DETERMINANTS OF GROSS DOMESTIC SAVINGS
IN KENYA (1970-2013)

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Abstract

This study investigates the effect of various macro-economic factors on savings in Kenya during the period 1970 – 2013, using the Life Cycle Hypothesis (LCH), Permanent Income Hypothesis (PIH) and Relative Income Hypothesis (RIH) framework for yearly data. Ordinary Least Square (OLS) technique is applied to test the validity of the model and the relative importance of different variables which may have an impact on gross domestic savings. The estimated results revealed that gross domestic product (GDP), Inflation (INF) and Age-dependency ratio (ADEPR) were significant determinants of gross domestic savings whereas real interest rates (RIR) was not a significant determinant of gross domestic savings. The overall findings of the study underlined the importance of adopting a strict monetary policy to maintain money supply within manageable levels and ensure stable and low inflation rates which would help improve real incomes and would also cause development in the financial sector and hence improve gross domestic savings in the economy. Further, the government should formulate policies to stimulate growth in GDP.

Keywords: Gross domestic savings, Life cycle hypothesis, Augmented Dickey Fuller, Ordinary Least Squares, Kenya

INTRODUCTION

Saving is not only considered important for investment but it is also an important aspect for macroeconomic stabilization. Much of disparity in the growth performance between countries is often attributed to the differences in the rates of saving and investment. Low domestic saving rates may maintain low-growth levels. Lack of enough domestic resources will however not hinder going for external sources to finance investment requirements which makes the country highly sensitive to external shocks. A disadvantage to this would be the danger that any perception by foreigners of political and/ or social instability, corruption, and declining rule of law may lead to the outflow of the foreign capital leading to macroeconomic instability. Therefore, domestic savings will continue to be a priority as a source of investment financing in order to minimize vulnerability to international economic fluctuations.

Adewuyi, Bankole, & Arawomo (2007) argues that a sufficiently strong saving performance is an important precondition for achieving economic growth, macroeconomic balance and financial and price stability. The relationship has become even more crucial with the studies confirming that despite the occasional importance of international flows of capital, the most important factor for a country's investment and economic growth is indeed its own saving.

The saving rate in Africa has perpetually been the lowest compared to other regions. It also faces serious credit constraints; and this, coupled with low income could greatly reduce any little incentive to save (Kibet, Mutai, Ouma, Ouma, & Owuor, 2009). Development economists have been concerned for decades about the crucial role of domestic saving mobilization in the sustenance and reinforcement of the saving investment-growth chain in developing economies (Nwachukwu & Egwaikhide, 2007). Increased savings rates is therefore of crucial importance for achieving sustainable development and poverty-reducing growth in African countries (Keho, 2011).

Despite the financial liberalization in Kenya, savings rates have generally remained very low. (Kahangi & Muturi, 2013), states Kenya's development road map dubbed the vision 2030 stipulates that by the year 2030, Kenya shall be a middle income country and one of the ways of achieving this is to encourage saving among the Kenyan households because this contributes to national economic growth. Kenya's gross domestic savings ratio has an average of only 14.6 percent of GDP through the period 1970 – 2013. This therefore indicates the need to boost savings in Kenya. Because of that, an understanding of the fundamental determinants of saving in Kenya represents critical importance in order to formulate policies to raise the domestic saving rate in line with the needs of economic growth. Studies carried out in the past, have not been conclusive about the factors influencing saving.

This paper examined some macroeconomic factors as possible explanations for domestic savings behavior in Kenya. These macroeconomic factors included; real interest rates, inflation, GDP growth and age dependency ratio.(Athukorala & Sen, 2004), advocate for the inclusion of inflation in the savings function for two reasons: first inflation affect savings through its impact on wealth. If consumers have a set target of wealth, as inflation rises so will savings. 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. The share of working population relative to that of retired persons is positively related to saving. A factor related to Age-dependency ratio is interpreted to mean that the lower the dependency in a family the higher the saving rate. We would therefore expect a negative effect of dependency rate on saving (Kibet, Mutai, Ouma, Ouma, & Owuor, 2009). Empirical evidence with regards to the role financial markets and interest rate in mobilizing savings has not been impressive in developing countries and this could partly be because of high distortions, which lead at times to negative real interest rate (Gebeyehu, 2010).

The life cycle model (LCM), the permanent income hypotheses (PIH) and the relative income hypothesis (RIH) are widely used as a benchmark to organize the arguments about the consumption and saving behavior of households. The LCM and PIH assume that individuals and households are concerned about long-term consumption opportunities and therefore explain saving and consumption in terms of expected future income. Basing their decisions on the underlying theory that suits the circumstances of their countries, governments strive to take policy measures that induce mobilization of saving.

Statement of the Problem

In Kenya's new long term development blueprint "VISION 2030", the Kenyan government aims to transform the economy from a low income country to a newly industrialized middle income country by the year 2030. This will see the gross national income grow at the rate of over 10 percent per annum from 2012 and thereafter to 2030 (Mbuthia, 2011). For an economy to realize sustainable economic growth, gross capital formation should be mainly financed from domestically generated resources which call for an increase in domestic savings. The Kenya government plans to increase gross domestic savings to 30 percent of GDP by year 2030 from the current savings ratio to GDP of 14.6 percent.

