Leff and Sato 1987). As Mwega, Ngola and Mwangi (1990) observe, the bulk of national savings in Kenya is mobilized by the private sector. One of the main determinants of saving is the interest rate. It is generally believed that a higher interest rate encourages savings. According to McKinnon (1973) and Shaw (1973), low interest rates discourages saving mobilization and the channeling of the mobilized savings through the financial system. This eventually has a negative impact on the quantity and quality of investment and hence on economic growth. The impact of interest rate on personal saving is however not straightforward in the sense that the raising of interest rates have two effects that work in the opposite direction. There is the substitution effect which causes savings to increase as consumption is postponed to the future and the wealth effect in which savers increase current consumption at the expense of saving. The impact of interest rate on saving will therefore depend on which of the two effects will dominate. Study on the effect of real deposit rate on saving in Kenya by Mwega et al (1990) shows no significant effect in contrast with McKinnon (1973) and Shaw (1973) hypothesis. The hypothesis argues for a positive impact of interest on saving for a less developing country whose financial and bond market is undeveloped.

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The effect of income on saving is inconclusive and varies across countries. Whereas some studies have found savings to cause growth in income, some have found income growth to cause savings. The causality from savings to economic growth is supported from the argument that domestic investment is determined by domestic savings. Following this argument, high rate of national saving is a crucial determinant of economic growth (Athukorala and Sen., 2004). In testing for causality between domestic saving and economic growth for some African countries, Anoruo and Ahmad (2001) found a bi-directional causality in the cases of Cote d'Ivoire and South Africa. The study also found that in the case of Congo, growth rate of domestic savings caused economic growth. For Ghana, Kenya, Nigeria and Zambia causality was found to run from economic growth rate to growth rate of domestic savings. Mwega et al (1990) found the growth rate of real income to have a significant effect on private saving in the case of Kenya.

From the Life-Cycle Model (LCM), determinants of saving rate include rate of growth of per capita income and the age structure of the population (Athukorala and Sen., 2004). Individuals will tend to smooth consumption over their lifetimes, and will tend to be net savers during their working years and disavers during retirement (Modigliani, 1986). If growth in population increases the proportion of people in their working age, then saving increases with population whereas if population increase leads to a high proportion being young, then savings will decrease with population growth. Jappelli and Pagano (1998) in their study on the determinants of savings in Italy found that changes in age structure does not affect saving for the reason that the elderly in Italy tend to save at a higher rate than the ones predicted by the life-cycle model.

Athukorala and Sen., (2004), advocate for the inclusion of inflation in the savings function. The reasons for the inclusion of inflation are: first inflation affect savings through its impact on wealth, if consumers have a set target of wealth, as inflation rises so will saving. Secondly, inflation brings uncertainty in future income and can lead to higher saving on precautionary grounds. The uncertainty of income is particularly relevant to the less developing countries (Deaton, 1989).

To the extent that Terms of Trade (TOT) affects income in a particular country, TOT will tend to affect savings in the same direction. A deterioration of TOT reduces income and hence saving (Athukorala and Sen., 2004). The rest of the paper is organized as: section 2 which discusses data, methodology and limitations, section 3 which specifies the savings function, section 4 which deals with causality issues and section 5 which concludes.

DATA, METHODOLOGY AND LIMITATIONS

The data for this paper is drawn from the World Development Indicators. Most variables are measured as share of GDP. Data on variables such as TOT was incomplete for Kenya and was therefore left out of the analysis. This paper intends to estimate a savings function for Kenya and contribute to the design of policy that aims at mobilization of private savings. Variables that are thought to affect savings will be included in the saving function. The study by Mwega et al (1990) included only a handful of variables and only covers 1966-1985 period. This paper intends to extend the research on the determinants of savings in Kenya by considering other variables that affect savings

and cover a longer period (1960-2005). The first procedure for any analysis involving time series data is to determine the stationarity of each variable by checking for the unit roots. This is done by the use of Augmented Dickey-Fuller (ADF) test for stationarity. The equation to be estimated for the ADF test for variable X is:

$$\Delta X_t = \alpha_0 + \beta_1 X_{t-1} + \delta t + \sum_{t-1}^{m} \theta_i \Delta X_{t-1} + \varepsilon_t \qquad (1)$$

Where Δ is the first-difference operator, t is the time trend, ε is the stationary random error, m is the maximum lag length. The null hypothesis is that the series contains a unit root which implies that $\beta_1=0$. The null hypothesis is rejected if β_1 is negative and statistically significant. The results of stationarity tests are presented in the following table:

TABLE 1: Augmented Dickey-Fuller test for unit root

Variable[2]	**t-statistic**	**Critical value at 5% level**
Psavrate	-1.002	-2.952
Dpsavrate	-5.375	
Expshare	-3.025	-2.955
Conshare	--1.002	-2.952
Dconshare	-5.375	
Gdprate	-2.363	-2.955
Dgdprate	-5.289	
Percaprate	-2.622	-2.955
Dpercaprate	-5.295	
Impshare	-2.257	-2.952
Dimpshare	-6.225	
Govtshare	-2.27	-2.952
Dgovtshare	-3789	
Invshare	-2.264	-2.952
Dinvshare	-5.658	
Infrate	-2.365	-2.955
Dinfrate	-4.178	
Lpercapita	-2.861	-2.952
Dlpercapita	-3.404	
UKconshare	-2.184	-2.952
DUKconshare	-3.984	
Poprate	-3.252	-2.955

[2] The variables are defined as Psavrate (Private saving), Expshare (Export), Conshare (Consumption), Impshare (Import), Percaprate (Per capita growth rate), Gdprate (GDP growth rate), Govtshare (Government expenditure), Infrate (Inflation rate), Lpercapita (Log of GDP per capita), UKconshare (UK consumption) and Poprate (Population growth rate). The operator D denotes the first difference for each of the variable. Note that most of the variables are measured as a share of GDP.

As the results show, all variables are stationary except for export as share of GDP (expshare) and population growth rate (poprate) are non-stationary but all becomes stationary after first differencing.

THE SAVINGS FUNCTION

The modeling of the savings function adopts the Hendry model with the two-step method (Hatanaka, 1996). This model has been used by Athukorala and Sen (2004) to model the determinants of private saving in India. The main estimation technique of the model moves from the general to specific model minimizing the possibility of spurious relations while retaining long-run information. The technique embeds the relationship being investigated within a sufficiently complex dynamic specification, including lagged dependent and independent variables. A major advantage of this method is that it yields an equation with first-differenced and hence stationary dependent variable and retains long-run information embodied in the data.

The savings function to be estimated is:

$$psavrate = f\{conshare[-], govtshare[+], gdprate[+], impshare[-], ukconshare[+/-], poprate[+/-], rir[+]\} \quad (2)$$

The first step is therefore to estimate equation (2) by OLS but also includes lagged first-difference of the explanatory variables. Some variables were found not to have an effect on saving and therefore were dropped from the analysis. To absorb the effects of serial correlation; we make use of Cochrane-Orcutt procedure. As the Durbin-Watson statistic shows, serial correlation has been corrected.

Empirical Results

The results of the above estimation give the long run saving function reported below:

TABLE 2: Private Saving Function Regression results (Long run model)

Variable	Coefficient	T-statistic
Gdprate	0.5003	2.45**
Impshare	-0.3757	-1.76*
Rir	0.03015	0.45
Expshare	0.2929	2.15**
Poprate	6.5903	2.94***

* significant at 10% ** significant at 5% significant *** significant at 1% ; R^2=0.6509 and Adj. R^2=0.44846
DW (original) =1.254 DW (transformed)= 2.053

The second step in the Hendry procedure is to multiply each of the coefficients of the explanatory variables by the respective variables and doing an estimation of the changes in the dependent variable on the lag of each of the new variables. By including lags and differences of the explanatory variables, we end up with a short-run relationship which must satisfy certain diagnostic testing procedures. The results of the short-run equation are presented below. Note that the dependent variable in the short-run model changes in private saving rate (dpsavrate). In addition to the variables that are computed using the Hendry procedure, we also include other relevant variables as changes in consumption as share of GDP. Test for the power of this short-run model is based on the Ramsey RESET test and the hypothesis of no omitted variable is accepted.

TABLE 3: Private Saving Function Regression results (Short run model)

Variable	Coefficient	T-statistic
Lgdprate1	-.6626333	-2.55**
Lpoprate1	.3540322	2.48**
Lpsavrate	-.3145302	-2.70**
dgdprate	.2421027	1.84*
Ldpoprate	7.68965	1.72*
Dconshare	-.5617945	-7.16***
Constant	-1.293959	-0.72

* significant at 10%, ** significant at 5% significant, *** significant at 1%; R^2=0.7921 and Adj. R^2=0.7574; Ramsey RESET test using powers of the fitted values of dpsavrate; Ho: model has no omitted variables; F(3, 33) = 1.85; Prob > F = 0.1577

We now turn to the long run model for interpretation. The results support the life cycle hypothesis in that a 1% increase in the growth rate of GDP leads to a long run 0.5% increase in private saving rate. These results are consistent with the results by Mwega et al (1990) who also found a positive relationship between saving rate and growth rate of GDP.