The current savings ratio of 14.6 percent of GDP therefore depicts the need to formulate policies that will raise the saving rate and an understanding of the fundamental determinants of saving in Kenya represents critical importance. Existing literature is mostly about household savings or private savings in other countries. Studies conducted in Kenya have mainly focused

on household savings in rural and urban settings and also household savings decisions in the formal and informal institutions. Most of the researches conducted for Kenya have focused on survey data approach and not time series data approach. This study will use time series data approach to establish whether gross domestic savings (i.e. both public and private savings) will give different or same results. It is therefore justifiable to carry out this study to establish whether the factors that determine saving using survey data approach will produce the same results as using time series data (i.e. microeconomic level and macroeconomic level analysis). Variable such as age-dependency ratio will be added in the analysis since few studies on Kenyan savings have concentrated on it.

This study will further compliment the previous literature on savings behavior in Kenya in the following ways (i) It will use the longest time series data available (1970-2012) (ii) It will use modern time series analysis tools which few previous studies have undertaken (iii) It will separately estimate different savings aggregates such as real interest rates, inflation and (iv) It will examine as a whole gross domestic saving and not partly as private or public savings.

Objectives of the Study

General Objective

To find out the major determinants of gross domestic savings in Kenya

Specific objectives

1. To determine the effect of GDP on gross domestic savings in Kenya
2. To find out the effect of real interest rates on gross domestic savings in Kenya
3. To establish the effect of inflation on gross domestic savings in Kenya
4. To determine the effect of age dependency ratio on gross domestic saving in Kenya

Research Hypothesis

H_{01}: GDP does not have a significant impact on gross domestic savings in Kenya.

H_{02}: Real Interest rates does not have a significant impact on gross domestic savings in Kenya.

H_{03}: Inflation rate does not have a significant impact on gross domestic savings in Kenya.

H_{04}: Age dependency ratio does not have a significant impact on gross domestic savings in Kenya.

Significance of the Study

The study attempted to find out if there is a long run and short run relationship between saving and its determinants and further to determine the causal relationship between the variables. The

results of this study will aid in formulation of policies to boost savings in Kenya in line with the needs of economic growth in the short run and the long run periods. Furthermore, it will aid in the Kenya's development road map dubbed the vision 2030. In addition it will contribute to the knowledge pool which may foster a clear understanding of the fundamental determinants of saving in Kenya.

Scope of the Study

The study used secondary data obtained from World Bank, African Development Indicators database to present a model for Kenya's saving function, with an aim of generating a better understanding of the factors that determine saving in Kenya both in the short run and in the long run. The model was estimated over the period 1970 – 2013 using the Co-integration test and Ordinary Least squares. Annual data from 1970 to 2013 on gross domestic savings, real interest rates, inflation, GDP growth and age-dependency ratio was used to estimate the model. This period was used because it the longest times series data available.

LITERATURE REVIEW

Theoretical Literature

Savings as a subject has received immense publishing from different authors and schools of thought. Savings and consumption are normally considered together in most of the theories of savings, due to the fact that if a household makes a decision to consume, it is in effect making a decision not to save the consumed amount (Mbuthia, 2011). Several models are used to explain motivations to save: life-cycle (to provide for anticipated needs), precautionary, independence, inter-temporal substitution (to enjoy interest), improvement (to enjoy increasing expenditure), enterprise, bequest, avarice and down payment (Karlan & Morduch, 2010).

Absolute Income Hypothesis (Keynesian Theory)

Aggregate consumption has featured in macro-models since (Keynes, 1936) and is especially important for growth in a transitional economy. Household's current consumption expenditure is a positive function of real current disposable income. As the income increases, the increment is partly consumed and partly saved for purposes of financial security in periods of unemployment, illness, death of bread winner or for investment so as to enhance future income. The absolute income hypothesis is a short run theory and makes the assumption that marginal propensity to consume (MPC) is between zero and one. MPC declines with increase in income, implying that marginal propensity to save increases as income increases. The implication of this is that low income families save a lower percentage of their income as compared to high income families.

Relative Income Hypothesis

Duesenberry (1949) contended that the utility of consumers depended not so much on their absolute income (Keynes' view), but rather on their relative income, both current income relative to previous income and current income relative to income of others in society with whom the consumer feels in competition with.

According to relative income hypothesis, a household's consumption expenditure is a function of the relative income of the household. When a household's income falls, the household dis-saves or borrows in order to prevent a large fall in their living standards and also to maintain their living standards at par with their peer groups. This is an important distinction between absolute income hypothesis and relative income hypothesis. The short run APC is greater than the long run APC according to relative income hypothesis. This implies that the short run average propensity to save is smaller than the long run average propensity to save.

According to the relative income hypothesis an increase in income is always proportional to the increase in household consumption expenditure irrespective of whether the increase in income is small or large.

Permanent Income Hypothesis

In economic theory, the permanent income hypothesis (Friedman, 1957) is generally accepted as an explanation of consumer behavior. Under this approach, households' consumption decisions are regarded as inter-temporal optimization problems, that is, households decide on how to divide their current disposable income between consumption and saving and thus determine their future consumption level. The permanent-income hypothesis postulates that these decisions are based not only on the level of currently disposable income, but also on (rational) expectations of lifetime income and wealth. This presupposes that households assess the present value of assets available for consumption in the future and distribute it evenly into an income stream (permanent income) so that they can afford constant consumption levels.

Life Cycle Hypothesis

Modigliani & Brumberg (1954) and Ando & Modigliani (1963 & 1964) formulated the life-cycle hypothesis (LCH). Like the permanent income hypothesis, it is based on the concept of constant consumption level over life, but it places special emphasis on a person's position in the life cycle. People's incomes vary systematically over the phases of the consumers' life and that saving allows consumers' to move income from those times in life when income is high to those times when it is low. It postulates that people need to take out loans to reach this consumption level while they are young and have a low income, whereas they can afford to save for

retirement when their income peaks several years later. The theory assumes that a household's consumption path is determined by expectations of its future income stream and wealth as well as real interest rates, which determine the present value of these assets. In addition, households tend to cut the saving rate during economic downturns to keep consumption constant despite a temporary income loss.

Rational Expectation Hypothesis

Hall (1978) took the Life cycle, permanent income approach and applied Rational Expectations Hypothesis (REH). Specifically, REH implies that people behave as though they have knowledge of the process of generating income. Therefore, people will not change their level of consumption unless new information causes them to revise their future expectations on income. Hall argues that the underlying behavior of consumers makes both consumption and wealth evolve as random walk. This is so, since marginal utility evolves as a random walk with trend. According to Hall for PIH/LCH to be consistent with data all coefficients for lagged variables such as measures of income and wealth except for that of the first lag of consumption must be statistically insignificant.

Psychological and Sociological Theory

Psychological and sociological theories of saving consider additional determinants of saving and asset accumulation, including personality characteristics, motives, aspirations, expectations, and peer and family influences (Duesenberry, 1949). Some of the propositions emphasize the effects of relatively stable personality characteristics on asset building. Other psychological and sociological propositions assume that saving-related preferences and aspirations are not fixed and in fact seek to explain how motives, aspirations, and expectations are shaped.

Behavioral Theories

Mbuthia (2011) points out households are expected to respond and create their own behavioral incentives and constraints to savings. Behavioral theorists have identified a number of common human characteristics that shape financial behavior, including lack of self-control (people tend to place too much weight on current consumption relative to future consumption); limited cognitive abilities (people do not always learn from their mistakes, and people tend to become overwhelmed by too many choices); inertia (people tend to continue doing what they are currently doing); the tendency to interpret default options as advice; and the tendency to use mental accounting techniques. Often, according to behavioral theory, these tendencies lead individuals to behave in ways that are inconsistent with their own priorities or inconsistent with

maximizing long-term consumption. For example, the lack of self-control often causes people to over-spend and under-save, even when they are saving for a specific, much-desired goal. Also, limited intellectual capabilities and inertia lead people to postpone making financial decisions

Conceptual Framework

This study was aimed at examining the macroeconomic determinants of savings in Kenya. The study was conceptualized in the framework below:

Figure 1: Conceptual framework
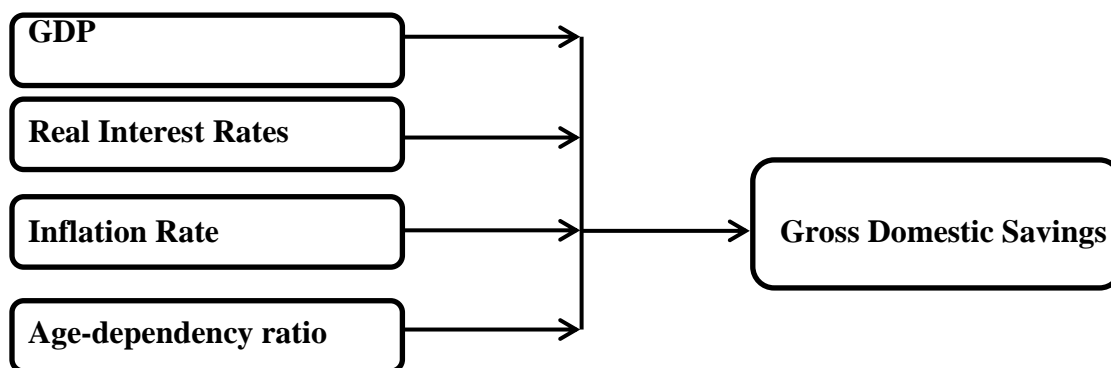
The dependent variable is Savings. The explanatory variables are growth in GDP, Real interest rates, inflation and age-dependency ratio. These variables were used because of their authenticity in empirical literature on economic growth and the fact that the state and local policy debates frequently revolve around them.

Empirical Literature

GDP

Samuel (2005) studied the determinants of aggregate domestic private savings in Kenya capturing the reform period 1980 to 2003. The study included demographic variables like young and old age dependency ratios, and the different measures or indicators of financial sector development: the ratio of M2 money to GDP, the ratio of liquid liabilities to GDP, and the ratio of the assets of commercial banks to the assets of central bank as new variables previously not used in any study on Kenya. Among the other variables were income tax, deposit rate used at central bank, current account deficit, the interest rate spread, terms of trade, inflation rate and real gross disposable per capita income. A hybrid model was specified consisting of all the

variables identified from the Life Cycle hypothesis on savings and consumption, the permanent income hypothesis and the simple Keynesian hypothesis was used in the estimations. The results of the estimations showed that aggregate private savings in Kenya is significantly determined by the current account deficit, the ratio of M2 money to GDP, real gross per capita income growth, deposit rate and the old age dependency ratio.