Import as a share of GDP has a negative effect on the saving rate. As Kenyans spend on imports, this seems to take resources out of the country thus lowering private saving rate. As we had indicated, demographic factors such as the rate of population growth can have either a positive or negative effect on saving rate. In the long run, as the population grows, it seems that for Kenya, the saving rate increases. This phenomenon can only be explained by a claim that as the population grows more people enter the labour market so that private savings grow as well. The positive effect of population growth to private saving could also be explained by the fact that as people become more, the assurances of income share at a private level in the future declines and people therefore will tend to save more out of their current income.

Export will generally tend to generate income for the exporting country. A 1% increase in export share leads to a 0.29% increase in the private saving. For a country such as Kenya, this result is not surprising. Kenya has heavily relied on her export mainly of tea and coffee for the generation of her export earnings. Export earnings form a significant share of private saving. Real interest rate although having a positive impact on private saving is insignificant. The results are consistent with Mwega et al (1990) who concluded that real interest rate is not an important tool for mobilizing private saving in Kenya.

In the short run model, changes in share of consumption seem to have a significant negative effect of the growth rate of private savings. A 1% increase in growth of consumption share leads to a 0.56% decrease in growth of private saving. Interestingly, consumption does not seem to have a long run effect on private savings.

Causality between Saving, GDP rate and Investment

We now turn to establishing the causal relationship between saving and economic growth. To achieve this we intend to do Granger causality tests. The Granger causality procedure based on vector error-correction method (VECM) the case where the two series are cointegrated. The procedure is attractive over the standard VAR since it allows causality to emerge even if the coefficient of the lagged differences of the explanatory variable is not jointly significant (Anoruo and Ahmad, 2001). The VECM models are based on the following regression equations:

$$\Delta gdprate_t = \alpha z_{t-1} + \sum_{i=1}^{a} \beta_i \Delta gdprate_{t-1} + \sum_{j=1}^{b} \phi_j \Delta gdsshare_{t-1} + \mu_t \quad (3)$$

$$\Delta gdsshare_t = \varphi z_{t-1} + \sum_{i=1}^{c} \phi_i \Delta gdsshare_{t-1} + \sum_{j=1}^{d} \lambda_j \Delta gdprate_{t-1} + \varepsilon_t \quad (4)$$

Where z_{t-1} represents the error-correction term lagged one period, a, b, c and d represent the optimal lag lengths obtained from the Akaike Information Criterion. In equation (3), the null hypothesis that growth rate of saving does not cause economic growth is rejected on the condition that either the sum of ϕ_j's or α is statistically significant. In equation (4) the null hypothesis that economic growth does not Granger cause growth rate of savings is rejected provided either the sum of λ_j's or φ is statistically significant.

The Granger causality between gross domestic saving and GDP growth results are presented below.

TABLE 4: Granger causality Wald tests between Dgdsshare and Dpercaprate

Equation	Excluded	chi2	df	Prob > chi2
dgdsshare	dpercaprate	1.59	2	0.45
dgdsshare	ALL	1.59	2	0.45
dpercaprate	dgdsshare	0.52	2	0.77
dpercaprate	ALL	0.52	2	0.77

The results indicates no causality either way between growth in gross domestic saving and growth in GDP, this finding is in contrast to the findings in a number of studies that have found GDP growth rate to lead to an rise in the growth rate of gross domestic savings. The lack of causality between GDP and savings is further confirmed by the impulse response that shows no permanent effect of a shock through savings. As the graph below indicates, a shock on the growth rate of savings in the short-run leads to a decline in the growth rate of GDP but which dies off in 4 years to return to the original level.

FIGURE 1: Impulse response of changes in the growth rate of Gross Domestic Saving Share and changes in per capita income rate

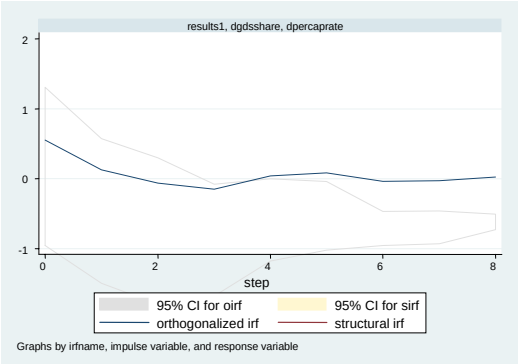


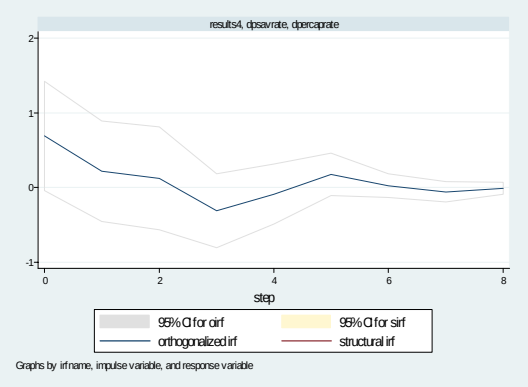
TABLE 5: Granger causality Wald tests results for change in private saving rate and changes in per capita income rate