Nwachukwu & Egwaikhide (2007) examined the macroeconomic determinants of private saving in Nigeria using an Error-Correction model. He compared the estimation results of the Error-Correction Model with those of three conventional models: Partial-Adjustment, Growth Rate and Static Models and concluded that the ECM performs much better than the other models. He adopted the neoclassical life cycle saving hypothesis and estimated the function on data covering 1970 to 2005. The estimation results for the error-correction model point that growth rate of income seem to have a negative impact on the saving rate. The author's most interesting finding was that, contrary to most previous empirical results, growth was found to have a negative impact on saving in Nigeria.

Waithama (2008) analyzes the causal relationship between the rate of saving and economic growth for Kenya for the period 1960 – 2005 and examines the impulse response of a shock in savings and the effects of such a shock on GDP and investment. The results do not find causality between GDS and GDP, GDP per capita is found to Granger cause private savings. On the other hand, there appeared 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.

Bankole & Fatai (2013) examined the cause and effect relationship between domestic savings and economic growth in Nigeria during the period 1980-2010. The researchers employed the Granger-causality and Engle-Granger co-integration techniques to analyze the relationship between savings and economic growth. In addition, the granger causality test revealed that causality moves from savings to economic growth in Nigeria. Thus, the researchers accept the Solow's hypothesis that savings precedes economic growth but reject them Keynesian theory that it is economic growth that leads to higher savings. The researchers recommended that government and policy makers should employ policies that would accelerate domestic savings so as to increase economic grow.

Real Interest Rates

Touny (2008) in his study of determinants of domestic saving performance in Egypt, adopts an empirical study approach to analyze the determinants of domestic saving performance in Egypt during the period 1975 – 2006. They revealed that growth rate of fixed per capita income, inflation rate, current account deficit ratio and budget deficit ratio are significant determinants of saving both in the short and long run. Real interest rate is a significant determinant in the short run but insignificant determinant in the long run. The ratio of broad money supply is insignificant determinant in the short run but significant in the long run.

Apunda (2009) examined the determinants of private savings and economic growth in Kenya, using annual time series data for the period 1980 to 2010. The study used regression analysis to determine the relationship between private savings and economic growth in Kenya. The findings show that there is a negative relationship between private savings GDP and interest rate, and a positive relationship between inflation rates, GDP per capita with private savings. From the findings, the researcher recommends that appropriate monetary and fiscal policies should be put in place to help regulate inflation since it positively influences private savings. In addition, we infer that private savings reflects the macro-economic condition of the country and can therefore be used to predict the future path of economic growth.

Nwachukwu (2011) examines the determinants of private savings in Nigeria during the period covering 1970-2010. The study employs the Error-Correction modeling procedure which minimizes the possibility of estimating spurious relations, while at the same time retaining long-run information. The results of the analysis show that the saving rate rises with both the growth rate of disposable income and the real interest rate on bank deposits. Fiscal balance also plays a clear role in increasing total saving. Finally, the degree of financial depth has a negative but insignificant impact on saving behavior in Nigeria.

Kiptoo (2011) main objective of his study was to find out the impacts of remittance on domestic savings levels in Kenya for the period between 1970- 2011. Secondary data sourced from the World Bank database and Kenya National Bureau of Statistics was used. The Error Correction Model (ECM) was used. Empirical results showed that GDP per capita, exports and investment affect domestic savings positively and significantly. Real interest rate does not have a significant effect on domestic savings. Remittance affects positively and significantly domestic savings positively.

Inflation rates

Keho (2011) examined the long run determinants of savings rates for seven West African countries over the period 1970-2006 using the bounds testing approach to cointegration. The

results showed; rate of real per capita GDP growth, Age-dependency ratio, inflation rate, interest rates on savings deposits and current account are significant determinants of saving. Financial sector development was found to be an insignificant determinant of saving.

Ismail & Rashid (2013) in their study of determinants of household savings in Pakistan states saving and inflation rate are interconnected. There exists a positive as well as a negative relationship between inflation and household saving as documented in the earlier studies. A positive association between household saving and inflation prevails because higher inflation reveals higher income and saving. Inflation can have a positive effect on saving rates as an insecurity about future asset values and future real incomes in an inflationary environment can promote saving in order to continue future consumption levels. The relationship between inflation rate and household saving may be negative as uncertainty about future increases. The other reason for this negative relationship is that mostly people want to maintain real level of consumption thus higher spending today results in lower level of household saving. A higher rate of inflation leads to insecurity about financial returns and results in lower rate of saving.

Larbi (2013) explored the determinants of private savings in Ghana using the residual-based tests for cointegration to determine the long run relationship between private savings and its determinants. Financial liberalization, per capita income and inflation were found to have a positive and significant relationship with private savings. The positive and significant coefficient of the fiscal deficit variable confirmed the Ricardian Equivalence hypothesis in Ghana. There is a strong willingness to save but the capacity to save is not very robust. Financial liberalization is recommended to be deepened to give financial institutions room for improved financial packages for increased savings. Growth should be pursued vigorously to improve incomes and hence people's capacity to save. In spite of the results for fiscal deficits, government must keep its spending within sustainable limits and invest appropriately.

Ogbokor (2014) stated that the driving objective for the article was to empirically establish the determinants of savings in Namibia through the use of co-integration and error correction mechanisms for the period running from 1991 to 2012. The article relied heavily on unit root tests, co-integration and error correction procedures as ways of investigating the research issue under consideration. First, the time series characteristics of the variables used were ascertained with the help of the augmented Dickey-Fuller unit root procedure. Second, the long-run relationship between savings and its determinants was examined using the procedure suggested in the literature by Johansen and Juselius. The results of the co-integration tests suggest that there is a long-run relationship between savings and the explanatory variables used in the study. The results suggest that inflation and income have positive impact on

savings, whilst population growth rate has negative effects on savings. Further, deposit rate and financial deepening have no significant effect on savings.

Age-dependency ratio

Kibet, Mutai, Ouma, Ouma, & Owuor (2009) adopt a microeconomic approach on establishing the determinants of household savings in rural Kenya. They estimated a saving function derived within the life cycle framework while taking cognizance of the structure of a developing economy. Their estimation result shows that; gross income, credit access, dependency ratio, age, nature of occupation and level of education are significant determinants of saving. Rate of interest were found to have some slight significance in determining saving.

Keho (2011) examined the long run determinants of savings rates for seven West African countries over the period 1970-2006 using the bounds testing approach to cointegration and the modified Granger causality test. The advantage of using these two approaches was that they both avoid the pre-testing bias associated with standard unit root and cointegration tests. The results showed; rate of real per capita GDP growth, Age-dependency ratio, inflation rate, interest rates on savings deposits and current account are significant determinants of saving. Financial sector development was found to be an insignificant determinant of saving.

Kahangi & Muturi (2013) adopts a microeconomic approach on establishing the determinants of household savings in urban Kenya. The methodology adopted involved the estimation of a saving function derived from standard life-cycle theory modified to cover the peculiar features of the developing economies. The study employed survey design and SPSS for analysis of data. Their estimation result showed that; age, income and gender were found to have a great influence on savings. Education level and household size were found to be insignificant determinants of saving.

Determinants of domestic saving in Ethiopia using the autoregressive distributed lag (ARDL) bounds testing approach (Ayalew, 2013) is a more recent study. Time series annual data form 1970/71-2010/11 was used for the analysis. The Estimated results revealed that growth rate of income, budget deficit ratio and inflation rate were statistically significant short run and long run determinants of domestic saving in Ethiopia. But, depositing interest rate, current account deficit ratio and financial depth were found to be statistically insignificant determinants in the long run. However, in the short run, financial depth and interest rates were found to have statistically significant meaning in explaining domestic savings in Ethiopia. The overall findings of the study underlined the importance of raising the level of income in a sustainable manner, minimizing the adverse impacts of budget deficit and inflation rate and creating competitive environment in the financial sector. (Ismail & Rashid, 2013), showed a negative association

between the old dependency ratio and household saving rate. The population structure has been identified as a factor affecting saving behavior in less developed countries.

Summary and Research Gaps

A review of previous literature in the preceding section shows that most of the studies carried out in Kenya on savings focused majorly on micro economic approach. For example Kibet, Mutai, Ouma, Ouma, & Owuor, (2009) studied the determinants of household savings where they focused on small holder farmers, entrepreneurs and teachers in rural areas. The study used survey data approach. Kahangi & Muturi (2013) also studied the determinants of low income households in pre-urban setting using survey data approach.

Studies that have been carried out in Kenya on savings using time series data approach have majorly focused on macro-economic variables such as Inflation, interest rates, Per Capita GDP and they have showed mixed results. Few studies have also focused on age- dependency ratio as a determinant of saving. Furthermore, a close scrutiny of all the study variables shows that there is a disparity between the different findings of the different variables and hence the study aims at filling this gap.

RESEARCH METHODOLOGY

Research Design

The research design is causal study, explanatory in nature. This study uses time series data analysis and design as it readily establishes whether a relationship exists between two or more variables observed at the same time and also over a series of time. There are also readily available statistical tools that help analyze the mass of data used in the research with a view to establishing whether a relationship actually exists.

Data Source

The study will focus on time series data for seven variables in Kenya. They are gross domestic savings, GDP, per capita GDP, real interest rates, inflation rate, age-dependency ratio, and terms of trade. The data will be for the period between 1970 and 2013. The choice of this period will be based on the data availability from various sources. The study will investigate the entire study area and as such, there will be no sampling undertaken.

Data Collection

For the empirical analysis, annual time series data from 1970 to 2013 will be used. The data will be obtained from various sources including Central Bank of Kenya, Economy watch, World

Bank, African Development Indicators database. This period is chosen because of data consistency and availability. Data will be picked from the database in excel format and used for running the regression.

Model Specification

Based on both the theoretical and empirical literature discussed earlier, we specify the savings function for this study as follows:

$$GDS = f\left(GDP, RIR, INF, ADEPR\right) \quad (1)$$

Where *gds* is Gross Domestic Saving Rate (as a percentage of GDP) and is calculated as GDP less final consumption expenditure (total consumption), *gdp* is real gross domestic product which is an inflation-adjusted measure that reflects the value of all goods and services produced in a given year, expressed in base-year prices, *rir* is Real Interest Rates which is the lending interest rate adjusted for inflation as measured by the GDP deflator, *inf* is Inflation Rate which is measured by the consumer price index and it reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals such as yearly, *adepr* is the logarithm of Age-Dependency Ratio and it's defined as the ratio of dependents--people younger than 15 or older than 64--to the working-age population--those ages 15-64. It is noteworthy here that these variables are by no means the only variables that do influence savings mobilization in an economy. The exclusion of some determinants is unavoidable due to the degrees of freedom available, on account of the short time series availability.