Equation	Excluded	chi2	df	Prob > chi2
dgdsshare	dpercaprate	5.51	2	0.06
dgdsshare	ALL	5.51	2	0.06
dpercaprate	dpsavrate	2.33	2	0.31

dpercaprate	ALL	2.33	2	0.31

Turning to the causality of growth in private saving and growth in GDP per capita, there appears to be a weak causality (significant at the 6% level) from GDP per capita to private saving (see table 5). This finding is consistent with those by Anoruo and Ahmad (2001) who found causality for Kenya to run from GDP to savings, except that in our case it is the per capita income that Granger causes growth in private savings. Mohan (2006) also found the causal relation to run from income to saving. This finding is also consistent with the endogenous growth models. It appears then that growth in GDP alone will not lead to growth in savings but in addition to measures to raise GDP, policymakers must put in place measures that will lead to growth in GDP per capita. Such measures may include reduction in population growth rate. As figure 2 below shows, a shock on private savings through perhaps a rise in interest rate will initially reduce per capita income due to a decline in investment and the borrowing power of business. As savings grow, this increases investment raising per capita income as the effects of the shock dies off.

FIGURE 2: Impulse response of changes in private saving and GDP per capita rate



Causality between Savings and Investment

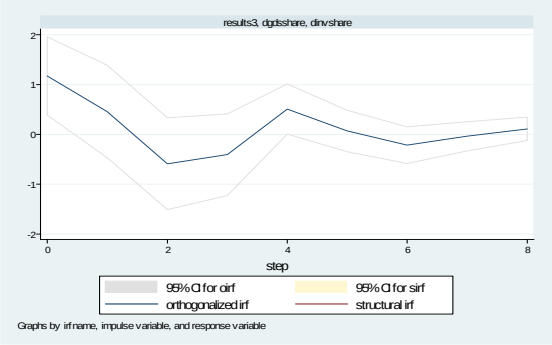
In theory, at equilibrium rate of interest, level of savings is equal to the level of investment. Whereas, savings increases with the rate of interest, investment in theory is a decreasing function of interest rate. According to this theory, interest rates need to be high to induce savings. Moore (2006), in a recent provocative paper seems to dispute the theory and instead argues that saving is simply the accounting record of investment as opposed to saving being an increasing function of interest rates. According to this argument, investment increases in response to lower interest rates and savings necessarily rises by an identical amount. The level of savings is therefore not as widely viewed equated to investment by changes in the rate of interest. Investment is, according to Moore not constrained by insufficient saving but by bank rate that is set by the Central Bank at too high a level to generate full employment level of aggregate demand and rapid economic growth. According to Moore, it is not an issue of causality between savings and investment. Subjecting this claim to a Granger causality test in the case of Kenya yields a different picture as the test result presented below shows.

TABLE 6: Results of Granger causality Wald tests for growth in domestic savings and growth in investment

Equation	Excluded	chi2	df	Prob > chi2
dgdsshare	dinvshare	9.1	2	0.011
dgdsshare	ALL	9.1	2	0.011
dpercaprate	dgdsshare	12.4	2	0.002
dpercaprate	ALL	12.4	2	0.002

The above analysis shows a significant double causality between growth in domestic saving and growth in investment. Growth in saving Granger causes growth in investment just as growth in investment Granger causes growth of saving. As the impulse response graph below shows, a shock in growth of savings perhaps by raising interest rates causes a decrease in growth of investment. The initial rise in savings translates into investment after the second year of the shock and the shock dies off after the 6th year. There is therefore no support for the claim by Moore that savings do not constrain investment. The results show that saving and investment Granger cause each other.

FIGURE 3: Impulse response of growth in GDS and growth of Investment share



CONCLUSION

This paper set out to determine the causality between saving and GDP on the one hand and investment on the other. Whereas this paper does not find causality between GDS and GDP, GDP per capita is found to Granger cause private savings. On the other hand, there appears to be a double causality between GDS and investment. An increase in savings will cause an increase in investment and vice versa.

Four variables were found to have a significant long run effect on private saving. These are; GDP growth rate, import share, export share and population growth rate. One striking variable is population growth rate which instead of having a negative impact on private saving had a significant positive impact. It would then appear that the notion of a

smaller population as a mobilization tool for private savings is incorrect in the case of Kenya.

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