Determination of a saving function based on country level data on time series requires following strict estimation procedures. First is to carry out unit root test to test for stationarity of the macroeconomic variables. This was done using the Augmented Dickey Fuller (ADF) approach on both the dependent and independent variables. The test for unit root was performed and variables were found to be stationary at level. The next step was to perform a cointegration test which is basically a test of stationarity of the residuals. If all or some explanatory variables are cointegrated, the next step was to estimate a multivariate saving function. If sets of variables were cointegrated, the short-run dynamics and long-run equilibrium could be described by an Error Correction Model. Estimation of the long-run relationship is by Ordinary Least Squares (OLS).

The long-run (equilibrium) specification is given by equation (2) specified below:

$$GDS = \beta_0 + \beta_1 GDP + \beta_2 RIR + \beta_3 INF + \beta_4 ADEPR + \varepsilon$$

The βs' are parameters to be estimated. With the variables found to be jointly integrated, short-run dynamics of the long-run are estimated using the following empirical model.

$$\Delta GDS_t = \beta_0 + \sum_{t=0}^{n} \beta_1 \Delta GDP_{t-n} + \sum_{t=0}^{n} \beta_2 \Delta RIR_{t-n} + \sum_{t=0}^{n} \beta_3 \Delta INF_{t-n} + \sum_{t=0}^{n} \beta_4 \Delta ADEPR_{t-n} + \beta_5 ECT_{t-1}$$
$$+ \varepsilon_t \qquad\qquad (3)$$

Where, ECT_{t-1} is the error correction term.

Data Processing and Analysis

Quantitative analysis is used to draw conclusion in the study. Eviews is the statistical package that is used to analyze the data quantitatively. For data that was not originally in percentage form, it had to be transformed by generating its natural logarithm in order to interpret the elasticity of its slope coefficients as a percentage.

EMPIRICAL RESULTS

Diagnostic Test for Normality

The Characteristics of the distribution of the variables are presented in Table 1 below.

Table 1: Descriptive statistics

	GDS	GDP	INF	RIR	ADEPR
Mean	14.40527	26.34518	12.59261	6.28987	99.44583
Median	15.25742	26.301	11.36185	5.25754	102.89710
Maximum	27.08909	29.19075	45.97888	21.09633	112.77380
Minimum	4.48497	23.26509	1.55433	-8.13243	81.49087
Std. Dev.	6.00547	1.76049	8.25801	7.56981	12.67532
Skewness	0.04001	-0.07810	1.79912	0.09105	-0.24661
Kurtosis	1.83000	1.78355	7.68156	2.42820	1.32187
Jarque-Bera	2.46410	2.69492	62.46508	0.64520	5.48139
Probability	0.29169	0.2599	0.00000	0.72426	0.06453
Observations	43	43	43	43	43

From the test, the distribution probabilities for GDS is 0.292, GDP is 0.2599, INF is 0.000, RIR is 0.724, ADEPR is 0.0645 (for a normal distribution, probability should be greater than 0.1). Therefore not all variables are normally distributed. The statistic for Kurtosis (K) shows that INF is leptokurtic, since its distribution is peaked relative to the normal. On the other hand, GDS, GDP, RIR and ADEPR are platykurtic, suggesting that their distributions are flat relative to the normal. Skewness (S) for GDS is 0.04, GDP is -0.0781, INF is 1.799, RIR is 0.091, ADEPR is -0.247 (for normal distribution, skewness: S=0). From the results GDP and ADEPR were negatively skewed whereas GDS, INF and RIR were positively skewed. The Jarque-Bera test was used to determine whether macro-economic factors and gross domestic savings follow the

normal probability distribution. It utilizes the skewness and kurtosis measures and uses the following formula;

$$JB = n [S^2/6 + (K-3)^2/24]$$

Where n= sample size, S= skewness coefficient, and K= Kurtosis coefficient. The JB normality test is a joint hypothesis that of skewness (S) and kurtosis (K) (for a normal distributed variable, S=0 and K=3). Therefore we conclude that all the variables in our study are not normally distributed since there is no variable whose distribution has S=0 and K=3.

The standard deviation is a measure of variability from the mean. From the test, we find that ADEPR has the greatest variability (12.675) while GDP has the smallest variability (1.7605) from the mean. The minimum, maximum, median and the mean, shows the smallest growth rate, the maximum growth rate, the middle growth rate and the average growth rate for each variable respectively.

Test for Stationarity

When estimating a model that includes time series variables, it is necessary to ensure that all time series variables in the model are stationary, which means that they are integrated of the same order. This is done by conducting a unit root test on each variable to find the order of integration. A stationary variable has a time invariant mean and covariance. Estimation based on non-stationary variables may lead to spurious results with high R^2 and t-statistics, but without any coherent economic meaning and inconsistent parameter estimator. This is called spurious regression.

An I(0) series is a time series that is stationary at level. An I(1) series contains one unit root and is a time series that is stationery at first difference. If the time series data is non-stationary and y_t is differenced d times before it became stationary, then it is said to be integrated of order d. We write $y_t \sim I(d)$. So if $y_t \sim I(0)$ then $\Delta dy_t \sim I(0)$. If the variables in the regression model are non-stationary, that is, not integrated of the same order, then, the analysis will call for the error correction model to be run. But if stationary, that is, integrated of the same order, then, we go ahead with our analysis using the OLS.

In this study, Augmented Dickey- Fuller (ADF) test was used to test for unit roots. The results are as shown in the table below. The decision criterion involves comparing the computed ADF statistic values with the Mackinnon critical values for the rejection of a hypothesis of unit root. If the computed ADF Statistic is smaller compared to the critical values, the null hypothesis of non-stationarity in time series variables is rejected and vice versa. In our case (Table 4.3), the computed ADF test-statistics are smaller than the critical values at 1%, 5%, 10% significant levels therefore we can reject Ho. It means the time series doesn't have unit

root problem and the series is stationary at 1%, 5% and 10% significant level. In our case (Table 4.3), the results shows that GDS are stationary at level i.e. I(0) at 5% significance. GDP, INF, RIR and ADEPR are stationary at level; I(0) at 1% significance.

Table 2: ADF Unit-Root Test (at zero difference) Results

Variable	t-Statistic	Test critical values			Remark	Order of Integration
		1% level	5% level	10% level		
GDS	-3.899718	-4.186481	-3.51809	-3.189732	Stationary	I(0)**
GDP(log)	-3.428392	-4.205004	-3.526609	-3.194611	Stationary	I(0)*
INF	-3.904576	-3.592462	-2.931404	-2.603944	Stationary	I(0)***
RIR	-4.081079	-3.596616	-2.933158	-2.604867	Stationary	I(0)***
ADEPR	-4.761063	-4.205004	-3.526609	-3.194611	Stationary	I(0)***

Notes:*Significant at 10 percent ** Significant at 5 percent, *** Significant at 1 percent; H0: there is a unit root

Cointegration Test

If all variables are integrated of the same order, the second step is to estimate the model, also called a "cointegrating equation," and test whether the residual of the model is stationary, in which case the model defines a long run equilibrium relationship among the cointegrated variables. This was done by generating the residual series using Eviews 7 Software and the residuals were subjected to an ADF Test.

The computed values are compared with the critical values as shown in table 4.4. The results show that for the six variables used in the study there is the existence of co integration. It shows that there is a linear combination between the dependent variable gross domestic saving (GDS) and the independent variables GDP, inflation rate, real interest rate, age-dependency ratio, Broad money and foreign direct investments.

Table 3 Unit Root Test for residual results

Variable	t-Statistic	Test critical values			Remark	Order of Integration
		1% level	5% level	10% level		
Residual	-6.390081	-3.596616	-2.933158	-2.604867	Stationary	I(0)***

Notes: ** Significant at 5 percent, *** Significant at 1 percent; H0: there is a unit root

The results indicate that these residuals are stationary of degree zero at 1% significance (i.e. I(0)). The linear combination of the variables of the model is stationary and they are co-integrated which shows presence of long run relationship between the dependent and independent variables.

Correlation Analysis

The correlation analysis is a statistical technique employed to analyze the relationship between the variables used in the study. Column 2 shows the relationship between the dependent and independent variables. From the results GDP, INF and ADEPR are directly correlated to GDS (note the positive sign) while RIR are inversely correlated to the same (note the negative sign). Columns 3, 4, 5 and 6, show the relationship among the explanatory variables. The correlation matrix shows that all the variables are not highly correlated (for high correlation, the coefficients are above 0.8). As a result, the problem of multicollinearity brought about by high correlation between the variables is avoided. This outcome gave the researcher the green light to run the OLS model.

Table 4: Correlation matrix

	GDS	GDP	INF	RIR	ADEPR
GDS	1.00000	0.17925	0.34477	-0.31476	0.82948
GRGDP	0.17925	1.00000	-0.40516	0.11386	0.17806
INF	0.34477	-0.40516	1.00000	-0.34534	0.15429
RIR	-0.31476	0.11386	-0.34534	1.00000	-0.31356
ADEPR	0.82948	0.17806	0.15429	-0.31356	1.00000

Testing the OLS Model

The test determines the impact of independent variables on the dependent variable by comparing the results of the model. In this study, the test was to determine the impact of GDP (GDP), inflation rate (INF), real interest rate (RIR) and Age-dependency ratio (ADEPR) on Gross domestic savings (GDS).

Table 5: OLS analysis

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-25.08526	4.20929	-5.95950	0.00000
GDP(Log)	0.23530	0.13026	1.80642	0.07880
INF	0.21574	0.06819	3.16396	0.00310
RIR	0.00492	0.07049	0.06981	0.94470
ADEPR	-0.35839	0.04146	8.64362	0.00153
GDS(-1)	-0.00556	0.15004	-0.03708	0.06735
R-squared	0.741075	Mean dependent var		14.40527
Adjusted R-squared	0.704086	S.D. dependent var		6.00547
S.E. of regression	3.298606	Akaike info criterion		5.21680
Sum squared resid	380.80820	Schwarz criterion		5.42159
Log likelihood	-103.16110	Hannan-Quinn criter.		5.29232
F-statistic	20.03487	Durbin-Watson stat		1.87511
Prob(F-statistic)	0.00000			

DISCUSSION OF RESULTS

An examination of the econometric results shows that the overall fit is satisfactory with an R-squared (R^2) of 0.741075 or 74%. It implies that GDP, inflation rate, real interest rate and age-dependency ratio explained about 74% systematic variations on Gross Domestic Savings (GDS) over the observed years in the Kenyan economy while the remaining 26% variation is explained by other determinant variables outside the model. The value of Durbin Watson is 1.88 for the model. This falls within the determinate region and implies that there is a positive first order serial autocorrelation among the explanatory variables in the model.

The potency of GDP in explaining GDS in the country is positive and is statistically significant at 10 percent significance level (p-value < 0.1). A one percent increase in GDP will cause GDS to increase by 0.23530 percent, ceteris paribus. This particular result is consistent with the works of (Athukorala & Sen, 2004), (Touny, 2008), (Keho, 2011) but inconsistent with previous studies by (Adewuyi, Bankole, & Arawomo, 2007) & (Nwachukwu & Egwaikhide, 2007).

Inflation has a positive coefficient which implies that it has a direct relationship with gross domestic savings and is statistically significant at 1 percent significance level (P-value< 0.01). Thus the results indicate that, if the inflation rate rises by one percent, then GDS will significantly increase by 0.21574 percent, ceteris paribus. The result is consistent with the works of (Athukorala & Sen, 2004), (Touny, 2008), (Keho, 2011) but inconsistent with previous studies by (Adewuyi, Bankole, & Arawomo, 2007) , (Nwachukwu & Egwaikhide, 2007)& (Gebeyehu, 2010).

Real interest rate was not an important determinant of gross domestic savings at 10% significance level (P-values > 0.1). This implies that it may be having negligible or insignificant impact on gross domestic savings. The result is consistent with the work of (Gebeyehu, 2010) but inconsistent with previous studies by (Adewuyi, Bankole, & Arawomo, 2007) , (Keho, 2011)& (Touny, 2008).

Age-dependency ratio is also an important determinant of gross domestic savings at 1% significant level (p-value < 0.01). This implies that a one unit increase in age-dependency ratio will lead to a decrease in GDS by 0.35839 units. It can be inferred that age-dependency ratio has a negative impact on GDS in Kenya. The result is consistent with the works of (Kibet, Mutai, Ouma, Ouma, & Owuor, 2009)&(Keho, 2011).

From the analysis, it was evident that GDP, Inflation and Age-dependency ratio were found to be significant determinants of savings, while Real interest rates on the other hand was found to be an insignificant determinant of gross domestic savings.

CONCLUSION

The problem of this study was to ascertain the key macroeconomic determinants of savings that would drive Kenya towards the attainment of the targeted middle income status by the year 2030 and determine which ways these determinants influence economic policy formulation and implementation.

In this regard, the main objective of the study was to examine the macroeconomic determinants of saving in Kenya for the period 1970 to 2013 by means of Ordinary Least Square Model using yearly data for a period of 43 years. In order to achieve the main stated objective, the following research questions were tested:

- To determine the effect of GDP on gross domestic savings in Kenya
- To find out the effect of real interest rates on gross domestic savings in Kenya
- To establish the effect of inflation on gross domestic savings in Kenya
- To determine the effect of age dependency ratio on gross domestic saving in Kenya

Before the estimation, the stationarity properties of the variables of interest were first tested with the help of the Augmented Dickey Fuller (ADF) test. This was to ensure that all the variables of interest are integrated of the same order. Unit root test for the residual value was employed to determine the long run relationship among the variables of interest. The study revealed that there is cointegration.

POLICY RECOMMENDATIONS

Adoption of a strict monetary policy to maintain money supply within manageable levels and ensure stable and low inflation rates will help improve real incomes and will also cause development in the financial sector and hence improve gross domestic savings in the economy. In addition, state interest is recommended in the old age dependency ratio, which was found to have significant and negative influence on gross domestic savings in the economy. From the empirical findings this study recommends the improvement of health care provision by the government for the entire population. This will go a long way in improving the life expectancy and hence improve this dependency ratio. This partly will motivate workers to save for the old age.

GDP was found to be a significant determinant of gross domestic savings and therefore the government should formulate policies to stimulate growth in GDP. Inflation was also a significant determinant of gross domestic savings and therefore the policy makers should formulate policies that will stabilize inflation in the country.

LIMITATIONS OF THE STUDY

The study focuses on four independent variables as determinants of gross domestic savings. These variables are by no means the only variables that do influence savings mobilization in an economy. The exclusion of some determinants is unavoidable due to the degrees of freedom available, on account of the short time series availability.

AREAS OF FUTURE RESEARCH

This research could be extended by further research to investigate possible effects of the degree of Financial Depth which I could not investigate in this study due to lack of information available to use about time series data of Kenya's degree of financial depth.

As more time series data become available coupled with structural changes in the economy, one should continue to consider whether there are fundamentally different determinants of gross domestic savings in Kenya, as this seems to imply and given their important policy implications. Therefore future research should consider to model with more alternative possible determinants of gross domestic savings.

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